GARVER

Airport Master Plan

Terrell Municipal Airport

June 2023

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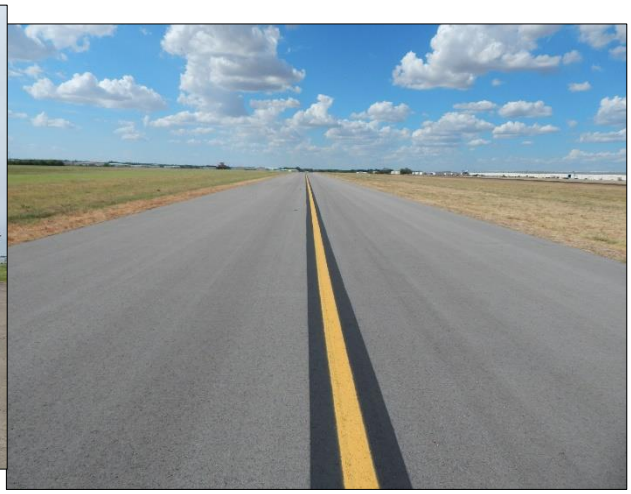


CHAPTER 1: INTRODUCTION

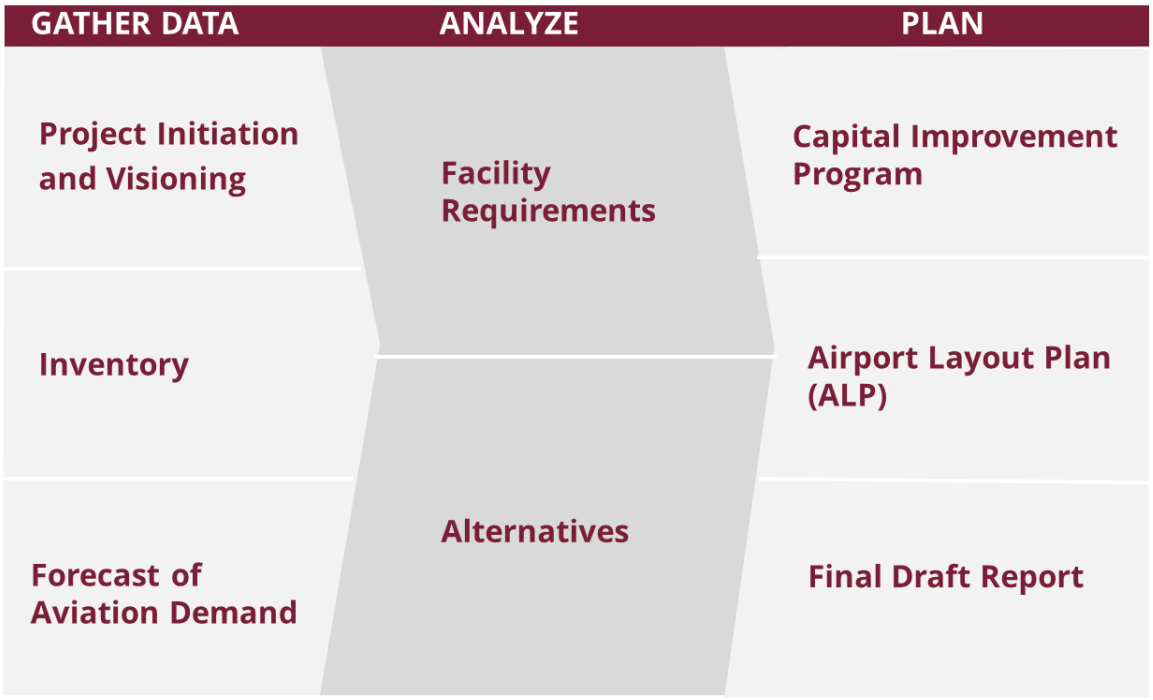
INTRODUCTION AND PURPOSE

An Airport Master Plan (AMP) evaluates an airport's physical facilities, management principles, planned development, and financial foundation for the future. Since the aviation industry is not static, periodic updates are needed to refresh this information and identify future plans and expectations. Terrell Municipal Airport (TRL) has had some significant changes since the previous AMP was completed in 2005. These changes include changes in area economic conditions, increased based aircraft demand, the closure of a crosswind runway, and the development of a new main apron and terminal building.

This AMP will focus on examining existing facilities, forecasting future aviation demands, identifying the projects necessary to meet that demand, and examining the financial means to achieve the short- and long-term goals for TRL. Additionally, the AMP will serve as a tool to aid City staff in their decision-making regarding TRL's upkeep and future development.

An overview of the AMP process is provided in **Figure 1-1**.

FIGURE 1-1
AIRPORT MASTER PLAN PROCESS
TERRELL MUNICIPAL AIRPORT



This document, referred to as the AMP report, provides a detailed overview of every element of the AMP for Terrell Municipal Airport (TRL) located in Terrell, TX.

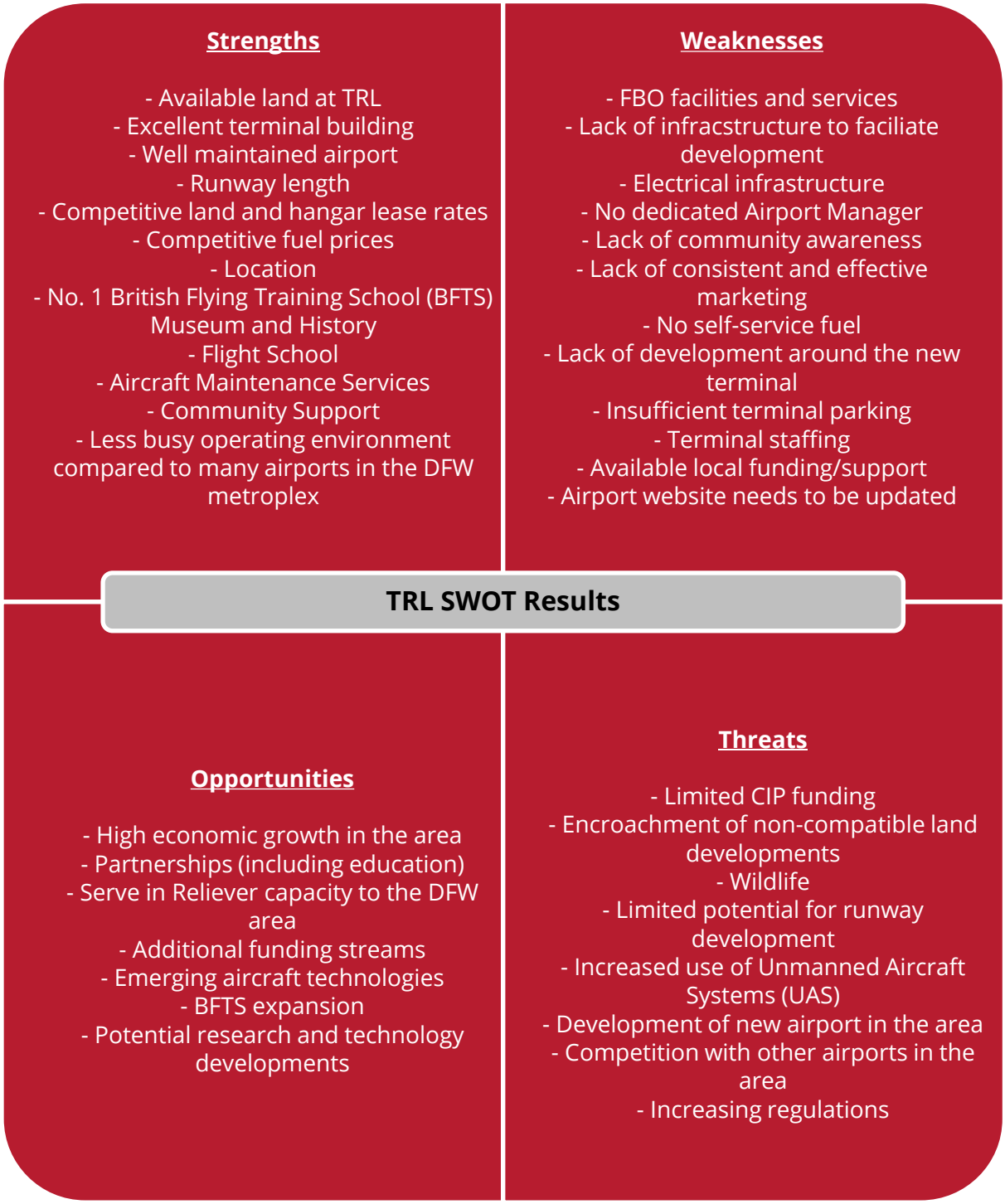
In addition to this report, an Airport Layout Plan (ALP) drawing set was developed. The ALP is a set of drawings that details the Airport's current infrastructure and proposed development plans as well as the airspace and properties surrounding the Airport. The ALP is reviewed and conditionally approved by the FAA and TxDOT Aviation. The ALP created as part of this project complies with FAA Standard Operating Procedures (SOP) 2.00 – *Standard Operating Procedure for FAA Review and Approval of Airport Layout Plans*.

VISIONING EFFORT

As an initial component of this AMP project, a visioning effort was conducted to identify items of key importance related to the future of the TRL and the AMP process. To support the visioning effort a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was completed to identify key items that needed to be considered during the AMP process. The SWOT analysis was completed with input from staff from the City of Terrell.

Figure 1-2 below provides an overview of the items identified during the SWOT Analysis.

FIGURE 1-2
SWOT ANALYSIS
TERRELL MUNICIPAL AIRPORT



2 Inventory

CHAPTER 2: INVENTORY

FACILITIES INVENTORY

As the initial step in the Airport Master Plan (AMP) process, the inventory is a systematic data collection effort that provides an understanding of past and present aviation factors associated with the Terrell Municipal Airport (TRL). A comprehensive inventory, including the following major inventory tasks, was completed to form the basis for recommendations throughout the remainder of the Airport Master Plan.

- An on-site inspection of existing facilities was conducted on July 27 and 28, 2022, to ensure an accurate inventory of airport facilities, equipment, and services.
- Discussions with Airport staff, local officials, and airport tenants regarding airport infrastructure, trends, operations, and services.
- The collection of airport activity data and aeronautical background information including a review of historical airport information, previous Airport Master Plans, maps, charts, and photographs of airport facilities.
- Review of current and planned on- and off-airport land use development and property information, including surrounding land use patterns, existing and proposed transportation developments, infrastructure, and utilities.
- The collection of environmental information related to the airport and future development.

AIRPORT ROLE

TRL's role is well documented in the FAA's National Plan of Integrated Airport Systems (NPIAS), the FAA's General Aviation Airports: A National Asset study, and the Texas Airport System Plan (TASP). TRL is classified as follows in each of the aforementioned documents:

- Designated as a "General Aviation – Business/Corporate" airport under the TASP. The Airport is also identified to be in the "Multipurpose" Functional Category.
- Designated as one of 2,535 "general aviation" airports in the NPIAS. The Airport is further subcategorized as one of 1,213 "local" airports in the NPIAS.
- Identified by the FAA's Asset study as a "local" general aviation airport.

The TASP describes Business/Corporate airports as general aviation airports that provide access to turboprop and turbojet business aircraft and that are located where there is sufficient population or economic activity to support a moderate to high level of business jet activity and/or to provide capacity into metropolitan areas. Business/Corporate airports generally meet the following criteria:

- Serve communities located more than 30 minutes from the nearest commercial service or reliever airport;
- Are located at least 25 miles from other business/cooperate airports and serve an area of concentrated population, purchasing power, or mineral production;
- Have or are forecasted to have 500 or more annual business/corporate aircraft operations within five years, or have two permanently based jets; and,
- Sometimes located within 25 miles of a significant national recreation or preservation area.

Under the TASP, airports with a multipurpose functional classification are intended to support diversified operations, though some may have or require special features to support airport users.

Beyond the TASP, NPIAS, and FAA Asset Study designations, the FAA identifies design standards for airports and their operating pavements based on FAA Advisory Circular (AC) 150/5300-13 (current edition), *Airport Design*. Pavement categorization is provided for runways through the Runway Design Code (RDC) classification system while taxiway pavements are designated separately through the Taxiway Design Group (TDG) classification system.

A runway's RDC is defined by two variables related to the designated critical design aircraft for the runway and the lowest approach visibility minimums for the runway.
The critical design aircraft is the largest single aircraft or classification of aircraft the runway is expected to serve on a regular basis (500 operations per year or more).

The critical design aircraft variables used to establish a runway's RDC include:

- Aircraft Approach Category (AAC)
- Airplane Design Group (ADG)

The tables below further define the variables utilized to establish the RDC for a runway. **Table 2-1** defines the AAC categories. **Table 2-2** documents the ADG categories. **Table 2-3** describes the various visibility minimum categories.

TABLE 2-1
AIRCRAFT APPROACH CATEGORY (AAC)

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

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

TABLE 2-2
AIRPLANE DESIGN GROUP (ADG)

Group #	Tail Height (ft. [m])	Wingspan (ft. [m])
I	< 20' (< 6.1 m)	< 49' (< 14.9 m)
II	20' ≤ 30' (6.1 m ≤ 9.1 m)	49' ≤ 79' (14.9 m ≤ 24.1 m)
III	30' ≤ 45' (9.1 m ≤ 13.7 m)	79' ≤ 118' (24.1 m ≤ 36 m)
IV	45' ≤ 60' (13.7 m ≤ 18.3 m)	118' ≤ 171' (36 m ≤ 52 m)
V	60' ≤ 66' (18.3 m ≤ 20.1 m)	171' ≤ 214' (52 m ≤ 65 m)
VI	66' ≤ 80' (20.1 m ≤ 24.4 m)	214' ≤ 262' (65 m ≤ 80 m)

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

TABLE 2-3
VISIBILITY MINIMUMS

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

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

The only runway at TRL is Runway 18-36. Based on the application of FAA airport design criteria, the TASP, a review of existing facilities, and a review of TRL's current Airport Layout Drawing (ALD) and instrument approach procedures, Runway 18-36 has an RDC of B-II-4000. This designation is consistent with the types of aircraft currently using the airfield and the Airport's established Instrument Approach Procedures (IAP).

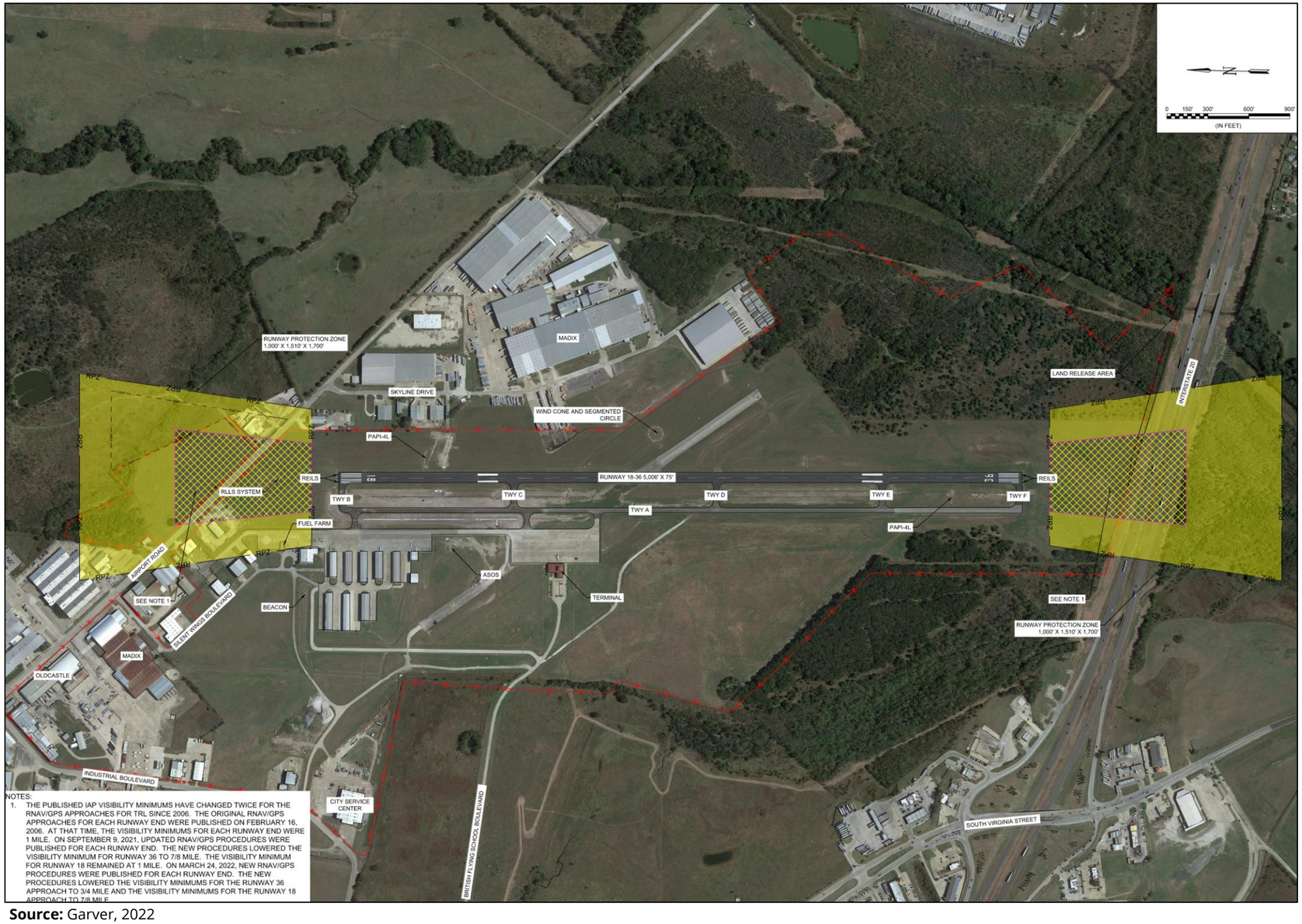
An airport's Airport Reference Code (ARC) is based on the highest RDC of a runway at the Airport minus the RDC visibility component. Based on the RDC for Runway 18-36, the ARC for TRL is B-II.

AIRFIELD FACILITIES AND CHARACTERISTICS

The Terrell Municipal Airport was originally established in 1941 as a training ground for British pilots preparing to serve in World War II (WWII). As part of the federal Land Lease Act of 1941, the Airport was established as the No. 1 British Flying Training School (BFTS). Between 1941 and 1945, approximately 2,100 cadets in the British Royal Air Force (RAF) and 138 American cadets were trained at the Airport. In September 1945, the No.1 BFTS closed, and the Airport was officially deeded to the City of Terrell in 1947. The Airport is still owned and operated by the City of Terrell today.

Today, as shown in **Figure 2-1**, *General Airport Layout*, TRL has a single runway, Runway 18-36, and a full-length parallel taxiway, Taxiway A. **Table 2-4** provides a summary of the airfield components and data. The airside facilities consist of the runway, taxiways, airfield lighting, weather reporting systems, and other various components.

FIGURE 2-1
GENERAL AIRPORT LAYOUT
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2022

TABLE 2-4
AIRFIELD FACILITIES
TERRELL MUNICIPAL AIRPORT

	Runway 18-36
Length (feet)	5,006
Width (feet)	75
Surface Material/Treatment	Asphalt
Weight Bearing Capacity (pounds) Single Wheel Gear (SWG)	30,000
Markings	Non-Precision Instrument
Runway Lighting	MIRL
Approach/Lighting Aids Vertical Guidance Slope Indicators	RWY 18: 4-Light PAPI (P4L) RWY 36: 4-Light PAPI (P4L) RWY 18: RLLS REILs both ends
Visual Aids	Centerfield lighted windcone with segmented circle
Runway RSA	150 ft. x 300 ft.
Runway OFA	500 ft. x 300 ft.
Runway OFZ	400 ft. x 200 ft.
Instrument Approach Aids	None on airport (Cedar Creek VORTAC 31.5 nautical miles south of TRL)
Weather Reporting Aids	ASOS

Source: FAA Airport Facility Directory, FAA 5010 Data, 2012 TRL Airport Layout Drawing (ALD), Garver Site Visit Data

RUNWAY 18-36

Runway 18-36 is 5,006 feet in length and 75 feet in width. The runway is constructed of asphalt. A pavement condition assessment was conducted by Schaumburg & Polk, Inc. in March 2021 that classified the condition of the pavement as being in "very good" condition. According to TxDOT Aviation records, the runway was rehabilitated in 2018.

Based on the Airport's current Airport Master Record (FAA Form 5010), the runway has a published gross weight-bearing capacity of 30,000 pounds single wheel. The runway is equipped with Medium Intensity Runway Lights (MIRLs), as well as a four-light Precision Approach Path Indicator (PAPI) system and Runway End Identifier Light (REIL) system for each runway end. Runway 18 also has a Runway Lead-In Light System (RLLS). According to TxDOT grant histories and record drawings, the MIRLs, PAPIs, RLLS, and REILs (Runway 36 only) were installed around 2002. An installation date could not be identified for the REILs for Runway 18, however, based on historical data they were likely installed prior to 2002. All the lighting systems are past their expected useful life. Additionally, the MIRLs were installed on Brooks boxes in lieu of the L-867 light bases as prescribed by AC 150/5340-30 (current edition). As a result, the existing installation is non-standard. The existing electrical vault is over 20 years old and was recently repaired to prevent water from leaking into the facility. The electrical vault facility is in need of replacement.

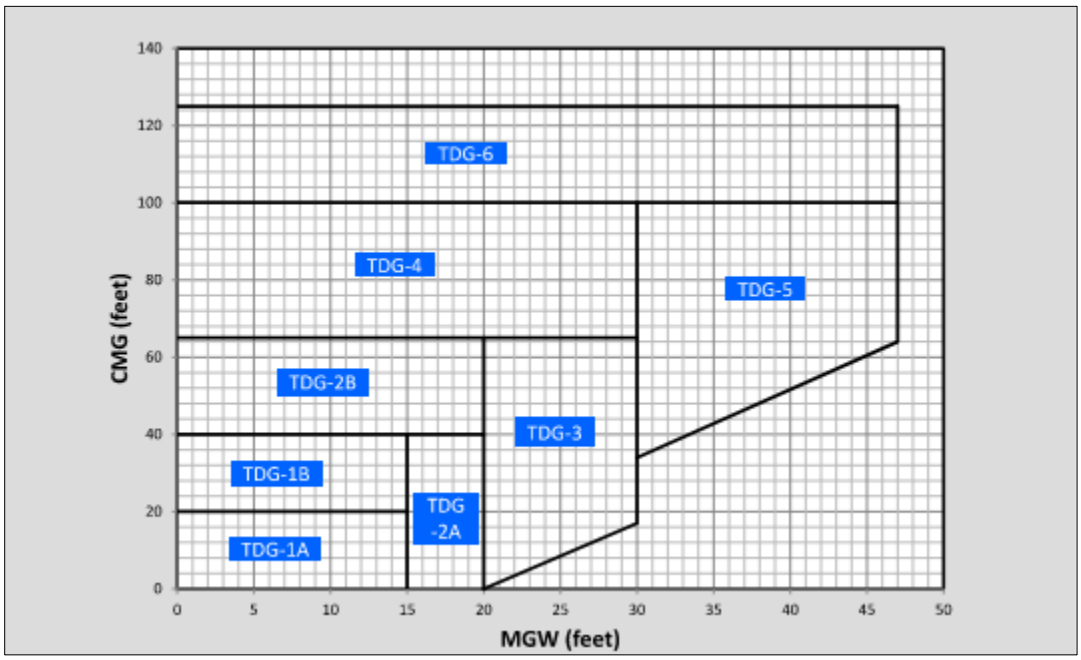
Both runway ends have non-precision instrument markings that are in good condition. There are no current Runway Safety Area (RSA) or Runway Object Free Area (ROFA) discrepancies. The Runway Protection Zones (RPZ) associated with each runway end protrude off property and extend over roadways. However, the airport does have avigation easements in some of these areas.

TAXIWAYS/TAXILANES

Aircraft move from the runway to the businesses/hangars on the airfield via taxiways and taxilanes. Each taxiway/taxilane is typically designated with a unique name and designed to

accommodate anticipated aircraft operations based on an established Taxiway Design Group (TDG). The TDG is a classification system for taxiways/taxilanes based on an airplane's landing gear dimensions. An aircraft's TDG is calculated based on its outer-to-outer main gear width and the cockpit to main gear distance. The wider the distance between the main gear struts and/or the greater the distance between the cockpit and main gear, the higher the TDG. The TDG for a given aircraft can be identified by the use of **Figure 2-2,** and the application of the specific safety parameters outlined in AC 150/5300-13 (current edition).

FIGURE 2-2
TAXIWAY DESIGN GROUPS



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

As previously mentioned, TRL has a full-length parallel taxiway (Taxiway A) for Runway 18-36 and five perpendicular taxiway stubs connecting the runway to the parallel taxiway. The stub taxiways are identified, from north to south, as Taxiway B, C, D, E, and F as shown in **Figure 2-1**. There are three stub taxilanes that connect Taxiway A to various aircraft hangar/apron areas. These taxilanes were identified, from north to south, as Taxilane G, H, and J in the plans for the Taxiway A relocation project. However, no signage is provided on the airfield designating these taxilanes.

The majority of the taxiways/taxilanes at TRL are constructed of asphalt but some taxilanes in the apron areas are constructed of concrete. Taxiway A was realigned in 2021 to have a uniform separation from the Runway 18-36 centerline. Consequently, the Taxiway A

pavement north of Taxiway E is in good condition. According to the 2017 pavement condition assessment performed by the Texas A&M Transportation Institute (TTI) the Taxiway A pavement south of Taxiway E is in fair condition. The Taxiway A centerline is currently located 240 feet from the centerline for Runway 18-36.

The taxiway/taxilanes at TRL range in width from 35 feet to 45 feet. In general, the taxiways/taxilanes follow TDG-2 design standards. However, an important aspect of taxiway design is the pavement layout where one taxiway curves to another taxiway, commonly referred to as a taxiway "fillet." The FAA changed the taxiway fillet design standards significantly in 2014. Due to the Taxiway A relocation project, the taxiway fillets at TRL meet TDG-2 standards.

Another aspect of taxiway layout and design are the establishment and protection of Taxiway Safety Areas (TSA), Taxiway Object Free Areas (TOFA), and Taxilane Object Free Areas (TLOFA). The TSA is a defined surface alongside the taxiway that is prepared or suitable for reducing the risk of damage to an aircraft deviating from the taxiway. The purpose of the TSA is to protect an aircraft from damage if the aircraft leaves the taxiway for any reason. The TOFA or TLOFA is an area centered on a taxiway or taxilane centerline that must be kept clear of objects except those objects that need to be located in the TOFA/TLOFA for air navigation or aircraft ground maneuvering purposes. The size of both the TSA and TOFA/TLOFA are based on the ADG (described in Table 2-2) of the critical design aircraft expected to use each taxiway. Currently, the TSA is 79 feet wide, TOFA is 124 feet wide, and the TLOFA is 110 feet wide for all taxiways/taxilanes at TRL.

All taxiways/taxilanes at TRL have a taxiway centerline marking. The markings are generally in good condition.

There is currently no taxiway lighting at TRL. However, taxiway centerline reflectors are located on all taxiways and edge reflectors are provided in some locations. There are

runway hold position signs and taxiway location signs that are co-located with the runway hold position markings. There are also taxiway directional signs located on the runway. The signs are all in good condition.

AIRFIELD LIGHTING AND SIGNAGE

Sufficient airfield lighting is an important part of maintaining an airfield's operational status during night and inclement weather conditions. As previously discussed, TRL has MIRLs for Runway 18-36. The MIRLs were installed around twenty years ago and are past their useful life. The illuminated airfield signage on the airfield was recently replaced and is in good condition.

At night or during poor weather conditions, pilots identify an airport by locating the rotating beacon, a lighting feature that provides alternating white and green flashes of light. TRL's beacon is located approximately 880 feet west-northwest of the Runway 18 threshold and directly north of the existing T-hangar development. The beacon is in good condition with no reported maintenance issues. The beacon has an LED light fixture.

To help identify the landing threshold for each runway end, the approach end of both runways is equipped with Runway End Identifier Lights (REILs). The REILs are owned by the Airport. The fixtures are incandescent and are past their established useful life.

A Runway Lead-In Light System (RLLS) is located at the approach end of Runway 18. It consists of five sequential light fixtures each spaced approximately 210 feet apart. The system is used to guide pilots toward the approach end of the runway. The lighting fixtures are incandescent. The RLLS is owned by the Airport and is past its established useful life.

A series of three red taxiway edge lights are installed along the eastern edge of the northern apron, in close proximity to the Runway 18 threshold. These lights were installed in 2002 to visually delineate the edge of the apron for aircraft landing on Runway 18. The original construction plans referred to these lights as obstruction lights.

NAVIGATIONAL AIDS (NAVAID)

NAVAIDs, located on the field or at other locations in the region, are specialized equipment that provide pilots with electronic guidance and/or visual references in an effort to execute instrument approaches and point-to-point navigation. TRL has a four-light PAPI system on each end of Runway 18-36. These systems provide pilots with a visual indication of whether they are above or below the established 3-degree glidepath for either runway end. The PAPI for Runway 18 is owned by the FAA and the PAPI for Runway 36 is owned by the airport. They are incandescent fixtures that are approximately twenty years old. They are past their established useful life.

Additionally, a VORTAC (Cedar Creek VORTAC) is located 31.5 miles south of TRL. A VORTAC is a VHF Omnidirectional Range Radio Beacon that emits a signal to aid aircraft in determining the location of the VOR station from the aircraft with respect to magnetic north. The co-located Tactical Air Navigation (TACAN) facility provides TACAN azimuth and Distance Measuring Equipment (DME) functionality that allows aircraft to measure the slant range distance from the VORTAC to the aircraft in nautical miles.

NAVAIDs and Global Positioning System (GPS) satellites are also critical to the development of Instrument Approach Procedures (IAPs) at an airport. Currently, there are two IAPs published for TRL. Details for these approaches are in **Table 2-5**.

TABLE 2-5
INSTRUMENT APPROACH PROCEDURES
TERRELL MUNICIPAL AIRPORT

Runway End	Approach	Type	Category	Visibility Min. Distance (mi)	Ceiling Min. MSL (ft)	Ceiling Min. AGL (ft)
Runway 18	RNAV (GPS)	LPV DA	A, B, C	7/8	756	282
		LNAV/VNAV DA	A, B, C	1 1/2	1013	539
		LNAV MDA	A & B	1	960	486
			C	1 3/8	960	486
		Circling	A	1	1000	526
			B	1	1020	546
			C	1 3/4	1100	626
Runway End	Approach	Type	Category	Visibility Min. Distance (mi)	Ceiling Min. MSL (ft)	Ceiling Min. AGL (ft)
Runway 36	RNAV (GPS)	LPV DA	A, B, C	3/4	730	258
		LNAV/VNAV DA	A, B, C	1	801	329
		LNAV MDA	A, B, C	1	820	348
		Circling	A	1	980	506
			B	1	1020	546
			C	1 3/4	1100	626

Source: FAA Digital – Terminal Procedures Publication (d-TPP) Website

WEATHER REPORTING

TRL has an Automated Surface Observing System (ASOS) that is the primary source of wind direction, velocity, and altimeter data for weather observation purposes for the Airport. The ASOS is an automated sensor suite that reports weather conditions over a discrete radio frequency for pilots to receive real-time weather information. The TRL ASOS information can be received by tuning to 119.275 MHz or by calling 972-551-1334. The FAA owns the ASOS and it is maintained by NOAA.

TRL also has a centerfield windsock that provides a visual indication of wind speed and direction. The windsock is surrounded by a segmented circle that is made from concrete. The windsock is externally illuminated.

LANDSIDE / TERMINAL AREA FACILITIES

The landside/terminal area facilities are those central to the business operations of an airport. They support transition from the airfield to aircraft storage areas/aeronautical businesses and then into community infrastructure. Landside/terminal facilities typically include a terminal building, aircraft storage facilities of various types (e.g., T-hangars and box hangars), aircraft parking aprons and other support facilities like fuel storage and delivery. Based on a based aircraft list provided by the FBO, TRL currently has a total of 86 based aircraft (71 single engine, 13 multi engine, 1 jet, and 1 helicopter).

GENERAL AVIATION TERMINAL AND FBO FACILITY

TRL has a General Aviation (GA) terminal building located in the center of the main aircraft apron area. Access to the terminal building is via British Flying School Boulevard, which connects to South Virginia Street (SH 34). The GA terminal was built in 2012 and is owned by the City of Terrell. The facility is approximately 5,100 square feet and is in good condition. The facility includes a lobby, large meeting room, office area, restrooms, pilots lounge, and flight planning facilities. The FBO staffs the terminal building daily between the hours of 8:00 a.m. – 5:00 p.m.

TRL currently has a single FBO. Terrell Aviation is a privately-owned FBO facility that is located on the north apron. The facility is separate from the GA terminal building. Roadway access to the FBO is provided via Silent Wings Boulevard. The terminal/office area associated with the FBO facility is approximately 1,900 square feet. The facility contains a lobby, office space, and restroom. Rental cars and courtesy cars are currently not provided. The FBO building/hangar was originally built in the 1960s.

AIRCRAFT STORAGE/HANGAR FACILITIES

TRL supports the storage of aircraft in two primary hangar types: T-hangars and box/common hangars. Box/common hangars are generally stand-alone structures while T-hangars are individual aircraft storage units joined as one standing structure. At TRL, there are seven box/common hangars and eight T-hangar structures. **Figure 2-3** and **Table 2-6** provides a breakdown of hangar storage at TRL.

In total, there is approximately 127,500 square feet of hangar space at TRL. All hangars at TRL are at capacity and a waiting list for hangar space exists. Currently, there are approximately 37 aircraft/individuals on the waiting list.

Based on feedback provided by the City, the roofs of Hangars B, C, and D need to be repaired or replaced.

FIGURE 2-3
AIRPORT HANGAR LAYOUT
TERRELL MUNICIPAL AIRPORT

Source: Garver, 2022

TABLE 2-6
AIRCRAFT STORAGE HANGARS
TERRELL MUNICIPAL AIRPORT

Building Number	Hangar Type	Area (sq. ft.)	Utilization
BFTS Hangar	Box Hangar	8,390	Hangar for BFTS Aircraft
BFTS Museum	Box Hangar	8,450	Museum
Madix	Box Hangar	10,000	Private Hangar
City Hangar	Box Hangar	6,400	City-owned Hangar
FBO	Box Hangar	12,485	FBO/Maintenance Hangar
Hangar "B"	T-Hangars	9,850	8 Bay T-Hangars
Hangar "C"	T-Hangars	11,285	10 Bay T-Hangars
Hangar "D"	T-Hangars	11,970	10 Bay T-Hangars
Hangar "E"	T-Hangars	11,940	9 Bay T-Hangars
Hangar "F"	T-Hangars	11,810	10 Bay T-Hangars
Terrell Aircraft Services	Box Hangar	3,545	Maintenance Hangar
Private Hangar	Box Hangar	4,397	Private Hangar
Hangar "H"	T-Hangars	15,160	12 Bay T-Hangars
Hangar "I"	T-Hangars	14,285	12 Bay T-Hangars
Hangar "J"	T-Hangars	12,480	P8 Bay T-Hangars

Source: Garver, 2022

AIRCRAFT PARKING APRON

The Airport has approximately 499,700 square feet of apron space used for parking and maneuvering of aircraft. The main apron located adjacent to the GA terminal building is approximately 161,000 square feet. The northern apron, including the taxilanes serving the T-hangars, is approximately 338,700 square feet. The majority of the apron is constructed of concrete, with some asphalt sections. According to the pavement study conducted by the Texas A&M Transportation Institute in 2017 and the 2021 pavement study conducted by Schaumburg & Polk, Inc., the majority of the apron and taxilane pavement is considered to be in good condition. However, the asphalt portions of the pavement along the north apron need to be rehabilitated. The portions of the apron commonly used for aircraft taxiing are equipped with taxilane centerline markings.

Within the apron space there are a total of 33 designated aircraft tie-down spaces. Seven tie-down spaces are located on the main apron and 26 tie-down spaces are located on the north apron.

AIRCRAFT CIRCULATION

The Airport has a single runway with a parallel taxiway and multiple taxiway connections making aircraft circulation on the airfield relatively simple. When aircraft are landing on Runway 18, they turn off the runway at the approach end of Runway 36 or one of the preceding stub taxiways and taxi to the terminal/hangar areas via the parallel taxiway. Aircraft departing Runway 18 taxi to the approach end of Runway 18 via the parallel taxiway and enter the runway at Taxiway B. When aircraft are landing on Runway 36, they turn off the runway at the approach end of Runway 18 or one of the preceding stub taxiways and taxi to the terminal/hangar area via the parallel taxiway. When departing Runway 36, aircraft taxi to the approach end of Runway 36 via the parallel taxiway and enter the runway on Taxiway F.

There are currently no aircraft circulation issues related to the runway and taxiway/taxilane configuration at TRL. It should also be noted that TRL does not have any taxiways that

could be classified as providing direct runway access under AC 150/5300-13 (current edition).

TERMINAL PARKING AND ROADWAY ACCESS

The GA terminal facility has a small striped parking lot immediately behind it. There are 22 striped parking spaces, including two handicapped parking spaces. The parking lot is concrete and is in good condition. The size of the parking lot is sufficient to accommodate existing demand unless a special event is occurring. An unstripped vehicle parking area is provided by the FBO and adjacent to the No. 1 BFTS museum.

Roadway access to the Airport is provided via British Flying School Boulevard, which connects to South Virginia Boulevard (SH 34). The Airport access road is constructed of concrete and is in good condition. In addition to a marquee sign at the Airport entrance, there are airport signs in both directions on South Virginia Blvd.

SECURITY

TRL has a mix of chain link, wrought iron, and barbed wire fence extending around the entire airport perimeter. The wrought iron fencing is located immediately adjacent to the terminal building. The majority of the fence surrounding the airport is chain link or barbed wire. The chain link fence is six feet tall in most locations and some portions have barbed wire on top. There is a pedestrian gate near the FBO and three access controlled vehicle gates located around the property (two located close to the GA terminal building and one next to the FBO). Security cameras are installed on the vehicle access gates by the GA terminal building and FBO.

In general, airport staff reported no known security issues. However, wildlife (e.g., hogs, deer, etc.) have been seen on airport property. Fencing improvements will likely be necessary to reduce the presence of wildlife at the Airport.

FUEL STORAGE FACILITY

The fuel storage facility at TRL is located on the north apron close to the FBO. The facility consists of two 12,000-gallon Underground Storage Tanks (USTs), one for Jet-A and one for 100LL. The facility was constructed in the mid-1980s, and the tanks are made of fiberglass. Both tanks are properly maintained and are expected to be in good condition. Self-service fueling is not available. Full service fueling is available during FBO business hours.

The FBO has three fuel trucks: a Jet-A truck that holds 2000 gallons, a 100LL truck that holds 600 gallons, and a second 100LL truck that holds between 400 and 500 gallons. The 100LL truck that holds less fuel is currently out of service. Aircraft can be fueled by a truck or at the fuel storage facility. There have been discussions regarding moving the fueling farm to be in closer proximity to the main apron.

EXISTING ENVIRONMENTAL OVERVIEW

This section provides an overview of the known environmental factors that should be considered as part of the Airport Master Plan process. There are no known previous significant environmental studies (e.g., Environmental Assessments, Environmental Impact Statements, etc.) that have been completed for projects at TRL. Previous capital projects at the Airport have received a Categorical Exclusion (CATEX).

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

The National Historic Preservation Act of 1966 requires that an initial review be made to determine if any properties in or eligible for inclusion in the National Register of Historic Places are within the area of a proposed action's potential environmental impact. The Archaeological and Historic Preservation Act of 1974 provides for the survey, recovery, and preservation of significant scientific, pre-historic, historical, archaeological, or paleontological data when such data may be destroyed or irreparably lost due to a federal, federally funded, or federally licensed project.

An online query through the National Registry of Historic Places and Texas Historical Commission website revealed that there are no historic site locations in the immediate vicinity of the Airport. The closest historical site that the query identified was the Terrell Times Star Building which is located 1.5 miles north-northwest of the Airport at 108 South Catherine Street.

A historical marker is located at TRL adjacent to the No. 1 British Flying School Museum on the northside of the Airport. However, the site is not part of the national registry.

FISH, WILDLIFE, AND PLANTS

The Endangered Species Act requires each federal agency to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of a habitat of such species. An online query was completed utilizing the United States Fish and Wildlife Service (USFWS) Endangered Species database and the Texas Parks and Wildlife Department (TPWD) Rare, Threatened, and Endangered Species of Texas database for Kaufman County. **Table 2-7** lists the threatened and endangered species identified through the online queries using both databases. Future coordination with USFWS and TPWD may be necessary prior to commencing any major construction

project at TRL to confirm that no hazard to an endangered or threatened species is being created.

TABLE 2-7
KAUFMAN COUNTY THREATENED AND ENDANGERED SPECIES

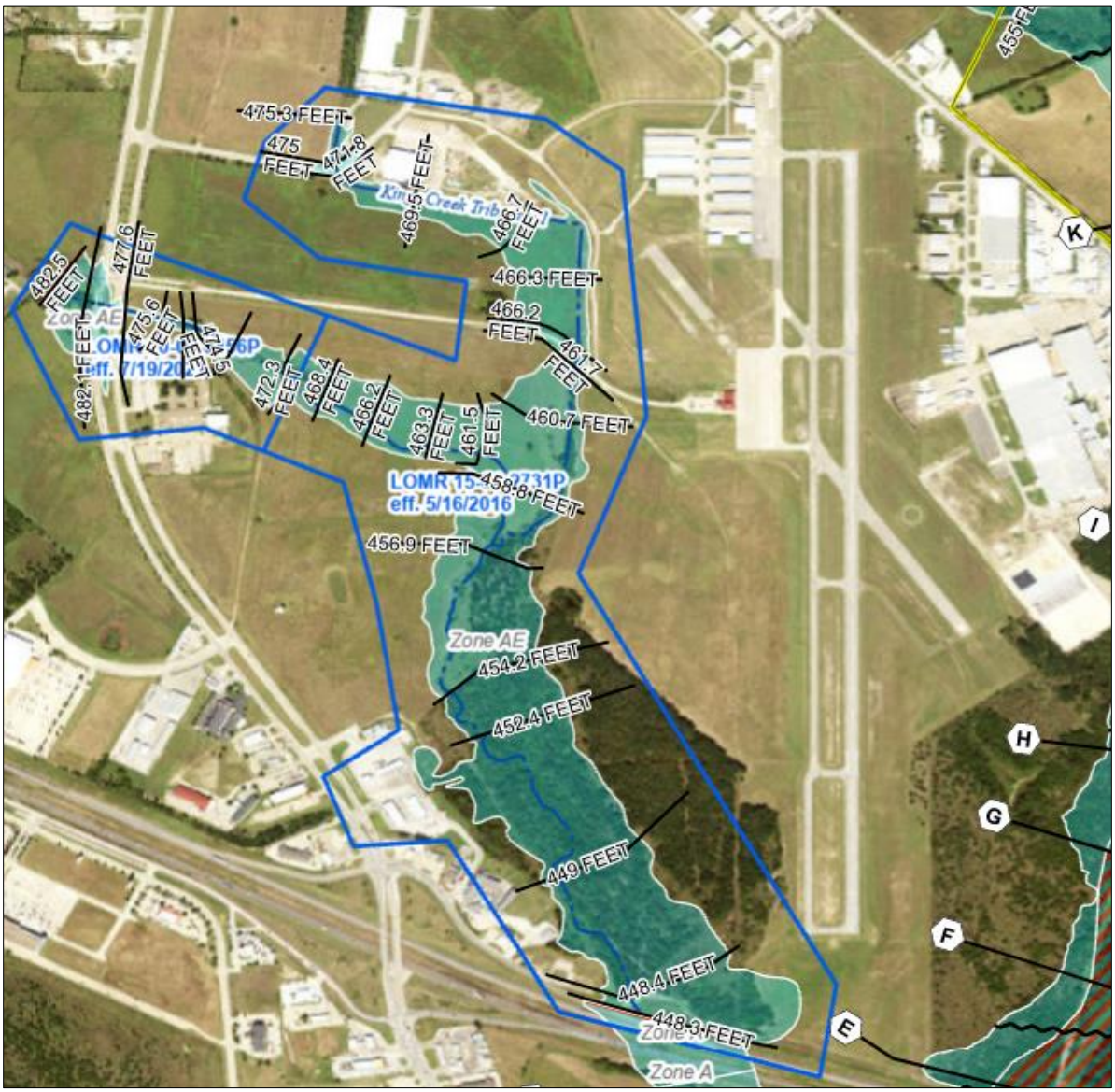
Common Name	Genus/Species	Status
Whooping Crane	Grus americana	LE
Black Rail	Laterallus jamaicensis	LT
Red Knot	Calidris canutus rufa	LT
Piping Plover	Charadrius melodus	LT
White-Faced Ibis	Plegadis chihi	State Listed
Wood Stork	Mycteria americana	State Listed
Alligator snapping turtle	Macrochelys temminckii	State Listed
Texas horned lizard	Phrynosoma cornutum	State Listed
Sandbank pocketbook	Lampsilis satura	State Listed
Louisiana pigtoe	Pleurobema riddellii	State Listed
Texas heelsplitter	Potamilus amphichaenus	State Listed
Trinity pigtoe	Fusconaia chunii	State Listed
Texas Fawnsfoot	Truncilla macrodon	State Listed

Source: USFWS and TPWD. LE = Federally Listed Endangered; LT = Federally Listed Threatened

FEMA Floodplain Map

Flooding can hamper the safe operation of an airport and make it difficult to develop property on or around an airport. As part of this study, an online inquiry was completed through the FEMA Flood Map Service Center to identify areas on or around the Airport affected by the existing floodplain. According to the results of the query, some southern and western portions of airport property lie within the 100-year floodplain as shown in **Figure 2-4.** However, City staff report that there have been no previous flooding issues at the Airport.

FIGURE 2-4
FEMA FLOODPLAIN MAP
TERRELL MUNICIPAL AIRPORT



Source: FEMA Flood Map Service Center, 2022

WETLANDS

Several small wetland areas are present on TRL property according to the United States Fish and Wildlife Service (USFWS) National Wetlands Inventory. Two riverines exist that generally follow the same paths as the floodplain areas.

Additionally, a freshwater pond is shown to be present at the approach end of Runway 36. These areas are shown in blue in **Figure 2-5.**

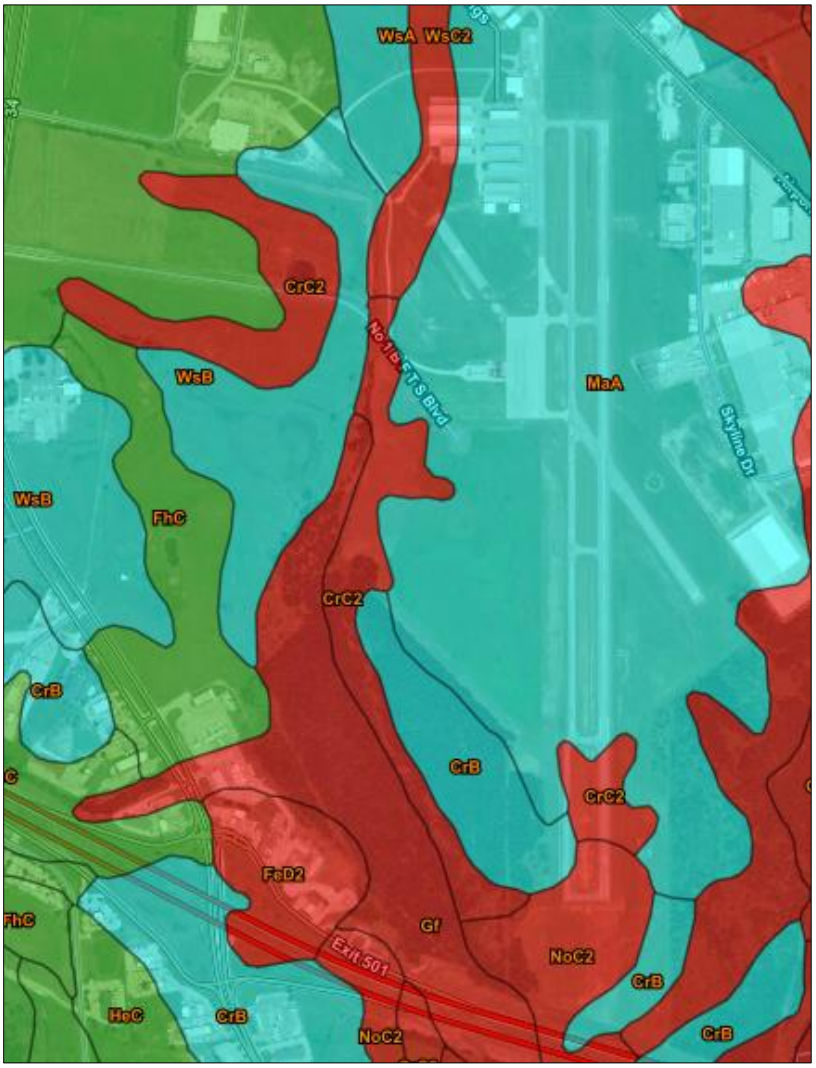
FIGURE 2-5
USFWS NATIONAL WETLANDS INVENTORY MAP
TERRELL MUNICIPAL AIRPORT

Source: USFWS National Wetlands Inventory

FARMLANDS

The Farmland Protection Policy Act (FPPA) regulates federal actions with the potential to convert farmlands to non-agricultural uses. The FPPA is intended to minimize the impact that federal programs have on the unnecessary and irreversible conversion of farmland to non-agricultural uses. According to the USDA Web Soil Survey System, several areas on and around TRL are considered farmland of statewide importance. As depicted in **Figure 2-6**, the areas shown in blue are considered farmland of statewide importance.

FIGURE 2-6
USDA NATURAL RESOURCES CONSERVATION SERVICE FARMLAND CLASSIFICATIONS
TERRELL MUNICIPAL AIRPORT



Source: USDA Web Soil Survey System

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION

Based on research completed as part of this project and discussions with airport stakeholders, there are no known hazardous materials, solid waste, or pollution hazards on or immediately adjacent to the Airport. An online inquiry completed using the Texas Commission on Environmental Quality website did not identify any active or closed landfill sites in the immediate vicinity of the Airport.

It should be noted that the City of Terrell has obtained a Municipal Setting Designation (MSD) for the property that the Airport is located on through TCEQ. The application number was 219 and the certification was provided on January 23, 2013.

NOISE

Based on discussions with airport stakeholders, there are no known significant noise issues related to the Airport.

LAND USE AND CONTROLS

The land within the perimeter fence at TRL is considered aviation use. The Airport does own several parcels of property that are currently utilized for non-aeronautical purposes. According to the Airport's existing property map, avigation easements have been obtained at the approach end of Runway 18 to protect the Runway Protection Zone (RPZ) associated with that runway.

The majority of the land immediately around the Airport is used for light industrial or commercial purposes. There are some single-family residential developments off each end of Runway 18-36. These developments are 3,000 feet to 1 mile from the runway ends.

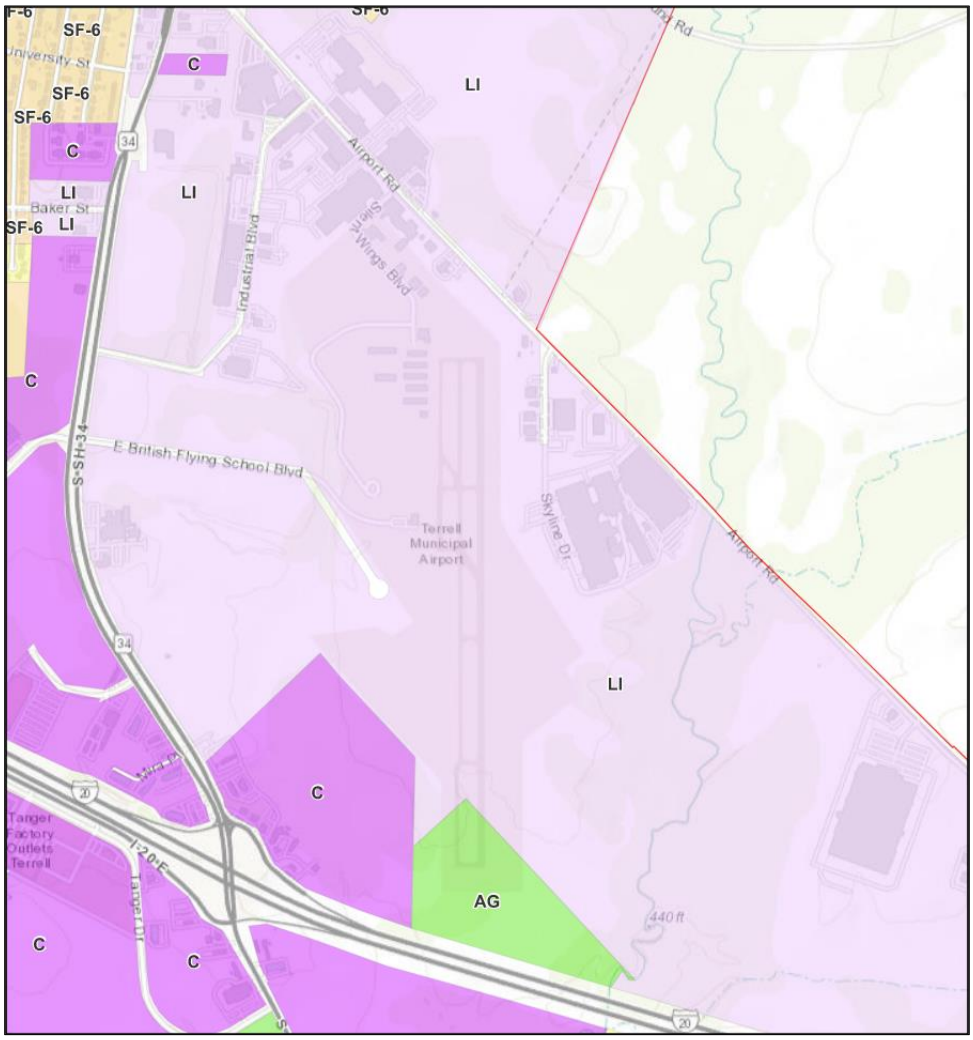
ZONING

The City of Terrell currently does not have a Height Hazard Zoning District in place, which would protect the airspace around TRL from development that might impact airport operations. Based on a review of historic city ordinances, the Terrell Joint Airport Zoning Board was abolished with City Ordinance #2351 on November 5, 2017.

Figure 2-7 shows the current zoning map for the City of Terrell. The majority of the Airport is currently zoned as light industrial. The light pink area labeled "LI" is zoned as Light

Industrial, the dark pink area labeled “C” is zoned as Commercial, and the light green area labeled “AG” is zoned as Agricultural.

FIGURE 2-7
ZONING MAP
TERRELL MUNICIPAL AIRPORT



Source: City of Terrell Maps ArcGIS, 2022

AIRPORT DEVELOPMENT CONSTRAINTS

The primary constraint to future development at TRL is the limited undeveloped land around the Airport. Interstate 20 passes directly south of the Airport, and Airport Road passes to the north. There is also significant industrial development just to the east of the Airport. However, a significant amount of vacant property is available for development on

the west of the existing runway and parallel taxiway. Maximizing the airports existing and future landholdings will be a key consideration in establishing its future development plan.

HISTORICAL DEVELOPMENT

Table 2-8 provides an overview of historical development projects completed at the Airport since 2000. This data only includes projects documented as part of TxDOT's state block grant program. Projects funded by sources outside the TxDOT state block grant program are not shown.

TABLE 2-8
HISTORICAL DEVELOPMENT
TERRELL MUNICIPAL AIRPORT

Year	Local Dollars	State Dollars	Federal Dollars	Project Description
2001	$ 24,000.00	$ 216,000.00	-	Acquire land for RPZ (20.167 acres in fee simple and .9956 acres in easement)
	$ 33,036.00	-	$ 297,326.00	Engineering/design for 2001 construction.
2003	$ 1,295.00	$ 1,295.00	-	RAMP: TxDOT herbicide -
	$ 350,756.00	$ 2,156,801.00	$ 1,000,000.00	Extend, overlay and mark RW 17-35; rehab and mark RW 14-32; extend and mark taxiway A to RW 35 end; overlay taxiway B, rehab taxiways C, D, E, G and H; construct taxiway F; remove taxiway A & D; rehab hangar access taxiway; construct hangarr access taxilanes; rehab, reconst and expand north apron; reconstruct terminal apron; mill and inlay terminal apron; expand south apron; extend MIRL TW 35 end; replace MIRL RW 14-32; relocate PAPI-4 on RW 35; install PAPI-2 RW 14 and 32; install REIL RW 35; install rotating bean and tower; upgrade runway signage; install lighting and vault equipment; inall lead in lighting system RW 17; install obstruction lights approach on RW 17; improve drainge for runway extension
2004	$ 15,500.00	$ 139,500.00	-	Update Airport Master Plan
2006	$ 23,270.00	-	$ 209,432.00	Reimbursement for eng/design for RW marking & signage (FY 03 NPE); Reimbursement for approach surface survey (FY 03 NPE) TW "C" construction (1,106 sy) and apron (533 sy)(Remaining FY 03 NPE)"Engineering/design for FY 07 tw ""C"" construction project (Remaining FY 03 NPE) NPE 2003 $24,849; NPE 2004 $13,370; NPE 2006 $111,781; NPE 2007 $59,432
2007	$ 31,862.00	-	$ 150,000.00	Hangar construction Used 2004 and 2006 NPE
2008	$ 134,788.00	$ 134,788.00	-	Design for auto parking; Design of new terminal building; Design for entrance road
	$ 3,187.00	$ 3,187.00	-	RAMP: Sponsor to contract for pavement crack sealing, markings and repairs, segmented circle painting and repairs, fire ant control, beacon, lighting and bulb replacement and repairs, hangar/terminal painting and repairs, professional services for SWPPP, Spill Prevention Control & Countermeasure Plans and maintenance/update of plans
	$ 22,128.00	-	$ 199,152.00	Engineering Design for Perimeter fencing w/ security gates (3,000 lf) Relocate segmented circle & windsock Drainage improvements for terminal apron Install signage for terminal apron and new RW orientation Remark & stripe RW 17-35 as RW 18-36 Construct terminal apron TWs (550 x 40) Scarify & remove portions of existing RW 14-32 & TW Golf Construct terminal apron (650 x 250) Install erosion/sedimentation controls NPE 2008

Continued on next page

Continued from pervious page

Year	Local Dollars	State Dollars	Federal Dollars	Project Description
2009	$ 86,117.00	-	$ 1,636,213.00	Relocate segmented circle & windsock; Drainage improvements for terminal apron; Install signage for terminal apron and new RW orientation; Remark & stripe RW 17-35 as RW 18-36 ; Construct terminal apron TWs (550 x 40); Scarify & remove portions of existing RW 14-32 & TW Golf; Construct terminal apron (650 x 250); Install erosion/sedimentation controls; Perimeter fencing w/ security gates (3,000 lf) 3-48-SBGP-200846 $1,425,280, 3-48-SBGP-200637-$154,392
2010	$ 28,730.00	$ 28,730.00	-	RAMP: GENERAL MAINT-Sponsor to contract for crack sealing, and pavement failure repairs. PAVEMENT MARKINGS-Sponsor to contract for pavement markings. MISC-TxDOT to apply herbicide; Arfield lighting, approach aids, & hangar maint; & environmental compl
	$ 1,220,536.00	$ 1,131,132.00	-	Construct new terminal building (4,000 sf); Construct new 24' wide entrance road (5,500 lf); Construct auto parking (200 x 70)
2011	$ 50,629.00	$ 50,000.00	-	RAMP: Sponsor to perform airport general maintenance.
2013	$ 46,302.00	$ 46,302.00	-	RAMP: Sponsor to perform airport general maintenance.
2014	$ 141,880.00	-	$ 812,140.00	Construct Hangar Access Taxiway (2,200 SY); Contingency, RPR, and Admin for Hangar Access Taxiway and T-Hangar; Engineering and Design to construct Hangar Access Taxiway and T-Hangar; Construct T-Hangar (NPE 11', 12', 13' + 100%)SBGP-85-2013 $66,780; SBGP-86-2014 $596,597.96; SBGP-88-2014 $137,679.26; SBGP-90-2015 $11,082.71
	$ 15,350.00	-	$ 138,150.00	Drainage Study (NPE 14') SBGP-084-2013 $17,104.50; SBGP-088-2014 $118,741.50; SBGP-089-2015 $2,304
	$ 18,221.00	$ 18,221.00	-	RAMP: Sponsor to perform airport general maintenance.
2015	$ 11,794.00	-	$ 106,150.00	Engineering/Design (NPE 15) - access road/drainage improvements SBGP-091-2015 $106,150.50
	$ 46,357.00	$ 46,357.00	-	RAMP: Sponsor to perform airport general maintenance.
2017	$ 559,697.00	-	$ 971,907.00	Northwest airport drainage improvements - install 42" pipe w/box culverts (100% local); Contingency, RPR, Admin for hangar/terminal access road; drainage improvements; Extend Utility Infrastructure (access road improvements); Construct Perimeter Fencing; Construct Hangar/Terminal Access Road (2,400' x 24' concrete); Perimeter road drainage improvements (install trapezoidal channel and 18' RCP sets); Northwest airport drainage improvements (install 42" pipe w/box culverts) SBGP-090-2015 $197,591.40; SBGP-101-2016 $31,245.30; SBGP-097-2016 $118,755; SBGP-103-2017 $71,144.42; SBGP-102-2017 $553,170.80
2018	$ 50,000.00	$ 50,000.00	-	RAMP: Sponsor to perform airport general maintenance
2019	$ 22,525.00	-	$ 202,725.00	Engineering/Design - TXY "A" relocation; RW 17-35 Rehabilitation SBGP-101-2016 $7,499.70; SBGP-108-2018 $45,225; SBGP-109-2018 $150,000.30
2020	$ 35,420.00	$ 35,420.00	-	RAMP: Sponsor to perform airport general maintenance
2021	$ 13,456.00	$ 13,456.00	-	RAMP: Sponsor to perform airport general maintenance

Source: TxDOT Aviation Division, 2022

UTILITIES

As part of the scope of this AMP project, research was conducted to document utility lines located within airport property. **Figure 2-8** depicts the utilities that were identified as part of this process. Water, wastewater, and electrical line data was obtained from their

providers. Some underground electrical line data was not available. Communication and fiber optic lines are not shown.

FIGURE 2-8
AIRPORT UTILITY LOCATIONS
TERRELL MUNICIPAL AIRPORT

Source: Garver, 2022

3 Activity Forecasts

CHAPTER 3: ACTIVITY FORECASTS

INTRODUCTION

Forecasting aviation activity helps the local airport sponsor determine future airport facility and equipment needs. The preferred demand forecasts are used to identify the type, extent, and timing of aviation development. In addition, the forecasts are instrumental in identifying airport-related infrastructure and capacity needs and guiding the timing and financial feasibility of airport development alternatives.

Airport activity is often influenced by the types of aviation services offered to transient and based aircraft and by the general business environment at an airport and in the local/regional community. In addition, factors such as vigorous local airport marketing, increased industrialization, changes in transportation preferences, and fluctuations in the national, regional, and local economy all influence aviation demand.

Aviation activity forecasts are developed in accordance with national trends and regional/local influences and, in context with the inventory findings, are developed as a guide with the expectation that facilities needed to support the forecast will be available as demand dictates. This chapter examines aviation trends and the numerous factors that have influenced those trends in the United States, Texas, and the region the Terrell Municipal Airport (TRL) serves.

SOCIOECONOMIC DATA

An assessment of national, state, and local economic conditions must be conducted to gain a better understanding of the relationship between historic and future aviation activity levels within an airport's area of influence. This information is essential and directly influences an airport's activity forecast. Therefore, the following socioeconomic information – population, employment, and median household income – have been collected to understand current conditions and influence assumptions involved in the development of the aviation demand forecasts for TRL.

POPULATION

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

Table 3-1 shows the breakdown of the actual population figures and estimates for Kaufman County, the State of Texas, and the United States between 2010 and 2021.

TABLE 3-1
HISTORIC POPULATION

Year	United States	Texas	Kaufman County
2010	309,321,666	25,241,971	103,872
2011	311,556,874	25,645,629	105,199
2012	313,830,990	26,084,481	106,553
2013	315,993,715	26,480,266	108,248
2014	318,301,008	26,964,333	110,872
2015	320,635,163	27,470,056	114,055
2016	322,941,311	27,914,410	117,904
2017	324,985,539	28,295,273	122,628
2018	326,687,501	28,628,666	128,279
2019	328,239,523	28,995,881	136,154
2020	331,501,080	29,217,653	146,986
2021	331,893,745	29,527,941	157,768
AAGR	**0.66%**	**1.54%**	**4.72%**

Source: US Census Bureau, Population Division – Annual Estimates of the Resident Population for Counties in Texas: April 1, 2010, to July 1, 2021; released December 2021

Kaufman County's estimated population in 2021 was 53,896 people more than the population figure obtained from the 2010 U.S. Census. In 2010, Kaufman County had a population of 103,872 people. Since that time, the population has increased to an estimated 157,768 people in 2021. This total population growth yielded an Average Annual Growth Rate (AAGR) of 4.72% per year since 2010. During the same period, the State of Texas saw population increase at a rate of approximately 1.54% per year and the United States saw a population increase at a rate of 0.66% per year. Additionally, it should be noted the population growth in Kaufman County has accelerated since 2016. In conclusion, the population AAGR for Kaufman County has significantly outpaced the AAGR for the State of Texas and the United States.

While historic population trends can provide an indication of future growth, it is also important to analyze population projections for the future. **Table 3-2** shows the breakdown of future population projections for Kaufman County, the State of Texas, and the United States between 2010 and 2041.

TABLE 3-2
FUTURE POPULATION PROJECTIONS

Year	United States	Texas	Kaufman County
2010	308,745,538	25,145,561	103,350
2015	320,742,673	27,326,193	113,657
2020	331,449,281	29,677,668	125,134
2025	344,234,000	32,204,920	138,252
2030	355,101,000	34,894,452	152,682
2035	364,862,000	37,176,495	167,957
2040	373,528,000	40,686,496	183,788
2041	375,152,000	41,303,005	187,064
AAGR	**0.69%**	**2.07%**	**2.61%**

Source: US Census Bureau – 2017 National Population Projections Tables, Texas Demographic Center – 2018 Texas Population Projections

Based on future population projections provided by the Texas Demographic Center, it is expected that the population of Kaufman County will grow significantly through 2041. This growth averages approximately 2.61% annually. Meanwhile, the State of Texas and the United States are expected to grow at slower rates. It should also be noted that, as shown in Table 3-1, the current population in Kaufman County has already greatly exceeded the population projections shown in Table 3-2. According to Table 3-2, the projected population for Kaufman County in 2020 was 125,124. The actual population from U.S. Census data was 146,986. Kaufman County's population is growing at a rate that outpaces the projects shown in Table 3-2.

In general, the population data reviewed indicates that Kaufman County has grown significantly since 2010, and this growth is expected to continue during the 20-year planning horizon.

EMPLOYMENT

Another key socioeconomic factor that is vitally important to evaluating the potential for aeronautical activity at an airport is the employment data for the state and local area. A local area's employment characteristics typically serve as the primary basis for the health of the local economy and the health of the local economy is closely linked to aeronautical activity. **Table 3-3** provides employment information for Kaufman County, the State of Texas, and the United States between 2012 and 2020.

TABLE 3-3
EMPLOYMENT DATA

Year	United States			Texas			Kaufman County		
	Number of Establishments	Paid Employees	Annual Payroll ($1,000)	Number of Establishments	Paid Employees	Annual Payroll ($1,000)	Number of Establishments	Paid Employees	Annual Payroll ($1,000)
2012	7,431,808	115,938,468	$5,414,255,995	537,839	9,350,829	$446,679,425	1,673	21,029	$694,600
2013	7,488,353	118,266,253	$5,621,697,325	547,190	9,663,567	$468,417,086	1,703	21,734	$754,126
2014	7,563,084	121,069,944	$5,940,186,911	557,721	9,920,214	$501,456,595	1,773	22,813	$780,609
2015	7,663,938	124,085,947	$6,253,488,252	569,091	10,239,710	$521,095,797	1,772	23,503	$854,862
2016	7,757,807	126,752,238	$6,435,142,055	579,168	10,429,924	$526,782,643	1,856	24,260	$905,693
2017	7,860,674	128,591,812	$6,725,346,754	592,677	10,580,160	$544,772,560	1,955	26,651	$997,794
2018	7,912,405	130,881,471	$7,097,310,272	600,747	10,794,596	$577,914,267	2,055	27,278	$1,061,142
2019	7,959,103	132,989,428	$7,428,553,593	609,476	11,107,054	$611,142,429	2,108	27,909	$1,105,421
2020	8,000,178	134,163,349	$7,564,809,878	618,272	11,210,906	$613,148,935	2,188	29,003	$1,146,111
AAGR	**0.96%**	**1.96%**	**4.97%**	**1.87%**	**2.49%**	**4.66%**	**3.85%**	**4.74%**	**8.13%**

Source: US Census County Business Patterns Economic Annual Surveys – 2020

Since 2012, the number of employment establishments, paid employees, and annual payroll in Kaufman County have all grown at a rate that is well over state and national averages. In general, the employment information reviewed indicates that the local economy has grown significantly since 2012.

MEDIAN HOUSEHOLD INCOME

In addition to general employment data, household income data provides insight into the local economy. Historically, higher levels of income have been associated with higher aeronautical activity levels.

Table 3-4 provides the historic median household income for Kaufman County, the State of Texas, and the United States from 2010 through 2020.

TABLE 3-4
MEDIAN HOUSEHOLD INCOME

Year	Median Household Income - United States	Median Household Income - Texas	Household Income - Kaufman County
2010	$51,914	$49,646	$58,555
2011	$52,762	$50,920	$60,575
2012	$53,046	$51,563	$61,564
2013	$53,046	$51,900	$61,194
2014	$53,482	$52,576	$61,459
2015	$53,889	$53,207	$60,391
2016	$55,322	$54,727	$60,179
2017	$57,652	$57,051	$63,926
2018	$60,293	$59,570	$65,390
2019	$62,843	$61,874	$70,107
2020	$64,994	$63,826	$72,179
AAGR	**2.52%**	**2.86%**	**2.33%**

Source: US Census Bureau 2020 American Community Survey 5-year Estimates

In general, median household income in Kaufman County has increased over the last ten years. Other than in 2013, 2015, and 2016, median household income has increased steadily, with notably larger year-over-year increases since 2017. The overall growth of median household income provides an indication that the local economy has grown and continues to grow at a significant rate. It should also be noted that the aggregate median household income numbers are well above state and national averages.

Additionally, review was completed to identify trends in the percentage of households in Kaufman County with an annual income of $75,000 or more. The results of the review are shown in **Table 3-5**.

TABLE 3-5
PERCENTAGE OF HOUSEHOLDS EARNING MORE THAN $75,000 ANNUALLY

Income	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Percentage of Household with Income $75,000 - $99,999	16.4%	16.8%	15.4%	14.4%	13.7%	12.5%	12.6%	13.3%	12.2%	12.8%	13.2%
Percentage of Household with Income $100,000 - $149,999	14.7%	15.4%	16.5%	16.9%	17.7%	17.5%	18.0%	19.2%	20.4%	21.1%	22.0%
Percentage of Household with Income $150,000 - $199,999	3.6%	3.8%	4.3%	4.7%	5.2%	5.6%	5.9%	6.5%	7.6%	8.3%	8.0%
Percentage of Household with Income $200,000+	2.9%	3.1%	3.0%	2.9%	2.6%	2.9%	3.0%	3.6%	3.8%	4.9%	5.2%
Total Percentage of Households with Income Above $75,000	**37.6%**	**39.1%**	**39.2%**	**38.9%**	**39.2%**	**38.5%**	**39.5%**	**42.6%**	**44.0%**	**47.1%**	**48.4%**

Source: US Census Bureau 2020 American Community Survey 5-year Estimates

As the analysis shows, the number of households earning more than $75,000 per year has increased significantly since 2016.

SOCIOECONOMIC SUMMARY

In general, the analysis of the socioeconomic factors for Kaufman County indicates that the local economy has grown significantly in recent years and continued growth is expected in the future.

SUMMARY OF AIRPORT HISTORICAL OPERATIONS AND BASED AIRCRAFT

TRL is a non-towered airport and, as such, accurately tracking aircraft operations is a challenge. Without an accurate method of counting operations, estimates from on-site staff, estimates from private sources, reported operations data on the Airport's FAA Form 5010, or the FAA's Terminal Area Forecast (TAF) can be used as a guide. The latest FAA Form 5010 shows an estimated 33,650 annual operations (approximately 92 operations per day) which matches the data within the TAF. Based on discussions with airport stakeholders, this number is close to the actual number of operations.

Table 3-6 summarizes the available historic-based aircraft and annual operations data (local and itinerant) at TRL since 2000 as recorded through the TAF program.

TABLE 3-6
HISTORICAL AVIATION ACTIVITY - TERMINAL AREA FORECASTS (TAF)
TERRELL MUNICIPAL AIRPORT

Year	Total Itinerant Operations	Itinerant Air Taxi Operations	Itinerant General Aviation Operations	Itinerant Military Operations	Total Local Operations	Total Annual Operations	Based Aircraft
2000	8,550	50	8,500	0	17,000	25,550	85
2001	8,550	50	8,500	0	17,000	25,550	85
2002	8,550	50	8,500	0	17,000	25,550	85
2003	8,550	50	8,500	0	17,000	25,550	85
2004	8,550	50	8,500	0	17,000	25,550	85
2005	8,550	50	8,500	0	17,000	25,550	85
2006	8,550	50	8,500	0	17,000	25,550	85
2007	8,550	50	8,500	0	17,000	25,550	86
2008	8,550	50	8,500	0	17,000	25,550	61
2009	8,550	50	8,500	0	17,000	25,550	61
2010	8,550	50	8,500	0	17,000	25,550	61
2011	8,550	50	8,500	0	17,000	25,550	61
2012	8,550	50	8,500	0	17,000	25,550	61
2013	8,550	50	8,500	0	17,000	25,550	45
2014	8,550	50	8,500	0	17,000	25,550	68
2015	8,550	50	8,500	0	17,000	25,550	70
2016	8,450	50	8,400	0	25,200	33,650	81
2017	8,450	50	8,400	0	25,200	33,650	83
2018	8,450	50	8,400	0	25,200	33,650	83
2019	8,450	50	8,400	0	25,200	33,650	73
2020	8,450	50	8,400	0	25,200	33,650	72
2021	8,450	50	8,400	0	25,200	33,650	72

Source: 2021 FAA Terminal Area Forecasts, issued March 2022

According to BasedAircraft.com a based aircraft is an aircraft that is operational and airworthy, which is typically based on the airport for the majority of the year. An aircraft operation is one takeoff or landing of an aircraft. Aircraft operations are identified as either local or itinerant. Local operations consist of those within the area immediately surrounding the airport, while itinerant operations include all operations other than local.

The following observations were identified at TRL as part of the inventory of historic and current airport activity levels:

- ✈ Based Aircraft Summary – TRL has seen some fluctuations in based aircraft since 2000. The lowest point was in 2013 when the Airport was reported to have 45 based

aircraft. The highest point has been 87 based aircraft, which was the number recorded in 2007. The low number reported in 2013 was likely inaccurate. As part of this study, a count of based aircraft at TRL was provided by the Airport. The Airport currently has 86 based aircraft. The current number shown in the TAF for 2021 is lower than the number of aircraft currently based at the Airport.

- Operational Summary – The number of annual aircraft operations recorded in the TAF at TRL has only changed once since 2000. Between 2000 and 2015, the TAF showed 25,500 operations per year. Since 2016, the number of annual operations has remained at 33,650. According to the TAF, the majority of these operations are local operations. Based on feedback provided by the airport, this ratio of local vs. itinerant operations is assumed to be accurate.

NATIONAL GENERAL AVIATION TRENDS

An understanding of recent and anticipated trends within the General Aviation (GA) industry is important when assessing aviation demand for TRL. Some trends may affect aviation demand in the study area while others will have little or no appreciable impact on local/regional aviation demands.

Various data sources were examined and used to support the analysis of national GA trends. Those sources include:

- Federal Aviation Administration, FAA Aerospace Forecasts, Fiscal Years 2022 – 2042;
- National Business Aircraft Association (NBAA), Business Aviation Fact Book (current edition); and,
- General Aviation Manufacturers Association (GAMA), 2021 Annual Data.

GENERAL AVIATION AIRPORT OVERVIEW

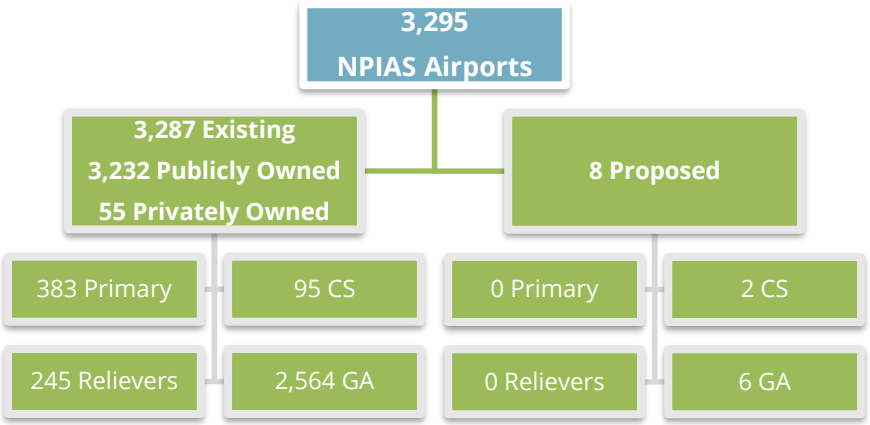
GA aircraft are defined as all aircraft not flown by commercial airlines or the military. In the FAA's *General Aviation Airports: A National Asset* report, dated May 2012, the FAA stated that general aviation serves 5 primary functions:

- Emergency Preparedness and Response;
- Critical Community Access;
- Commercial, Industrial, and Economic Activities;
- Destination and Special Events; and

- Other Aviation Specific Functions (e.g., self-piloted business flights, corporate, flight instruction, personal flying, etc.).

According to the current National Plan of Integrated Airport System (NPIAS), there are 19,853 public and private airports located throughout the United States, and 5,069 of these are open to public use. **Figure 3-1** displays the breakdown of airports as described in the FAA's *2023 -2027 National Plan of Integrated Airport System* (NPIAS) that are part of the NPIAS. The number and distribution of public-use airports available to GA users provides a valuable transportation and economic resource to local communities, businesses, and individuals throughout the region, state, and nation.

FIGURE 3-1
NPIAS AIRPORT BREAKDOWN



Primary – Commercial Service airports enplaning more than 10,000 passengers per year. CS – Non-Primary Commercial Service airports having more than 2,500 enplaned passengers per year but less than 10,000 passengers per year

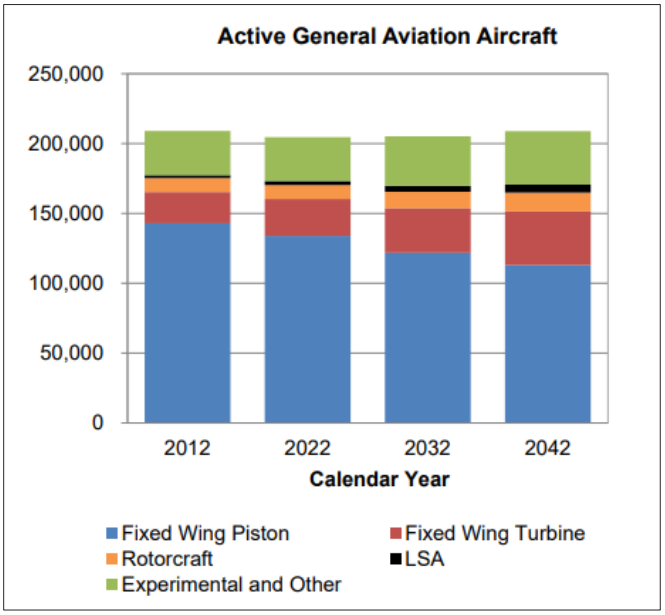
SUMMARY OF NATIONAL GENERAL AVIATION TRENDS

According to the FAA's 2022 – 2042 Aerospace Forecast, the overall number of active GA aircraft is expected to grow at a rate of 0.1% between 2021 and 2041, and the number of hours flown is forecasted to grow at a rate of 1.0% annually during that same period. Slight declines are expected in the hours flown with piston aircraft as well as the number of active single-engine piston and multi-engine aircraft. Growth is expected in the Light Sport Aircraft (LSA), rotorcraft, jet, turboprop, and experimental aircraft categories.

Figures 3-2 and **Figure 3-3** depict these forecasted trends. Additionally, the total number of pilots (excluding student pilots) is expected to grow to 500,720 during the same period,

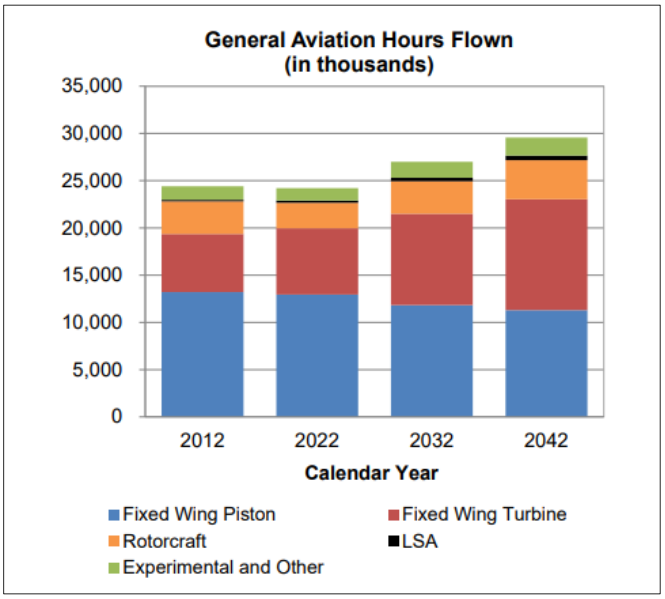
with an average annual growth rate of 0.3% annually. A decline is expected in the recreational and private categories. An increase is expected in the sport pilot, commercial, and Airline Transport Pilot (ATP) categories.

FIGURE 3-2
FAA AEROSPACE FORECAST



Source: FAA Aerospace Forecast, 2022-2042

FIGURE 3-3
FAA AEROSPACE FORECAST



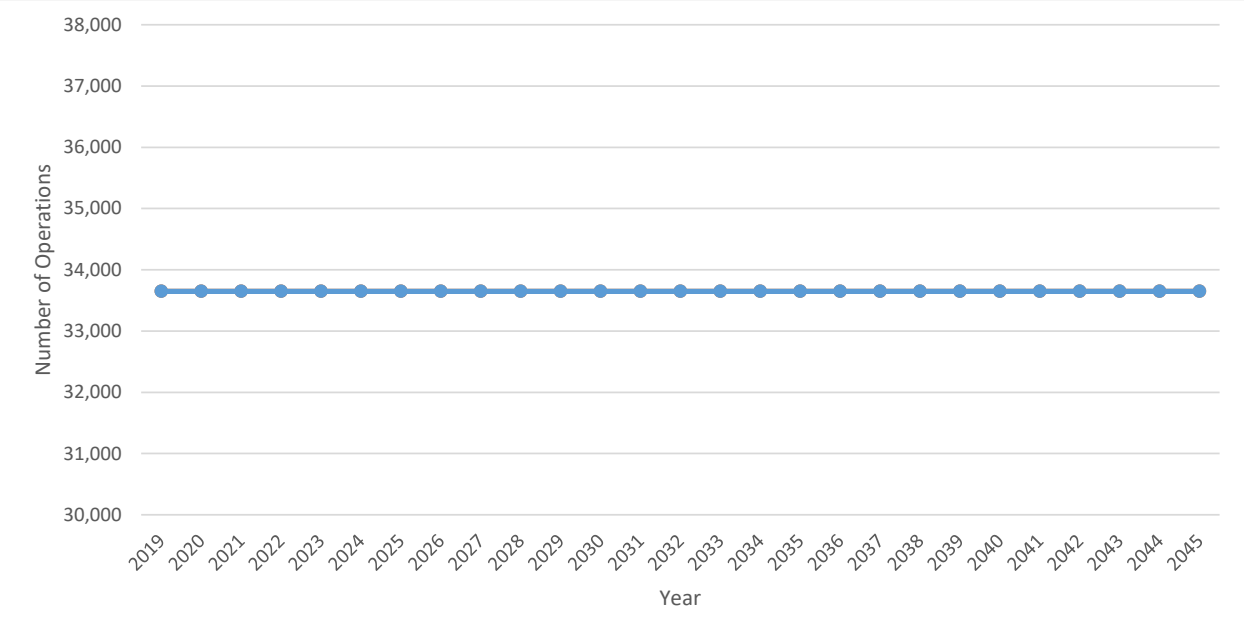
Source: FAA Aerospace Forecast, 2022-2042

FAA TERMINAL AREA FORECAST

The Terminal Area Forecast (TAF) is a detailed FAA forecast-planning database produced each year covering many airports that are part of the NPIAS. The TAF is prepared to assist the FAA in meeting its planning, budgeting, and staffing requirements. The TAF forecasts are made at the individual airport level and are based in part on the national FAA Aerospace Forecasts. The TAF contains historic and forecast data for enplanements, airport operations, TRACON operations, and based aircraft. TAF data is developed for 264 FAA towered airports, 258 contract-towered airports, 153 terminal radar approach control facilities, and 2,770 non-towered airports as of 2021. Data in the TAF is presented on a U.S. Governmental fiscal year basis, which runs from October through September.

Based aircraft and aircraft operations forecasts contained in the TAF for non-towered airports are primarily based on current and historic FAA Form 5010 data. For these airports, the TAF generally reflects a 0% growth rate. The TAF forecast for TRL, presented in **Figure 3-4**, reflects a 0% growth rate, and shows the same number of annual operations through 2045.

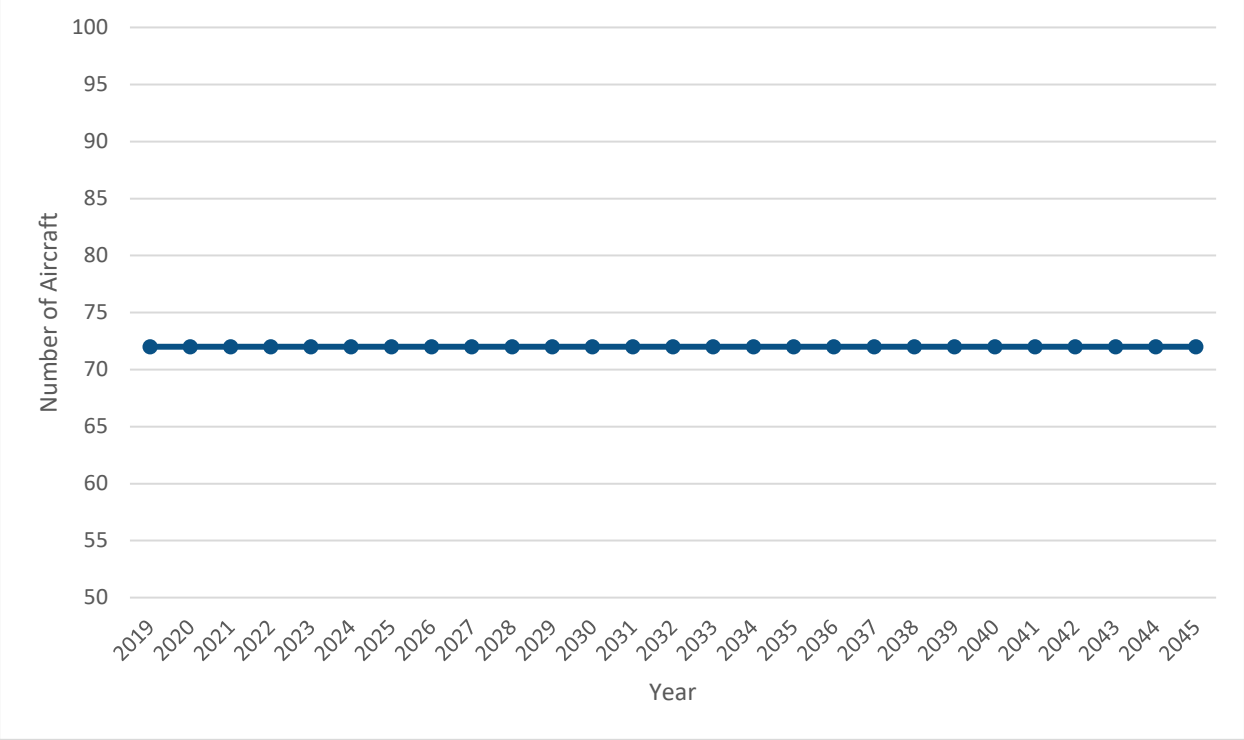
FIGURE 3-4
TERMINAL AREA FORECAST – FUTURE OPERATIONS FORECAST
TERRELL MUNICIPAL AIRPORT



Source: FAA TAF, 2021

The TAF also depicts a 0% growth rate for based aircraft at TRL. The TAF forecast shows that based aircraft will remain flat at 72 based aircraft through 2045. **Figure 3-5** shows the TAF based aircraft forecast.

FIGURE 3-5
TERMINAL AREA FORECAST – FUTURE BASED AIRCRAFT FORECAST
TERRELL MUNICIPAL AIRPORT



Source: FAA TAF, 2021

GENERAL AVIATION DEMAND FORECASTS

Based on information obtained in the inventory analysis, the socioeconomic data presented, and the aforementioned national aviation trends, the following factors and assumptions have been incorporated into the GA forecasts of based aircraft and annual operations for TRL:

- Future airport facilities will continue to accommodate a broad array of GA aircraft including some business-type aircraft and helicopters.
- Changes in aeronautical activity levels and based aircraft will likely be tied to the local economy and population changes.
- An "unconstrained" forecast of aviation demand assumes facility improvements will occur as demand increases.
- Greater aircraft utilization resulting from airfield and terminal area improvements can be both directly and indirectly linked to economic development activity.

FORECAST METHODOLOGIES

The development of an aviation forecast involves analytical and judgmental assumptions to realize the highest level of forecast confidence. The aircraft operations and based aircraft forecasts are developed in accordance with national and regional trends, and in context with the inventory findings and socioeconomic trends. The forecasts developed here begin with baseline information from 2021 with 2022 as the first forecast year.

Various forecast techniques can be used to develop GA forecasts including:

- Trend Analysis – Trend analysis is the simplest and most familiar form of forecasting and is also one of the most widely used. This forecasting technique uses historic data as a basis to develop a forecast for the future. An assumption of this forecast method is that historic levels of aviation demand will continue and influence similar linear progressions in the future. Though this assumption seems broad in its application, it can serve as a reliable benchmark against other forecasting methods.
- Regression Analysis – In a regression model, the forecasts of aviation demand (the dependent variable) are projected on the basis of one or more external indicators (the independent variables). Historical values for both the dependent and independent variables are analyzed to determine their relationships. Once defined, this relationship is used to project the dependent variable with a forecast or

projection of the independent variable(s). In aviation forecasting, an example of the dependent variable is based aircraft. Population or median household income levels are commonly used independent variables that aid in the projection of aviation growth.

- ✈ Forecast Utilizing National or Regional Projections – The FAA produces an annual aerospace forecast that includes projections regarding the growth of aviation throughout the United States. The FAA utilizes a variety of data sources to help formulate its forecast including aircraft sales/delivery data, the number of active pilots, economic growth protections, etc. The annual growth rates provided by the FAA may be utilized to formulate a growth forecast for an airport.
- ✈ Market Analysis – These aviation demand forecasts are developed based on a causal model technique in which independent variables statistically relate the relationship(s) between historical events and aviation demands. This forecasting method typically uses an easily identifiable independent variable such as population, which has a high correlation or an indirect cause-and-effect relationship within certain segments of the GA industry. The market analysis technique often employs a static and dynamic variable relationship between community factors and GA trends that aids in predicting aviation growth based on forecast community indicators such as population.

FORECAST OF BASED AIRCRAFT

Determining the number and type of aircraft anticipated to be based at an airport is a vital component in creating a development plan for the Airport. Depending on the potential market and forecast, the Airport should tailor the development plan to the unique characteristics of the anticipated demand.

The number and type of GA aircraft that can be expected to base at an airport are dependent on several factors, such as available facilities, airport operator services, airport proximity and accessibility, and the local economy. GA operators are particularly sensitive to both the quality and location of their basing facilities, with the proximity of home and work often identified as the primary consideration in the selection of an aircraft-basing location.

One factor that should be considered to gauge the immediate potential for based aircraft growth is whether the Airport has an active hangar waiting list. Currently, TRL's hangars are 100% leased and a waiting list exists for hangar space. As of August 2022, TRL has 86 total

based aircraft (70 single-engine, 11 multi-engine, 3 turbo-prop, 1 turbo-jet, and 1 helicopter). Consequently, 86 based aircraft was the figure used for the first year (2021) of the based aircraft forecast. As of August 2022, 37 aircraft are on the hangar waiting list.

Numerous forecast methods were used to predict based aircraft growth for TRL. Five are presented here:

- FAA Aerospace Forecast – Active GA and Air Taxi Aircraft Growth Rate (0.1%);
- FAA Terminal Area Forecast – Southwest Region Based Aircraft Growth Rate (1.05%);
- FAA Terminal Area Forecast –Texas Statewide Based Aircraft Growth Rate (1.16%);
- Texas Population Average Annual Growth Rate (2.07%); and
- Kaufman County Population Average Annual Growth Rate (2.61%).

In addition to these forecasts, the FAA's TAF forecast for based aircraft and an average of the aforementioned forecasts (excluding the TAF forecast) is presented.

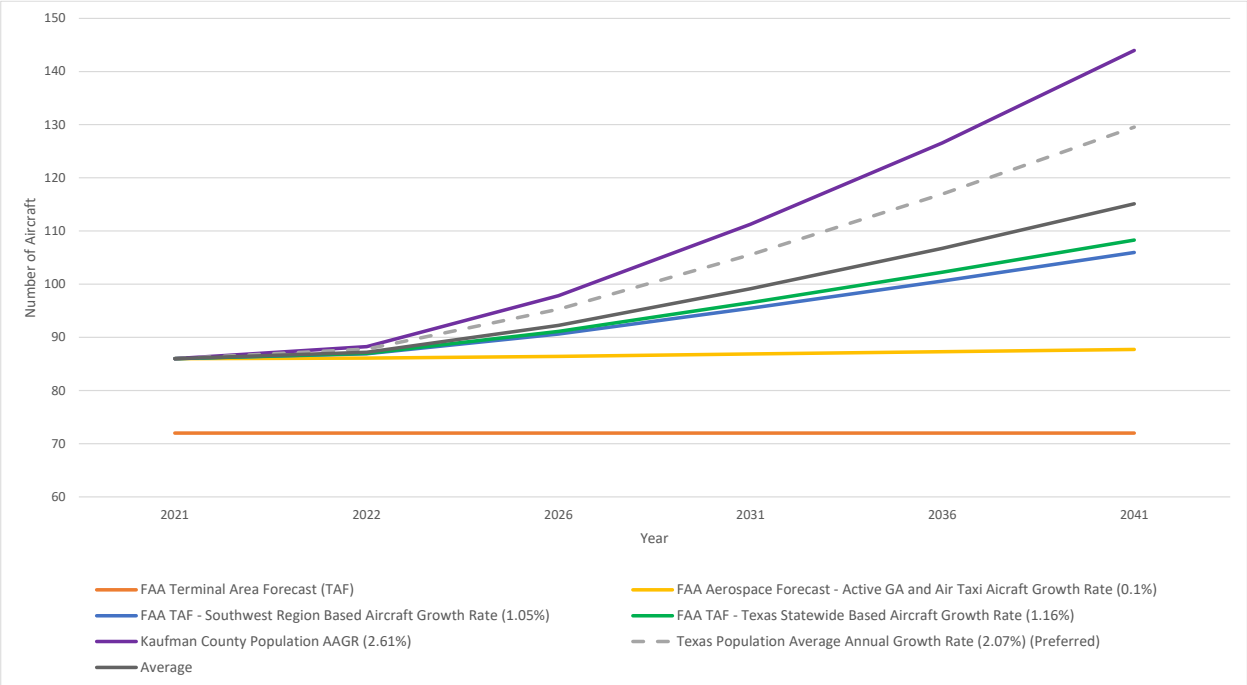
Table 3-7 and **Figure 3-6** provide a summary of the forecast models for based aircraft anticipated at the Airport over the 20-year planning period.

TABLE 3-7
SUMMARY OF BASED AIRCRAFT FORECASTS, 2021-2041
TERRELL MUNICIPAL AIRPORT

Year	FAA Terminal Area Forecast (TAF)	FAA Aerospace Forecast - Active GA and Air Taxi Aicraft Growth Rate (0.1%)	FAA TAF - Southwest Region Based Aircraft Growth Rate (1.05%)	FAA TAF - Texas Statewide Based Aircraft Growth Rate (1.16%)	Texas Population Average Annual Growth Rate (2.07%) (Preferred)	Kaufman County Population AAGR (2.61%)	Average
2021	72	86	86	86	86	86	86
2022	72	86	87	87	88	88	87
2026	72	86	91	91	95	98	92
2031	72	87	95	97	106	111	99
2036	72	87	101	102	117	127	107
2041	72	88	106	108	130	144	115

Source: Garver Forecast Data for TRL, 2022 and FAA Aerospace Forecasts, Fiscal Years 2022-2042

FIGURE 3-6
SUMMARY OF BASED AIRCRAFT FORECASTS, 2021-2041
TERRELL MUNICIPAL AIRPORT



Source: Garver Forecast Data for TRL, 2022 and FAA Aerospace Forecasts, Fiscal Years 2022-2042

Several of the forecast models yielded very similar results, showing moderate growth throughout the forecast period. The Kaufman County Population Average Annual Growth Rate (AAGR) model showed the strongest growth rate during the planning horizon, followed by the Texas Population AAGR. All other models showed more moderate growth.

Based on the economic conditions of the region and the current based aircraft fleet mix, it is realistic for based aircraft at the Airport to grow significantly during the planning period. Consequently, the Texas Population AAGR forecast was selected as the preferred based aircraft forecast.

FORECAST OF AIRCRAFT MIX FOR BASED AIRCRAFT

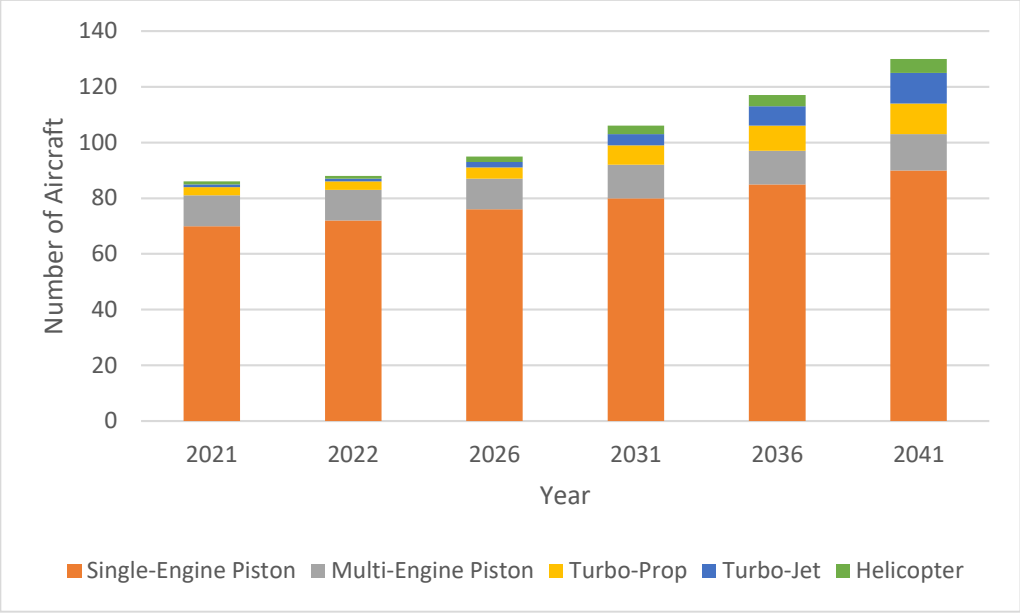
The mix of based aircraft for incremental periods throughout the planning horizon is illustrated in **Table 3-8** and **Figure 3-7**. The additional new based aircraft shown in each forecast period are somewhat evenly distributed across all aircraft type categories. The increase in the number of aircraft forecasted in each of these categories generally correlates with the trends set forth in FAA National Aerospace Forecast and the types of aircraft currently using and forecasted to use TRL.

TABLE 3-8
BASED AIRCRAFT FLEET MIX, 2021-2041
TERRELL MUNICIPAL AIRPORT

Year	2021	2022	2026	2031	2036	2041
Single-Engine Piston	70	72	76	80	85	90
Multi-Engine Piston	11	11	11	12	12	13
Turbo-Prop	3	3	4	7	9	11
Turbo-Jet	1	1	2	4	7	11
Helicopter	1	1	2	3	4	5
Total	86	88	95	106	117	130

Source: Garver Forecast Data for TRL, 2022

FIGURE 3-7
BASED AIRCRAFT FLEET MIX, 2021-2041
TERRELL MUNICIPAL AIRPORT



Source: Garver Forecast Data for TRL, 2022

AIRCRAFT OPERATIONS FORECASTS

Determining the projected number and mix of future aircraft operations at an airport is a vital component in developing future infrastructure plans. Aeronautical activity at an airport is typically closely linked to the number of aircraft based at the Airport and the aeronautical needs of businesses, organizations, and individuals within the surrounding area.

Numerous forecast methods were used to predict aircraft operations growth for TRL. Five are presented here:

- FAA Aerospace Forecast – Active GA and Air Taxi Fleet Hours Flown Growth Rate (1.0%);
- FAA Aerospace Forecast – Total Fuel Consumption Growth Rate (2.2%);
- FAA Terminal Area Forecast – State of Texas OPS Growth Rate (1.33%);
- Kaufman County Median Household Income Average Annual Growth Rate (2.33%); and
- Texas Statewide Median Household Income Average Annual Growth Rate (2.86%).

In addition to these forecasts, the FAA's TAF forecast for operations and an average of the aforementioned forecasts (excluding the TAF forecast) is presented.

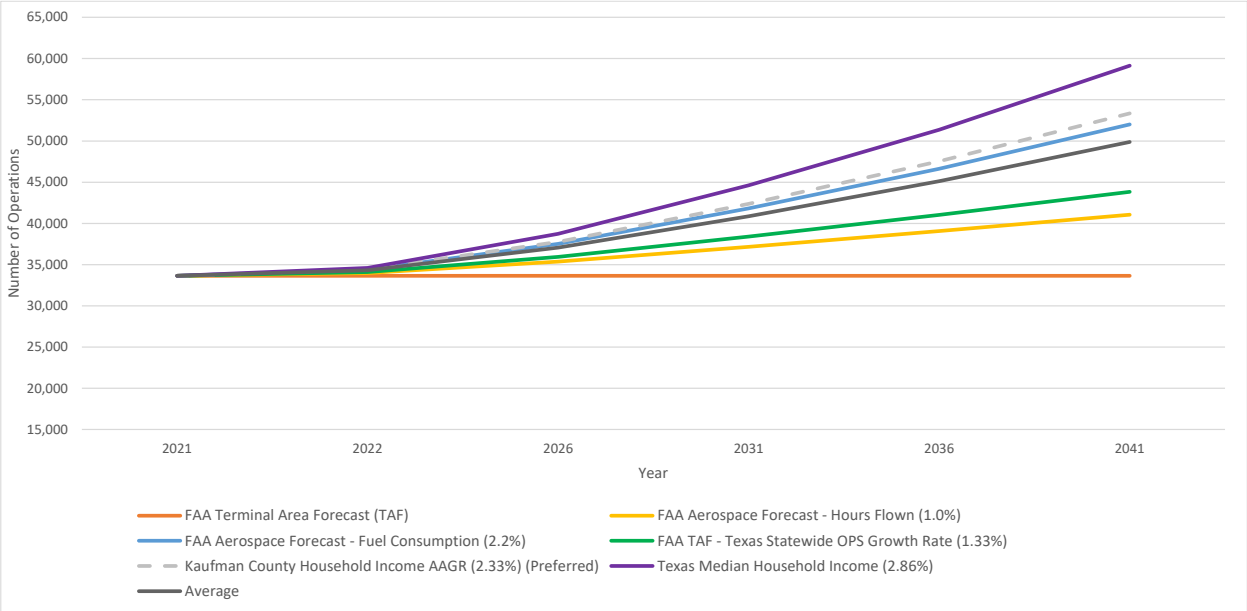
Table 3-9 and **Figure 3-8** provide a summary of the forecast models for aircraft operations anticipated at the Airport over the 20-year planning period.

TABLE 3-9
AIRCRAFT OPERATIONS FORECAST, 2021-2041
TERRELL MUNICIPAL AIRPORT

Year	FAA Terminal Area Forecast (TAF)	FAA Aerospace Forecast - Hours Flown (1.0%)	FAA Aerospace Forecast - Fuel Consumption (2.2%)	FAA TAF - Texas Statewide OPS Growth Rate (1.33%)	Kaufman County Household Income AAGR (2.33%) (Preferred)	Texas Median Household Income (2.86%)	Average
2021	33,650	33,650	33,650	33,650	33,650	33,650	33,650
2022	33,650	33,987	34,390	34,098	34,434	34,612	34,304
2026	33,650	35,366	37,518	35,948	37,757	38,745	37,067
2031	33,650	37,171	41,831	38,403	42,366	44,612	40,876
2036	33,650	39,067	46,639	41,026	47,537	51,367	45,127
2041	33,650	41,059	52,000	43,827	53,339	59,145	49,874

Source: Garver Forecast Data for TRL, 2022 and FAA Aerospace Forecasts, Fiscal Years 2022-2042

FIGURE 3-8
AIRCRAFT OPERATIONS FORECASTS, 2021-2041
TERRELL MUNICIPAL AIRPORT



Source: Garver Forecast Data for TRL, 2022 and FAA Aerospace Forecasts, Fiscal Years 2022-2042

Based on the forecasted growth of the local economy and in order to consider both national and local factors, the Kaufman County Household Income AAGR forecast was selected as the preferred aircraft operations forecast for TRL.

AIRCRAFT OPERATIONS FLEET MIX FORECAST

In addition to forecasting the total number of annual operations projected to occur at an airport during the forecast period, it is also critical to project the types of aircraft that will likely be operating at the Airport. **Table 3-10** and **Figure 3-9** display the aircraft operations fleet mix forecast for TRL for each phase throughout the 20-year planning period.

An examination of Instrument Flight Rules (IFR) operations at TRL, through the FAA's Traffic Flow Management System Counts (TFMSC) database, provides some guidance towards developing an accurate fleet mix forecast. While these records account for only a fraction of the total operations that occur at TRL, they do provide an indicator of the type of aircraft that use the airfield and their frequency. It can also be assumed that most aircraft not operating under IFR flight rules at the Airport are smaller single-engine and light-twin engine aircraft that typically fall in the A-I and B-I aircraft classifications. FAA TFMSC data from July 2012 to July 2022 was used for this analysis.

Based on a review of the Airport's IFR flight data, discussions with airport stakeholders, and the Airport's current mix of based aircraft, the following aircraft operations fleet mix ratios were established:

- Single-Engine Piston Aircraft – 93%
- Multi-Engine Piston Aircraft – 1%
- Turbo-Prop Aircraft – 2.5%
- Jet – 3.3%
- Helicopter – 0.2%

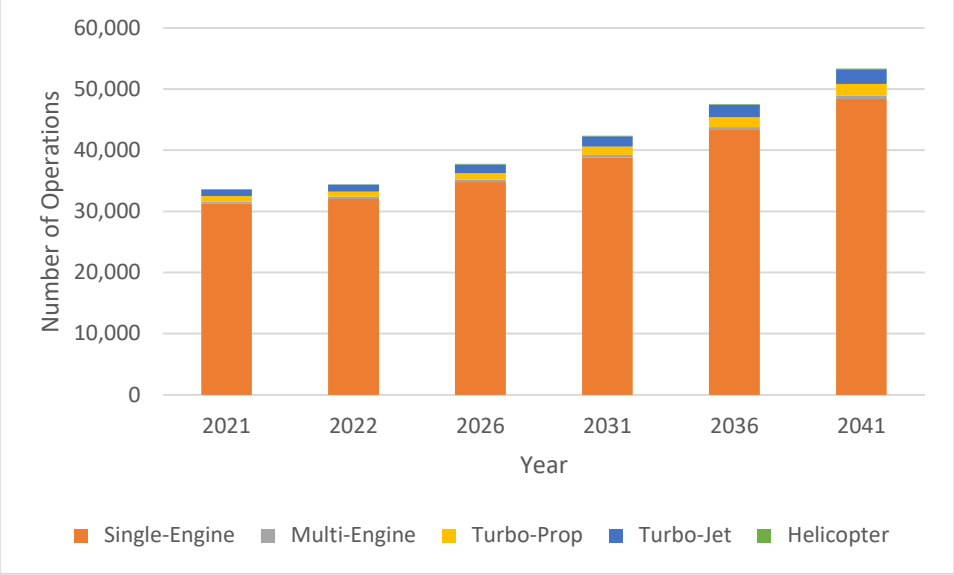
For the purposes of these calculations, light sport aircraft and experimental aircraft have been included in the single-engine piston aircraft category. Acceleration factors were applied to the growth of turboprop and jet aircraft as they are expected to grow at a stronger pace as the local economy continues to expand.

TABLE 3-10
SUMMARY OF OPERATIONS BY AIRCRAFT TYPE, 2021-2041
TERRELL MUNICIPAL AIRPORT

Operations By Type	2021	2022	2026	2031	2036	2041
Single-Engine	31,295	32,024	34,813	38,800	43,309	48,405
Multi-Engine	337	344	378	424	475	533
Turbo-Prop	841	861	1,094	1,359	1,638	1,933
Turbo-Jet	1,110	1,136	1,396	1,698	2,020	2,361
Helicopter	67	69	76	85	95	107
Total	33,650	34,434	37,757	42,366	47,537	53,339

Source: Garver Forecast Data for TRL, 2022

FIGURE 3-9
SUMMARY OF OPERATIONS BY AIRCRAFT TYPE, 2021-2041
TERRELL MUNICIPAL AIRPORT



Source: Garver Forecast Data for TRL, 2022

Utilizing the same IFR flight data, aircraft operations can be further broken down into Aircraft Approach Categories (AAC) and Airplane Design Groups (ADG). This helps to better define the types of aircraft that will operate at the Airport in the future. It also allows for better planning of future facilities and airside needs for the Airport and the ability to justify such facilities when the market demands their construction. As previously noted, the majority of the aircraft utilizing the Airport are single-engine aircraft, however growth in operations of larger aircraft is expected during the planning period. Based on this information and the TFMSC data, the following ratios were utilized for the forecasted fleet mix:

Aircraft Approach Category (AAC):

- A – 92.7%
- B – 7%
- C/D – 0.1%
- Helicopter – 0.2%

Aircraft Design Group (ADG):

- Group 1 – 93.2%
- Group 2 – 6.6%
- Group 3 – 0%
- Helicopter – 0.2%

These ratios are expected to remain relatively constant during the forecast period. **Table 3-11** displays this breakdown for the 20-year planning effort.

TABLE 3-11
FLEET MIX OPERATIONS BY DESIGN GROUP, 2021-2041
TERRELL MUNICIPAL AIRPORT

Aircraft Approach Category (AAC)	2021	2022	2026	2031	2036	2041
Category A (Less Than 91 Knots)	31,193	31,921	35,000	39,273	44,066	49,445
Category B (92 – 120 Knots)	2,356	2,410	2,643	2,966	3,328	3,734
Category C/D (121 – 160 Knots)	34	34	38	42	48	53
Helicopter	67	69	76	85	95	107
Airplane Design Group (ADG)						
Group I (Less Than 49 Feet)	31,362	32,092	35,187	39,481	44,298	49,703
Group II (49 Feet To 78 Feet)	2,214	2,266	2,484	2,788	3,128	3,510
Group III (79 Feet To 118 Feet)	7	7	10	12	16	19
Helicopter	67	69	76	85	95	107
Total	33,650	34,434	37,757	42,366	47,537	53,339

Source: Garver Forecast Data for TRL, 2022

LOCAL AND ITINERANT OPERATIONS FORECAST

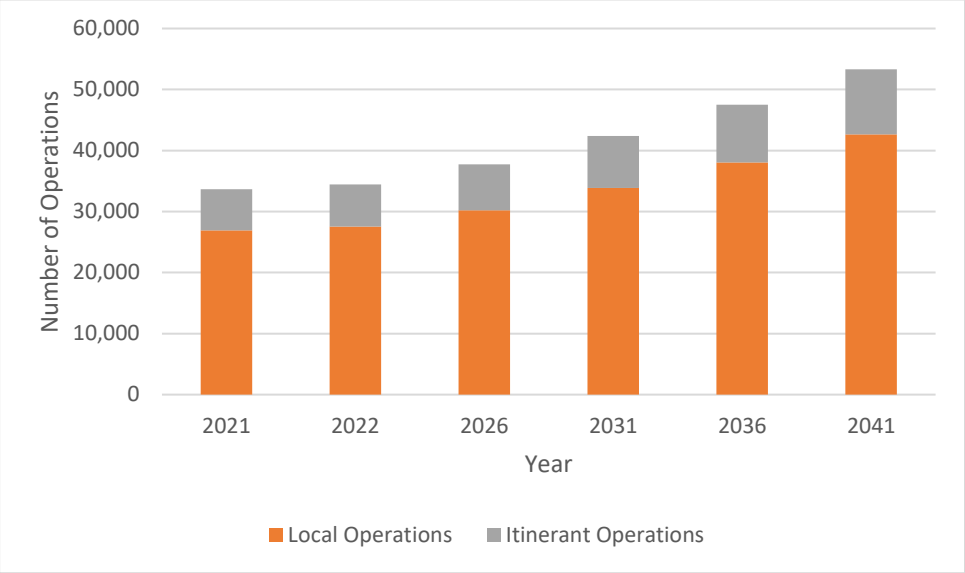
According to FAA Order JO 7210.3CC, *Facility Operation and Administration, May 17, 2021*, a local operation is any operation performed by an aircraft that remains in the local traffic pattern (e.g., touch and go, stop and go) or operates to or from the Airport and a designated practice area. An itinerant operation is any operation that is not considered local. Based on an analysis of available operations data and discussions with airport stakeholders, it is estimated that 80% of the operations conducted at the Airport are local and 20% are itinerant. These percentages are expected to remain at or near these same levels throughout the forecast period. **Table 3-12** and **Figure 3-10** provide a summary of this information.

TABLE 3-12
SUMMARY OF LOCAL AND ITINERANT OPERATIONS, 2021-2041
TERRELL MUNICIPAL AIRPORT

Year	2021	2022	2026	2031	2036	2041
Local Operations	26,920	27,547	30,206	33,893	38,030	42,671
Itinerant Operations	6,730	6,887	7,551	8,473	9,507	10,668
Total	33,650	34,434	37,757	42,366	47,537	53,339

Source: Garver Forecast Data for TRL, 2022

FIGURE 3-10
SUMMARY OF LOCAL AND ITINERANT OPERATIONS, 2021-2041
TERRELL MUNICIPAL AIRPORT



Source: Garver Forecast Data for TRL, 2022

ANNUAL INSTRUMENT APPROACH FORECAST

Table 3-13 summarizes the forecast of annual civilian instrument approaches at TRL throughout the planning period. The forecast of Annual Instrument Approaches (AIAs) provides further guidance in determining requirements for the type, extent, and timing of future navigational aid (NAVAID) equipment.

The forecast for instrument approaches is based on the IFR flight plan filings for the last three-year period. During the three-year period ending July 01, 2022, it is estimated that approximately 2.5% of all aircraft operations at TRL were completed under IFR. Dividing this percentage in half provides an estimate on the number of IFR approaches annually.

The ratio of instrument operations to Visual Flight Rule (VFR) operations is expected to increase during the forecast period.

TABLE 3-13
INSTRUMENT APPROACH FORECASTS, 2021-2041
TERRELL MUNICIPAL AIRPORT

Year	2021	2022	2026	2031	2036	2041
Annual Operations	33,650	34,434	37,757	42,366	47,537	53,339
Forecasted Number of Instrument Approaches	423	480	572	680	794	917

Source: Garver Forecast Data for TRL, 2022

CRITICAL AIRCRAFT

The "critical" aircraft at an airport is the largest and most demanding aircraft or category of aircraft conducting at least 500 operations per year. Determining the critical aircraft is important for assessing airport design and layout and the structural and equipment needs for both the airfield and terminal area. It is evaluated with respect to aircraft size, speed, and weight. The aircraft operating at TRL vary from small piston aircraft to twin turboprops, with some jet activity as well. Based on the types of aircraft utilizing the Airport and the forecasted growth in operations, the existing "critical" aircraft at TRL is in the B-II category and is expected to remain in that category during the forecast period.

Table 3-14 shows the most common aircraft operating at TRL that define its current critical aircraft category. The preferred forecasts confirm this aircraft category to be the critical aircraft during the short-term and maintain it as such throughout the 20-year planning period. The chart below shows the characteristics and operational frequency of some of these aircraft that operated at TRL recently according to IFR flight data.

TABLE 3-14
CRITICAL AIRCRAFT OPERATIONS
TERRELL MUNICIPAL AIRPORT

Aircraft Type and ARC	Wingspan	Height	Max Gross Takeoff Weight	Approach Speed	# of Operations 2017-2021	# of Operations 2021
Cessna Citation 650 ARC C-II	53.5 ft	17.25 ft	22,000 lbs	126 kts	117	93
King Air 200 ARC B-II	57.92 ft	14.33 ft	12,500 lbs	107 kts	350	59
Super King Air 350 ARC B-II	57.92 ft	14.33 ft	15,000 lbs	107 Kts	153	39
Cessna Citation Latitude ARC B-II	72.33 ft	20.92 ft	30,800 lbs	100 kts	17	10

Source: FAA TFMSC Database, 2022

AIRCRAFT OPERATIONS PEAKING FORECAST

A primary consideration for facility planning should be the peaking characteristics of TRL's activity level. To the greatest extent possible, airport facilities should be designed to be able to effectively accommodate normal peaks in aircraft traffic. Since, TRL does not have an operating ATCT, IFR numbers, and discussions with stakeholders were utilized to estimate peaks in operational activity. For the purposes of this study, it was estimated that the peak month would have approximately 11.8% of the total annual operations. The Peak Month Average Day (PMAD) forecasts were developed by dividing the peak month forecast levels by 30 days. For the purpose of the Peak Hour Operations forecast, it was assumed that 15% of total PMAD traffic would occur during the peak hour. **Table 3-15** depicts the forecasted peaking numbers for TRL.

TABLE 3-15
AIRCRAFT OPERATIONS PEAKING, 2021-2041
TERRELL MUNICIPAL AIRPORT

Year	2021	2022	2026	2031	2036	2041
Peak Month	3,971	4,063	4,455	4,999	5,609	6,294
PMAD Operations	132	135	149	167	187	210
Peak Hour Operations	20	20	22	25	28	31
Total Annual Operations	33,650	34,434	37,757	42,366	47,537	53,339

Source: Garver Forecast Data for TRL, 2022

FORECAST SUMMARY

The various forecast elements are displayed in **Table 3-16**. The forecasts, combined with the inventory data, will be used to identify and develop the facility requirements and the need for improved general aviation facilities to serve TRL. The next chapter, Facility Requirements, identifies the types and extent of facilities needed to adequately accommodate the demand levels identified in this chapter.

TABLE 3-16
AVIATION FORECAST SUMMARY, 2021-2041
TERRELL MUNICIPAL AIRPORT

Based Aircraft By Type						
Year	2021	2022	2026	2031	2036	2041
Single-Engine Piston	70	72	76	80	85	90
Multi-Engine Piston	11	11	11	12	12	13
Turbo-Prop	3	3	4	7	9	11
Turbo-Jet	1	1	2	4	7	11
Helicopter	1	1	2	3	4	5
Total	86	88	95	106	117	130
Operations						
Year	2021	2022	2026	2031	2036	2041
Single-Engine Piston	31,295	32,024	34,813	38,800	43,309	48,405
Multi-Engine Piston	337	344	378	424	475	533
Turbo-Prop	841	861	1,094	1,359	1,638	1,933
Turbo-Jet	1,110	1,136	1,396	1,698	2,020	2,361
Helicopter	67	69	76	85	95	107
Local Operations	26,920	27,547	30,206	33,893	38,030	42,671
Itinerant Operations	6,730	6,887	7,551	8,473	9,507	10,668
Total	33,650	34,434	37,756	42,366	47,538	53,340

Source: Garver Forecast Data for TRL, 2022

TAF COMPARISON

Both the based aircraft and aircraft operations forecast provided in this chapter exceed the requirements stated in AC 150/5070-6 (current series) for generally being in compliance with the existing TAF for TRL (e.g., 10% or less difference in the 5-year forecast and 15% or less difference in the 10-year forecast). This is due to the fact that the based aircraft counts in the TAF are lower than the actual number of aircraft based at the airport today. The stronger operation growth is due to the expected strong growth in the local economy.

Table 3-17 shows the baseline forecast comparison to the FAA's TAF.

TABLE 3-17
TAF COMPARISON, 2021-2041
TERRELL MUNICIPAL AIRPORT

Year	TAF Forecast	Based Aircraft Preferred Forecast	% Difference
Initial Forecast Year (2022)	72	88	21.92%
Base Year +5 (2026)	72	95	32.33%
Base Year +10 (2031)	72	106	46.60%
Base Year +15 (2036)	72	117	62.42%
Base Year +20 (2041)	72	130	79.94%
Year	**TAF Forecast**	**Aircraft Operations Preferred Forecast**	**% Difference**
Initial Forecast Year (2022)	33,650	34,434	2.33%
Base Year +5 (2026)	33,650	37,757	12.21%
Base Year +10 (2031)	33,650	42,366	25.90%
Base Year +15 (2036)	33,650	47,537	41.27%
Base Year +20 (2041)	33,650	53,339	58.51%

Source: Garver Forecast Data for TRL, 2022

4 Facility Requirements

CHAPTER 4: FACILITY REQUIREMENTS

INTRODUCTION

This chapter evaluates the existing airport facilities and identifies improvements needed to effectively meet the forecasted demand discussed in the Forecast Chapter in a manner that complies with FAA standards and best practices. Identification of a needed facility or infrastructure improvement does not necessarily constitute a "requirement", but an "option" for facility development to accommodate future aviation activity. Market demand will ultimately drive the facility development requirements at Terrell Municipal Airport (TRL) and the operational statistics discussed in the Forecast Chapter (e.g., aircraft operations, based aircraft, etc.) should be used to help guide the discussion.

Airport facilities can be divided into two areas: airside and terminal/landside. The airside facilities include the runways, taxiways, protected surfaces, airspace, navigational aids (NAVAIDs), airfield markings, signage, and lighting. Terminal/landside facilities include the hangars, terminal building, FBO facilities, apron, fuel storage and delivery, vehicular parking, and airport access roads.

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

AIRSIDE/AIRSPACE FACILITIES

RUNWAY LENGTH

FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance to help determine the most appropriate recommended runway lengths for an airport, which is predicated upon the category of aircraft using or forecasted to use the Airport.

A significant factor to consider when analyzing the generalized runway length requirements for an airport is that the actual length necessary for an aircraft operation is a function of airport field elevation, temperature, weather conditions, and aircraft stage length (e.g., non-stop flight distance). As temperatures, density altitude, weather, and aircraft stage length change, the runway length requirements change accordingly. Consequently, if a runway is designed to accommodate 75% of the fleet at 60% useful load, this does not prevent larger aircraft at certain times and during specific conditions from

utilizing the runway. However, the amount of time such operations can safely occur is limited.

As **Table 4-1** indicates, Runway 18/36 currently meets the runway length requirements for 100% of the small GA aircraft fleet (under 12,500 lbs.).

TABLE 4-1
RUNWAY LENGTH REQUIREMENTS
TERRELL MUNICIPAL AIRPORT

Aircraft Category Small Aircraft: 12,500 pounds or less:	Runway Designation	Current Runway Length	Runway Length Requirement	Deficiency
95% GA Fleet	18/36	5,006	**3,275**	1,731
100 % GA Fleet	18/36	5,006	**3,875**	1,131
100 % GA Fleet with 10 or more passenger seats	18/36	5,006	**4,375**	631
Large Aircraft between 12,500 and 60,000 pounds:				
75% of fleet at 60% useful load	18/36	5,006	**5,500**	-494
75% of fleet at 90% useful load	18/36	5,006	**7,430**	-2,424
100% of fleet at 60% useful load	18/36	5,006	**6,055**	-1,049
100% of fleet at 90% useful load	18/36	5,006	**9,530**	-4,524

Source: AC 150/5325-4B, Runway Length Requirements for Airport Design, Figures 2-1, 2-2, 3-1 and 3-2. Generalized length only. Actual lengths should be calculated based on a specific aircraft's operational nomographs. Useful load refers to all usable fuel, passengers, and cargo. Calculations based on 474.2 feet airport elevation, mean maximum daily temperature of 96.3˚F and maximum difference in runway end elevation of 18 feet. For Large Aircraft, figures are increased 10 feet for each foot of elevation difference between the high and low points of the runway centerline.

Based on this analysis, the length of TRL's existing runway is sufficient to accommodate forecasted operations for small aircraft but may not be sufficient to accommodate some large aircraft operations depending on the weight of the aircraft, weather conditions, and stage length.

As part of this AMP process, an aircraft range analysis was also conducted. This analysis used flight data captured by FlightAware, a third-party company, over a 3-year period ending in July 2022 to identify some of the larger aircraft operating out of TRL and the farthest destinations to which they flew during that period. Additionally, coordination with a variety of jet aircraft manufacturers (e.g., Cessna, Bombardier, and Dassault) was completed to gather specific range estimates for their aircraft when departing TRL under a range of atmospheric conditions. For these range calculations, the manufacturers were asked to assume that the aircraft would depart at 80% of its useful payload. **Table 4-2** and **Figure 4-1** depict the findings of this analysis.

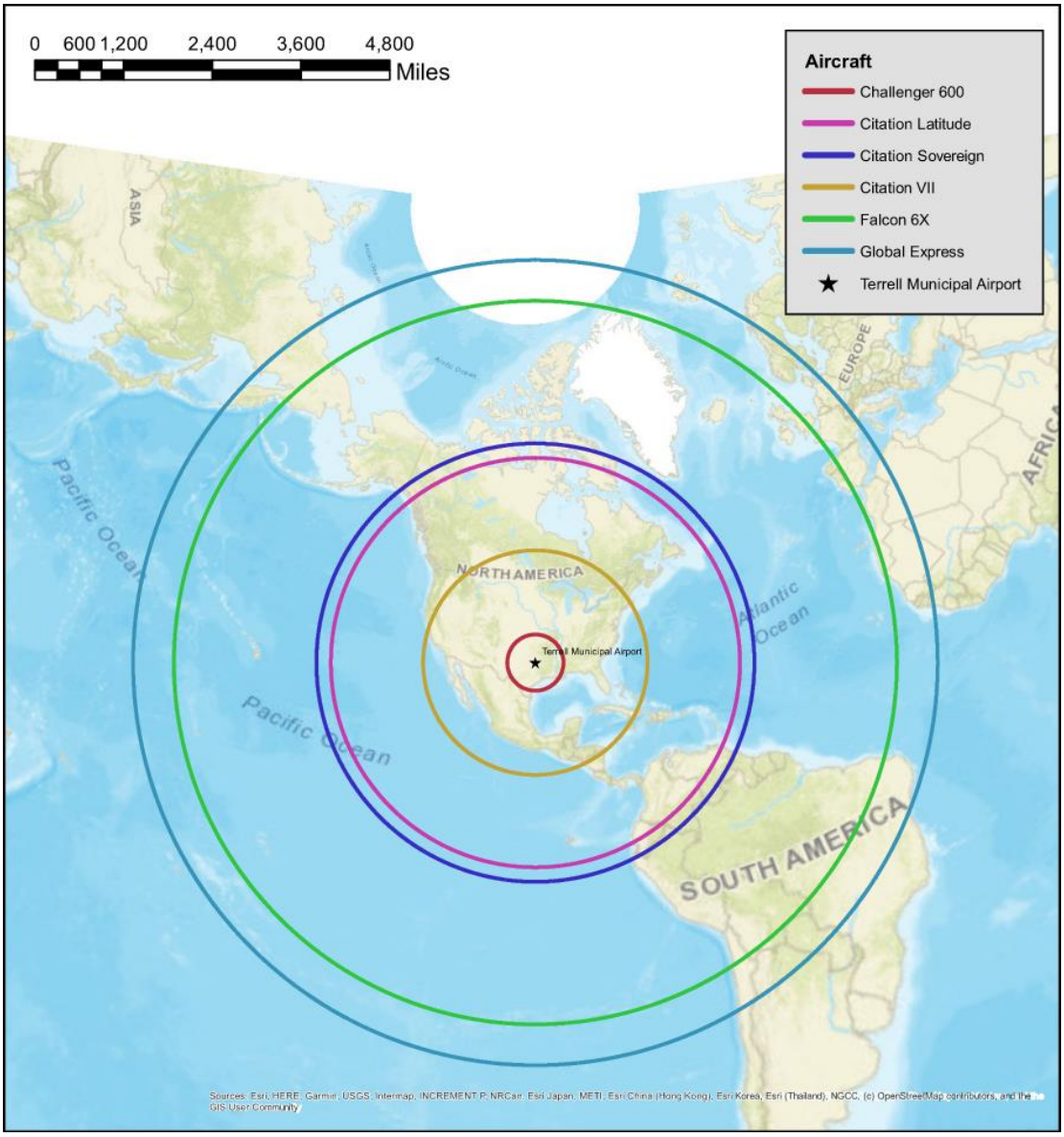
TABLE 4-2
AIRCRAFT RANGE CALCULATIONS
TERRELL MUNICIPAL AIRPORT

Range Using Existing Runway 18/36 - 5,006 ft. Length (NM)	Range (Nautical Miles - NM)					
	Currently Operating at TRL				Potential Future Operations at TRL	
	Citation VII	Citation Sovereign	Citation Latitude	Challenger 600	Global Express	Falcon 6X
ISA (59 degrees F)	1,716	2,575	2,405	1044^	4927^	4,500
ISA +15 (86 degrees F)	1,319	2,575	2,405	330^	4730^	4,250
ISA +30 (113 degrees F)	551	2,575	2,405	---*	3821^	3,300
Longest Distance Flown between Nov '20 - Nov '21	1107 NM (BUR - April 2021)	832 NM (GSO - Nov 2020)	1025 NM (BWI - July 2021)	190 NM (HOU - Aug 2021)		
	Runway Length (ft)					
	Citation VII	Citation Sovereign	Citation Latitude	Challenger 600	Global Express	Falcon 6X
Total Runway Length Necessary to Depart TRL at MTOW (ft) in ISA +15 Conditions	5,575	3,895	3,836	---*	---*	5,700

* - Bombardier figures denoted with an "*" were unable to be provided by Bombardier due to off-field obstructions.
^ - Bombardier figures denoted with an "^" were limited to obstructions according to Bombardier.
ISA - International Standard Atmosphere
MTOW - Maximum Takeoff Weight
NM - Nautical Miles

Source: Aircraft manufacturer data, 2022

FIGURE 4-1
AIRCRAFT RANGE CALCULATIONS AT ISA +15°C (86°F)
GILLESPIE COUNTY AIRPORT



Source: Aircraft manufacturer data, 2022

In general, the analysis shows that the existing runway length can accommodate the set of reviewed aircraft beyond the recently flown farthest distance (essentially anywhere within the continental United States) except in ISA +30°C conditions, which equate to 113°F.

Based on this analysis, the length of TRL's existing runway is expected to be sufficient to meet the Airport's anticipated fleet mix unless international flights begin to regularly occur at the Airport with much larger aircraft.

Based on the runway length analysis conducted, an obstruction mitigation project should be considered due to the results provided by Bombardier.

RUNWAY STRENGTH

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

As reported in the most recent TRL Airport Master Record, the existing runway pavement strength for Runway 18/36 is 30,000 pounds for single-wheel landing gear configurations.

Table 4-3 shows some of the larger aircraft that could be expected to operate at TRL during the planning horizon, and their maximum take-off weights (MTOW).

TABLE 4-3
LARGE AIRCRAFT MAXIMUM TAKE-OFF WEIGHTS
TERRELL MUNICIPAL AIRPORT

	Pavement Weight-Bearing Capacity			
	Hawker 800	Dassault Falcon 2000	Cessna Citation VII	Cessna Citation CJ2
Gear Type	DW	DW	DW	SW
Maximum Takeoff Weight (MTOW)	28,000	36,500	23,000	12,300

Source: Manufacturers data

Based on this analysis, Runway 18/36 is sufficient to accommodate expected aircraft within the planning horizon.

RUNWAY ALIGNMENT

The evaluation of runway alignment is based on crosswind coverage and velocity. FAA Advisory Circular 150/5300-13 (current series), *Airport Design*, states that the allowable crosswind component for a runway with a B-II-4,000 Runway Design Code (RDC) is 13 knots at 95% wind coverage. Runway 18/36 is a B-II-4,000 runway.

Table 4-4 shows the crosswind coverage percentages for Runway 18/36 at TRL. Based on this analysis, Runway 18/36 currently provides sufficient wind coverage.

TABLE 4-4
CROSSWIND COVERAGE
TERRELL MUNICIPAL AIRPORT

	All Weather Wind Coverage %			IFR Wind Coverage %			VFR Wind Coverage %		
Runway	10.5 Knots	13 Knots	16 Knots	10.5 Knots	13 Knots	16 Knots	10.5 Knots	13 Knots	16 Knots
18/36	97.21%	98.68%	99.63%	95.91%	97.74%	99.15%	97.42%	98.84%	99.71%

Source: FAA Airports – GIS Wind Analysis Tool. Terrell Municipal Airport wind data

MAGNETIC DECLINATION

The existing magnetic declination for TRL is 2° 29' E with an annual rate of change of 0° 6' W annually according to the National Oceanic and Atmospheric Administration (NOAA) Magnetic Declination Estimated Value Calculator (July 2022). The true bearing of Runway 18/36 is 180° and 360°. The current magnetic heading published on the instrument approach charts for Runway 18/36 is 176° and 356° respectively based on magnetic variation documented at 4° E from 2005. Based on the aforementioned rate of change it is not expected that Runway 18/36 will need to be redesignated during the planning horizon.

AIRPORT DESIGN CONSIDERATIONS

Compliance with airport design standards is vitally important because they aid an airport in maintaining a minimum level of operational safety. The major airport design elements are established by FAA AC 150/5300-13 (current series), *Airport Design.* In general, the design of an airport should conform to FAA airport design criteria without requiring modification to standards.

Table 4-5 provides an overview of the FAA design standards for a B-II-4,000 runway and their application to Runway 18/36 at TRL.

TABLE 4-5
RUNWAY DESIGN
TERRELL MUNICIPAL AIRPORT

Item Runway Design:	FAA Design Standard: B-II	Runway 18/36
Width (ft)	75	75
RSA Width (ft)	150	150
RSA Length beyond R/W end (ft)	300	300
OFA Width (ft)	500	500
OFA Length beyond R/W end (ft)	300	300
ROFZ Width (ft)	400	400
ROFZ Length beyond R/W end (ft)	200	200
Runway Setbacks -Runway Centerline to:		
Parallel Taxiway Centerline (ft)	240	240
Holdline (ft)	200	200
Aircraft Parking Area (ft)	250	389

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

Currently, TRL does not have a deficiency related to runway design. An analysis of the Runway Protection Zones (RPZs) is provided later in this chapter.

RUNWAY WIDTH

FAA AC 150/5300-13 (current series), *Airport Design*, delineates the requirements for runway width. At present, Runway 18/36 is 75 feet wide. This width meets the minimum runway width recommended for a runway with an RDC of B-II–4,000 which is 75 feet. TRL's critical aircraft is forecasted to remain in the B-II category (e.g., Cessna Citation V) throughout the forecast period. Consequently, the existing runway width should be sufficient.

RUNWAY SAFETY AREA

The Runway Safety Area (RSA) is a two-dimensional area surrounding and extending beyond the paved surface of the runway. The RSA is provided to reduce the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway pavement. In addition, it must be free of objects, except those required for air navigation, and be graded to transverse and longitudinal standards to prevent water accumulation. Objects located in the RSA that are over 3 inches above grade must be constructed, to the extent practical, on frangibly mounted structures with a frangible point no higher than 3 inches above grade. All non-frangible items located in the RSA must have a top elevation that is between flush with the grade and a height of 1 inch above the immediate

surrounding grade. Under dry conditions, the RSA must support Aircraft Rescue and Fire Fighting (ARFF) equipment (if applicable), snow removal equipment (if applicable), and the occasional passage of aircraft without causing damage to the aircraft. The Airport should own all the property inside the limits of the RSA.

Based on RDC B-II-4,000 design standards, the RSA at TRL should extend beyond the end of the runway for 300 feet and be 150 feet wide. No RSA deficiencies have been identified at TRL.

RUNWAY OBJECT FREE AREA

The Runway Object Free Area (ROFA) is a two-dimensional area surrounding runways. It must remain clear of objects except those used for air navigation or aircraft ground maneuvering purposes and requires clearing of above-ground objects protruding higher than the elevation of the RSA at the closest adjacent point. An object is considered any terrain, structure, navigational aid, person, equipment, or parked aircraft. The Airport should own all the property inside the limits of the ROFA.

FAA Airport Design criteria for a RDC B-II-4,000 runway require the ROFA to be 500 feet wide and extend 300 feet beyond each runway end. There are currently no deficiencies associated with Runway 18/36.

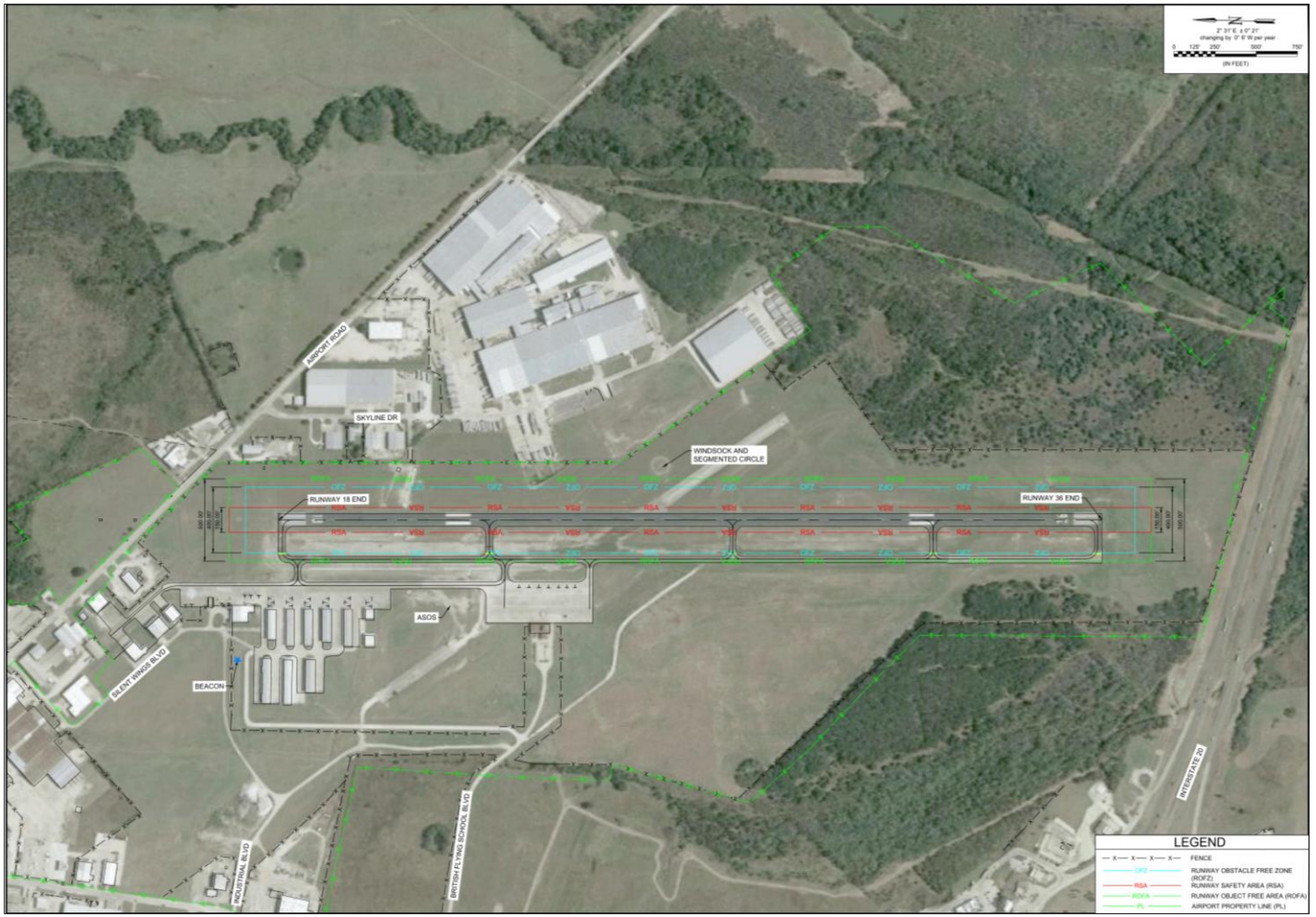
OBSTACLE FREE ZONE

The Obstacle Free Zone (OFZ) is a volume of airspace above and centered along the runway centerline. The OFZ precludes taxiing and parked airplanes and object penetrations except for objects required to be located in the OFZ due to their function. OFZs can have a number of different components including a Runway Obstacle Free Zone (ROFZ), inner-transitional OFZ, inner approach OFZ, and a Precision Obstacle Free Zone (POFZ). However, only the ROFZ is applicable at TRL.

The length of the ROFZ is fixed at 200 feet beyond the associated runway end but the width is dependent upon the size of aircraft using the runway (e.g., small aircraft – less than 12,500 pounds, or large aircraft – greater than 12,500 pounds) and the visibility minimums for the lowest instrument approach to the runway. The ROFZ width at TRL is 400 feet wide and the elevation of the OFZ is equal to the closest point along the runway centerline. No ROFZ deficiencies have been identified at TRL.

Since the Forecast Chapter identified that TRL is expected to remain in the B-II-4,000 RDC during the 20-year planning horizon, no other improvements to the RSA, ROFA, and ROFZ at TRL are expected. **Figure 4-2** depicts the Runway 18/36 ROFA, ROFZ, and RSA.

FIGURE 4-2
RUNWAY 18/36 ROFA, ROFZ, RSA
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2022

RUNWAY HOLD POSITION MARKINGS

The runway hold position markings (or holdlines) denote the entrance to the runway from a taxiway and the location where an aircraft is supposed to stop when approaching the runway. Their location is prescribed by FAA AC 150/5300-13 (current edition), *Airport Design*. They are generally located across the centerline of a given taxiway within 10 feet of an associated hold position sign. According to FAA standards, the holdlines for TRL should be located at least 200 feet from the runway centerline. Currently, both holdlines are located 200 feet from runway centerline.

BUILDING RESTRICTION LINE

According to AC 150/5300-13 (current series), *Airport Design*, the Building Restriction Line (BRL) represents the boundary where it is suitable or unsuitable to develop buildings such as hangars, terminals, or other facilities. The BRL is established based on an airport's FAR Part 77 imaginary surfaces, Runway Protection Zones (RPZs), Obstacle Free Zones (OFZ), Object Free Areas (OFA), runway visibility zones, NAVAID critical areas, and approach surfaces. Based on existing instrument approach procedures, the Runway 18/36 primary surface is 1,000 feet wide and extends 200 feet beyond each runway end. The transitional surfaces slope up at a 7:1 ratio from the primary surface to the horizontal surface which is 150 feet above airport elevation. Based on the activity at the field, instrument approach procedures, and the Runway 18/36 RDC, a BRL-0 feet are being used for TRL, meaning that the BRL follows the edge of the primary surface laterally from the runway (500 feet from the runway centerline). Due to the 1,000 feet wide primary surface, several of the existing hangars on the north end of the Airport penetrate the transitional surface. This will be a consideration in the alternatives analysis.

RUNWAY LINE-OF-SIGHT

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

On a single runway, an acceptable runway profile permits any two points, generally each runway ends five feet above the runway centerline, to be mutually visible for the entire runway length. If the runway offers a full-length parallel taxiway, an unobstructed line of sight should exist from any point five feet above the runway centerline to any other point

five feet above the runway centerline for one-half the runway length. There is no single runway line of sight issues along Runway 18/36.

RUNWAY PROTECTION ZONE

The purpose of a Runway Protection Zone (RPZ) is to enhance the protection of people and property on the ground and to prevent developments that are incompatible with aircraft operations. The FAA recommends that airports own the entire RPZ in "fee simple" title and that the RPZ be clear of any non-aeronautical structure or object that would interfere with the arrival and departure of aircraft. However, if “fee simple” interest is unachievable, the next option is controlling the height of objects through an avigation easement and keeping the area clear of any facilities that would support an incompatible activity (e.g., places of public assembly, etc.).

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

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

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

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

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

RPZ dimensions are determined by the type/size of aircraft expected to operate at an airport and the type of approach, existing or planned, for each runway end (visual, precision, or non-precision). The recommended visibility minimums for the runway ends are determined with respect to published instrument approach procedures, the ultimate runway RDC, airfield design standards, instrument meteorological conditions, wind conditions, and physical constraints (approach slope clearance) along the extended runway centerline beyond the runway end. **Table 4-6**, *Runway Protection Zone Dimensions*, delineates the RPZ requirements for TRL.

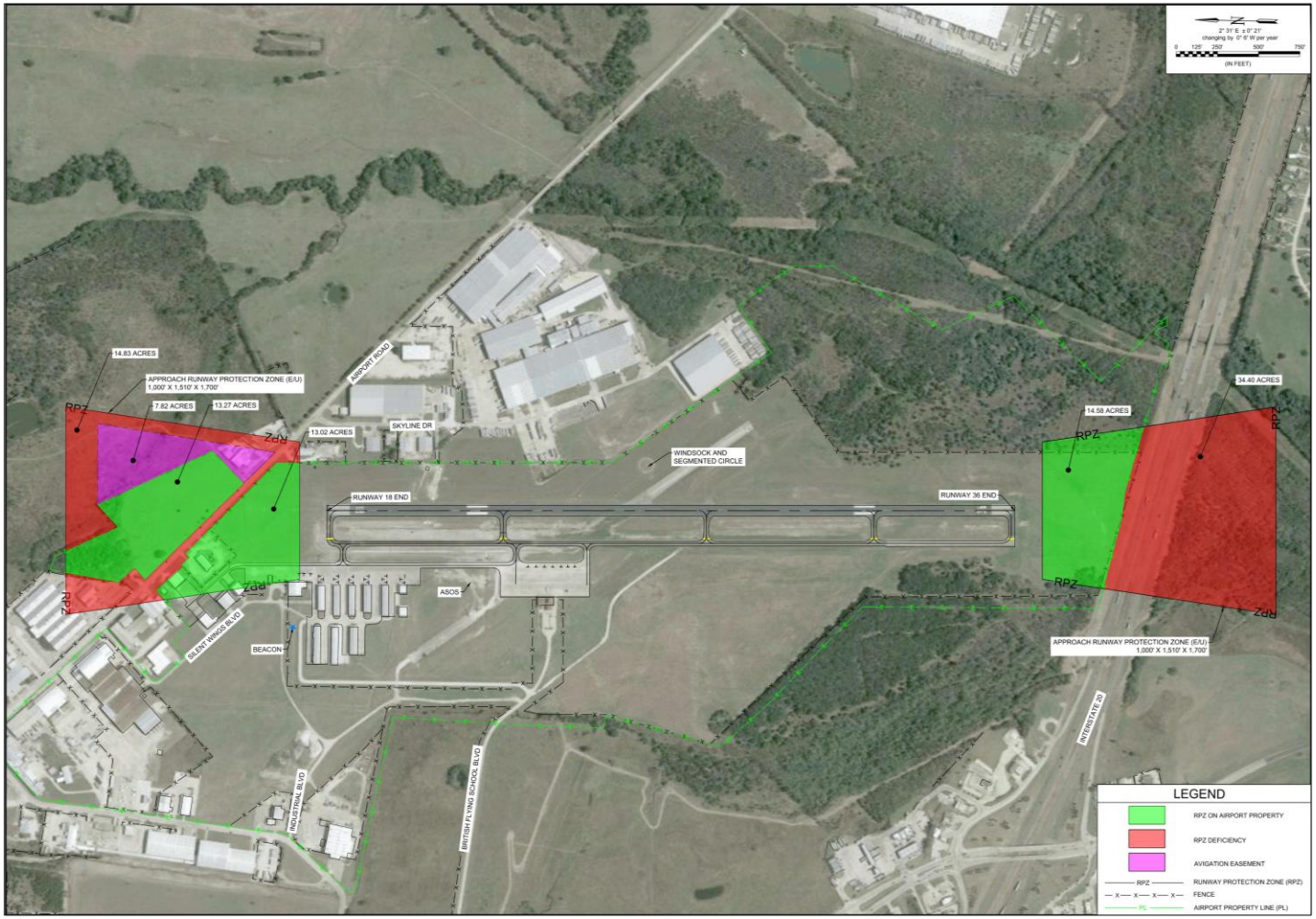
TABLE 4-6
RUNWAY PROTECTION ZONE DIMENSIONS
TERRELL MUNICIPAL AIRPORT

Runway End	Approach Visibility Minimums	Facilities Expected to Serve (AAC - ADG)	Length (ft)	Inner Width (ft)	Outer Width (ft)	Acres
Runway 18	Not Lower Than 3/4 Mile	B-II	1,700	1,000	1,510	48.898
Runway 36	Not Lower Than 3/4 Mile	B-II	1,700	1,000	1,510	48.898

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

Both Runway 18 and Runway 36 RPZs at TRL extend beyond the current airport property limits. At the Runway 18 approach end, the RPZ extends across Airport Road and encroaches on both a commercial business and an underdeveloped parcel north of the road. The Airport also has avigation easements in some of these areas. At the Runway 36 approach end, the RPZ extends across Interstate 20 and encroaches on an undeveloped parcel south of the highway. **Figure 4-3** depicts the RPZs and highlights the portions outside of airport property as well as the avigation easements. This will be a consideration during the alternatives process.

FIGURE 4-3
RUNWAY PROTECTION ZONES
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2022

OTHER AIRSIDE FACILITIES

EMERGING TECHNOLOGIES

The aviation industry is currently experiencing the emergence of new technologies (e.g., electric aircraft, vertical takeoff and landing vehicles, etc.) that have the potential to impact airport infrastructure. While many of the specific infrastructure requirements related to these emerging technologies are not finalized, it is important that airports take steps as part of their planning efforts to identify and protect landholdings to potentially support these operations. Consequently, as part of the alternatives analysis, consideration should be given to where vertiports should be located at TRL. The location and impacts of the electrical infrastructure necessary to support electric aircraft should also be considered.

TAXIWAYS

Taxiways serve a critical function as they are the primary surface that aircraft utilize to transition to/from aircraft parking facilities (ramps, hangars, etc.) to runways. Taxiways that are properly laid out can provide a high-level of safety and efficiency for aircraft moving to/from the runway. By contrast, poorly laid out taxiways can increase the risk of an unintentional pavement excursion for a taxiing aircraft and cause congestion on the airfield.

TAXIWAY PAVEMENT DESIGN

Taxiway design is complex because it is largely based on landing gear configurations which vary widely between different aircraft types. The FAA has classified the numerous variations of aircraft landing gear configurations into various Taxiway Design Groups (TDG) that now guide taxiway pavement design. Generally, all taxiways at TRL follow TDG-2A design standards, and forecasted aeronautical activity is expected to remain primarily in this category. **Table 4-7** depicts the operational statistics of some common TDG-2A aircraft that have frequently operated at TRL over the last 5-year period.

TABLE 4-7
TDG-2A AIRCRAFT OPERATIONS
TERRELL MUNICIPAL AIRPORT

Aircraft	# of OPS (Jan 2017 - Dec 2021)
Cessna Citation CJ2 (C25A)	81
Beech Super King Air 350 (BE350)	153
Beech 200 Super King (BE20)	350
Cessna Citation II/Bravo (C550)	236

Source: FAA TFMSC database, 2022

Based on forecasted activity at TRL during the planning horizon, TDG-2A is expected to be sufficient for operations at TRL.

Taxiway A was realigned in 2021. The fillets that connect to Taxiway A were designed to meet the FAA's TDG based taxiway pavement design standards that were implemented in 2014. An analysis was conducted on the fillets that connect to the runway and it was determined that they meet the FAA's TDG based taxiway pavement design standards. There are no taxiway fillet design deficiencies at TRL.

TAXIWAY DESIGN STANDARDS BASED ON AIRPLANE DESIGN GROUP (ADG)

While taxiway pavement design is based on an aircraft's TDG, Taxiway Safety Areas (TSA), Taxiway Object Free Areas (TOFAs), and taxiway separation standards are based on the Airplane Design Group (ADG) for a given taxiway. Unlike a taxiway's TDG, a taxiway's ADG is based on aircraft wingspan and tail height and not its landing gear configuration. All the taxiways at TRL currently fall into the ADG II category and are expected to remain in that category during the forecast period. **Table 4-8** provides an overview of the ADG requirements applicable to TRL and the dimensions that currently exist.

TABLE 4-8
TAXIWAY STANDARDS BASED ON AIRPLANE DESIGN GROUP
TERRELL MUNICIPAL AIRPORT

Taxiway	Applicable Taxiway ADG	TSA (feet) Current	TSA (feet) FAA Standard	TSA (feet) Standard Met (Y/N)	TOFA (feet) Current	TOFA (feet) FAA Standard	TOFA (feet) Standard Met (Y/N)
A (Parallel)	II	79	79	Y	124	124	Y
B	II	79	79	Y	124	124	Y
C	II	79	79	Y	124	124	Y
D	II	79	79	Y	124	124	Y
E	II	79	79	Y	124	124	Y
F	II	79	79	Y	124	124	Y

Source: Garver, 2022

All taxiways at TRL meet current ADG based taxiway design standards.

TAXIWAY CONFIGURATION ISSUES

Based on research, the FAA has identified a number of taxiway layout/configuration issues that have been shown to cause pilot confusion which can lead to safety issues such as runway incursions. As part of this Airport Master Plan, an analysis was completed to review the existing taxiway system at TRL to identify any taxiway layout/configuration issues that need to be considered as part of the alternatives process. TRL currently does not have any taxiway configuration issues.

AIRFIELD LIGHTING AND MARKING REQUIREMENTS

Sufficient airfield marking, lighting, and signage is essential to maintaining a high level of safety in an airport's daily operation. Airport lighting is used to help maximize the utility of the Airport during day, night, and adverse weather conditions. This section identifies facility requirements related to airfield marking and lighting at TRL.

RUNWAY LIGHTING/PAVEMENT MARKING

Currently, Runway 18/36 is equipped with Medium Intensity Runway Lights (MIRL). The current MIRLs are pilot controlled through the Common Traffic Advisory Frequency (CTAF) at TRL. Pilots can increase the brightness of the MIRLs through a series of microphone click transmissions on the CTAF. The lights were installed over 20 years ago in a non-standard form and are past their useful life. The runway lights need replacement.

Runway pavement markings should follow the requirements prescribed in AC 150/5340-1 (current series), *Standards for Airport Markings*. Both ends of the runway have non-precision instrument markings. These markings are in good condition.

ELECTRICAL VAULT

Currently, the existing electrical vault is over 20 years old and was recently repaired to prevent water from leaking into the facility. The electrical vault facility needs replacement.

TAXIWAY LIGHTING/PAVEMENT MARKING

Effective taxiway lighting is imperative to maintain the safety of aircraft operations at night and during periods of poor visibility. There is no taxiway lighting at TRL. However, taxiway centerline reflectors are located on all taxiways and edge reflectors are provided in some locations. Since TRL is forecasted to have over 100 based aircraft during the planning period, adding Medium Intensity Taxiway Edge Lights (MITL) lighting will be considered as

part of the alternatives process to accommodate the anticipated growth in business aircraft operations.

All paved taxiways should be painted with standard taxiway markings as prescribed in FAA Advisory Circular 150/5340-1 (current series), *Standards for Airport Markings*. All taxiways at TRL have standard taxiway centerline markings. These markings are generally in good condition.

APPROACH LIGHTING SYSTEM

An approach lighting system (ALS) provides the basic means to transition from instrument flight to visual flight for landing. Operational requirements dictate the sophistication and configuration of the ALS for a particular runway. Depending on the type of approach, certain ALS are required to aid pilots in the identification of the Airport environment during instrument meteorological conditions. ALS are a configuration of signal lights starting at the landing threshold and extending into the approach area for a distance of 2,400-3,000 feet for precision instrument runways and 1,400-1,500 feet for non-precision instrument runways. Some systems include sequenced flashing lights that appear to the pilot as a ball of light traveling towards the runway at high speed.

TRL has a Runway Lead-In Light System (RLLS) that is located at the approach end of Runway 18. It consists of five sequential light fixtures each spaced approximately 210 feet apart. The lighting fixtures are incandescent. The RLLs is past its established useful life. This will be a consideration during the alternatives process.

RUNWAY END IDENTIFIER LIGHTS

Runway End Identifier Lights (REILs) provide rapid and positive identification of the runway approach end. REILs consist of a pair of synchronized (directional) flashing white strobes located laterally along the runway threshold. They are typically installed along with threshold lights at each runway end. REILs are not commonly needed unless an airport is situated within an area of heavy light pollution or adjacent to areas that would deem them necessary at specific times such as a lighted ball field, lighted rodeo grounds, etc. REILs can also be used in undeveloped areas to help pilots find and identify the runway. REIL systems are currently located at both runway ends at TRL. The fixtures are incandescent and are past their established useful life.

AIRPORT SIGNS

Airport sign systems provide pilots with a visual indication of runway and taxiway location, direction, and mandatory instructions that are essential to the safe and efficient operation of aircraft. The signage at TRL was recently replaced and is in good condition.

WIND CONE/SEGMENTED CIRCLE/AIRPORT BEACON

TRL has a primary wind cone and segmented circle in the centerfield southeast of the terminal area and east of the runway. They both are in good condition.

TRL's beacon is located 880 feet west-northwest of the Runway 18 threshold and directly north of the existing T-hangar development. The beacon is in good condition with no reported maintenance issues.

AIRPORT NAVIGATION AIDS

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

FAA Order 7031.2C, *Airport Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services*, specifies minimum activity levels to qualify for instrument approach equipment and approach procedures. As forecast in the previous chapter, approximately 1,834 instrument operations (approaches and takeoffs) will be conducted annually under IFR flight rules by the end of the 20-year planning period. The following sections describe the status of existing and new NAVAIDs used at general aviation airports.

VISUAL GUIDANCE SLOPE INDICATORS

Typically, Visual Guidance Slope Indicators (VGSI) provide a system of sequenced colored light beams providing continuous visual descent guidance information along the desired final approach descent path. The system normally consists of two Precision Approach Path Indicator lamp housings (PAPI-2), or four (PAPI-4) lamp housing units installed 600 to 800 feet from the runway threshold and offset 50 feet to the left of the runway edge. Runway 18/36 is equipped with a 4-light PAPI system on each runway end. The Runway 18 PAPI system is owned by the FAA. The Runway 36 PAPI system is owned by the Airport and is past its established useful life. It is an incandescent fixture that is approximately 20 years old. This will be a consideration during the alternatives process.

GLOBAL POSITIONING SYSTEM

The Global Positioning System (GPS) is a highly accurate worldwide satellite navigational system that provides point-to-point navigation by encoding transmissions from multiple satellites and ground-based data-link stations using an airborne receiver. GPS is presently FAA-certified for enroute and instrument approaches into numerous airports.

The Wide Area Augmentation System (WAAS) is being installed at or near airports to provide a signal correction enabling GPS precision approaches (commonly called GPS approaches with LPV minimums). RNAV/GPS approaches to both Runway 18 and Runway 36 currently exist at TRL.

INSTRUMENT APPROACH PROCEDURES

An analysis was conducted to determine the average number of days in a year where weather conditions were at or below the existing Instrument Approach Procedure (IAP) minimums. This analysis was conducted by reviewing the historic weather data at TRL captured by the Automated Surface Observation System (ASOS) located on the field. This data was obtained from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI) website.

It was found that weather conditions were lower than 300 ft. Above Ground Level (AGL), the existing IAP minimum, or the visibility was below ¾ mile for 1.73% of the year. This equates to 151.5 hours or 6.31 days annually. It was also found that the months when ceilings were below minimums the most were between December to April (**Table 4-9**). The hours when ceilings were below minimums the most were between 0500 to 1500 local time (**Table 4-10**). Based on this analysis, TRL does not need to lower their current instrument approach minimums.

TABLE 4-9
MONTHLY OBSERVATIONS
TERRELL MUNICIPAL AIRPORT

Month	Observations
Jan	75
Feb	34
Mar	24
Apr	23
May	4
Jun	2
Jul	1
Aug	3
Sep	2
Oct	16
Nov	23
Dec	135

Source: NCEI, 2022

TABLE 4-10
HOURLY OBSERVATIONS
TERRELL MUNICIPAL AIRPORT

Time	Observations	Time	Observations
0000	1	1200	38
0100	0	1300	49
0200	3	1400	36
0300	3	1500	12
0400	9	1600	2
0500	18	1700	2
0600	19	1800	2
0700	22	1900	0
0800	28	2000	0
0900	29	2100	1
1000	29	2200	0
1100	39	2300	0

Source: NCEI, 2022

WEATHER OBSERVING SYSTEM

Automated Weather Observation Systems (AWOS) and Automated Surface Observation Systems (ASOS) consist of various types of sensors, a processor, a computer-generated voice subsystem, and a transmitter to broadcast minute-by-minute weather data from a fixed location directly to pilots. The information is transmitted over the voice portion of a local NAVAID (VOR or DME) or a discrete VHF radio frequency.

AWOS/ASOS are significant for non-towered airports with instrument procedures to relay accurate and invaluable weather information to pilots. At airports with instrument procedures, an AWOS/ASOS weather report eliminates the remote altimeter setting penalty, thereby permitting lower minimum descent altitudes (lower approach minimums). These systems should be sited within 500 to 1,000 feet of the primary runway centerline. FAA Order 6560.20C, *Siting Criteria for Automated Weather Observing Systems*, assists in the site planning for AWOS/ASOS systems.

TRL is equipped with an ASOS that meets all the parameters of FAA Order 6560.20C. The ASOS information can be received by tuning to 119.275 MHZ or by calling 972-551-1334. The FAA owns the ASOS, and it is maintained by NOAA.

AIRSPACE

TRL is not currently served by an Air Traffic Control Tower (ATCT) and based on the established operations forecast, an ATCT is not expected to be needed during the forecast

period. The current airspace surrounding TRL is classified as Class E airspace and that is not expected to change during the 20-year planning horizon.

The 14 CFR Part 77 Imaginary Surfaces for the Airport are defined below:

- Runway 18/36
  - Primary Surface – 1000 feet wide x 200 feet past each runway end
  - Approach Surface – 34:1 slope for both runway ends for 10,000 feet

- Non-Runway Specific Surfaces
  - Horizontal Surface – Flat surface established at an elevation 624.2 feet (150 feet above field elevation). The perimeter is based on 10,000 feet arcs from each end of Runway 18/36.
  - Conical Surface – Extends from the edges of the horizontal surface for a horizontal distance of 4,000 feet at a 20:1 slope.
  - Transitional Surface – Extends from the edges of the primary surface at a 7:1 slope until it reaches the horizontal surface and from the edges of the approach surfaces at a 7:1 slope until it reaches the horizontal surface or for a horizontal distance of 5,000 feet.

These surfaces are depicted in the Airspace Drawing that is included as part of the Airport Master Plan.

AIRFIELD/AIRSPACE FACILITY REQUIREMENTS SUMMARY

Based on the airfield and airspace facility requirements analysis, the following development objectives have been established for the TRL alternatives development process.

- Acquire a controlling interest in unowned RPZ property
- Complete obstruction mitigation in the Airport area to support aircraft performance
- Replace MIRLs
- Replace the current electrical vault
- Replace PAPI to Runway 36
- Replace REILs and RLLS
- Reserve land for VTOL aircraft within the terminal area
- Electrical infrastructure considerations should be integrated for eVTOL aircraft
- Add taxiway edge lighting

TERMINAL/LANDSIDE FACILITIES

Terminal area and landside area facilities play an important role in enabling the transition of pilots, passengers, and goods to and from the airside facilities at the airport. Terminal and landside area facilities include FBO/terminal building facilities, hangars, apron space, vehicle parking areas, and roadway access.

Key terminal/landside area facility requirements are developed in consideration of the following general planning concepts:

- Future terminal area development for general aviation airports serving utility and larger than utility aircraft should typically be centralized to minimize development cost;
- Future developments should be grouped based on the size of the aircraft expected to use the development to minimize wasted space;
- Planned development should allow for the incremental linear expansion of facilities and services in a modular fashion along an established flightline so development can easily scale to demand;
- Major design considerations involve minimizing earthwork/grading, avoiding flood-prone areas, and integrating existing paved areas to reduce pavement (taxilane) costs;
- Future terminal expansion should allow sufficient maneuverability and accessibility for appropriate types (mix) of general aviation aircraft; and,
- Future terminal area development should enhance safety, visibility, and be aesthetically pleasing.

These general planning concepts are integrated into this terminal and landside facilities analysis.

TERMINAL BUILDING REQUIREMENTS

The terminal building serves both a functional and social capacity central to the operation, promotion, and visible identity of an airport.

The current GA terminal building, owned by the City of Terrell, and the FBO are separate buildings. The terminal building is approximately 5,100 square feet but underutilized because it is separate from the FBO. The FBO is approximately 1,900 square feet and is also used for flight training which makes the facility crowded. For the space requirements analysis (**Table 4-11**), only the space for the FBO building was considered. However, if the FBO is relocated to the terminal building area, synergies between the facilities will exist that will likely reduce the total amount of FBO space needed.

TABLE 4-11
FBO SPACE/NEED
TERRELL MUNICIPAL AIRPORT

Facility	2021	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Formula Factors						
- Peak Hour Operations	20	20	22	25	28	31
- % of Aircraft Using FBO Facilities	40%	40%	40%	45%	45%	50%
- Peak Hour Multiplier	2.5	2.5	2.5	3	3	3
- Sq. Ft. Per Person	150	150	150	150	150	150
Unmet Flight Training/Support Space	1,000	1,000	1,000	1,000	1,000	1,000
Total FBO Sq. Ft. Requirement	4,000	4,000	4,300	6,063	6,670	7,975
Current FBO Sq. Ft.	1,900	1,900	1,900	1,900	1,900	1,900
Surplus/Deficiency (Sq. Ft.)	**-2,100**	**-2,100**	**-2,400**	**-4,163**	**-4,770**	**-6,075**

Source: ACRP Guidebook for GA Facility Planning and Garver, 2022

Additional FBO space is expected to be needed during the planning horizon. The existing terminal building will not likely need to be expanded.

AIRCRAFT STORAGE

Establishing requirements for future hangar space is a critical component of terminal/landside facility planning. In general, future hangar areas should achieve a balance between maintaining an unobstructed expansion area, minimizing pavement development, and allowing convenient airside and landside access.

To evaluate future hangar space requirements, generalized parking area needs must be established for different types of aircraft. For this analysis it was assumed that:

- A single-engine piston aircraft demands approximately 1,250 square feet of parking space;
- A twin engine propeller aircraft requires approximately 3,000 square feet of parking space;
- A business turboprop/jet aircraft requires approximately 3,000 to 5,000 square feet of parking space; and,
- A helicopter requires approximately 1,500 square feet.

General hangar planning considerations incorporated in this analysis include the following:

- Construction of aircraft hangars should be beyond an established building restriction line (BRL) surrounding the runway and taxiway areas, the runway OFZ, runway and taxiway OFAs, and remain clear of the FAR Part 77 Surfaces and Threshold Siting Surfaces.
- Maintaining the minimum recommended clearance between T-hangars of 79 feet for one-way traffic and 143 feet for two-way traffic. Taxilanes supporting T-hangars should be no less than 25 feet wide. Individual paved approaches to each hangar stall are typically less costly, but not preferred to paving the entire T-hangar access/ramp area.
- Box hangar areas should provide for ADG II clearances and should generally be constructed to TDG-2A pavement design standards.
- Segregate hangar development based on the hangar type and function. From a planning standpoint, hangars should be centralized in terms of auto access, and located along the established flight line to minimize costs associated with access, drainage, utilities, and auto parking expansion.

Today, TRL has box and T-hangar storage totaling 127,500 square feet. Currently, the hangars are at capacity and a waiting list exists with approximately 37 aircraft/individuals on it. There are currently 86 based aircraft. Based on the forecast for based aircraft, it is presumed that hangar space at TRL will need to grow as described in **Table 4-12** to accommodate future demand.

TABLE 4-12
AIRCRAFT HANGAR STORAGE DEMAND
TERRELL MUNICIPAL AIRPORT

Facility	2021	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
Based Aircraft - Single Engine Piston	70	72	76	80	85	90
% of Based SE Aircraft Utilizing Hangar Space	96%	96%	95%	95%	94%	94%
Total Based SE Aircraft Placed in Hangar	67	69	72	76	80	85
Estimated Hangar Space per Aircraft	1,250	1,250	1,250	1,250	1,250	1,250
Total Hangar Space Required (sq. ft.)	84,000	86,400	90,250	95,000	99,875	105,750
Based Aircraft - Multi-Engine/Turboprop	14	14	15	19	21	24
% of Based ME/TP Aircraft Utilizing Hangar Space	100%	100%	100%	100%	100%	100%
Total Based ME/TP Aircraft Placed in Hangar	14	14	15	19	21	24
Estimated Hangar Space per Aircraft	3,000	3,000	3,000	3,000	3,000	3,000
Total Hangar Space Required (sq. ft.)	42,000	42,000	45,000	57,000	63,000	72,000
Based Aircraft - Turbo-Jet	1	1	2	4	7	11
% of Based Jet Aircraft Utilizing Hangar Space	100%	100%	100%	100%	100%	100%
Total Based Jet Aircraft Placed in Hangar	1	1	2	4	7	11
Estimated Hangar Space per Aircraft	3,500	3,500	3,500	3,500	3,500	3,500
Total Hangar Space Required (sq. ft.)	3,500	3,500	7,000	14,000	24,500	38,500
Based Aircraft - Helicopters	1	1	2	3	4	5
Estimated Hangar Space per Aircraft	1,500	1,500	1,500	1,500	1,500	1,500
Total Hangar Space Required (sq. ft.)	1,500	1,500	3,000	4,500	6,000	7,500
Annual Itinerant Aircraft Operations	6,730	6,887	7,551	8,473	9,507	10,668
Maintenance/Transient Hangar Area Demand (ft^2)	16,825	17,218	18,878	21,183	23,768	26,670
Current Unmet Demand (e.g. Hangar Wait List)	27,750	27,750	24,000	20,250	16,500	12,750
Total Based Aircraft	86	88	95	106	117	130
Total Hangar Space Required (sq. ft.)	175,575	178,368	188,128	211,933	233,643	263,170
Hangar Space Lost to Exclusive Use/Office Space (estimated at 15%) (sq. ft.)	26,336	26,755	28,219	31,790	35,046	39,476
Hangar Space Required + Space Lost to Exclusive Use/Office Space (sq. ft.)	201,911	205,123	216,347	243,722	268,689	302,646
Current Total Hangar Space (sq. ft.)	127,500	127,500	127,500	127,500	127,500	127,500
Surplus/Deficiency (sq. ft.)	**-74,411**	**-77,623**	**-88,847**	**-116,222**	**-141,189**	**-175,146**

Source: Garver, 2022

AUTO PARKING, CIRCULATION, AND ACCESS REQUIREMENTS

TERMINAL PARKING

General aviation terminals are unique facilities with regard to parking requirements because they are used by a number of aeronautical and non-aeronautical users and for a variety of purposes. Consequently, a calculation on the number of required parking spaces was completed using the best practices established in Airport Cooperative Research Program's (ACRP) *Guidebook for General Aviation Facility Planning*. Under the best practices established in the document a total of 2.5 to 3 spaces should be allocated for each peak hour aircraft operation and an additional 1 space for every 1,000 square feet of hangar space. The Airport also allows for long-term parking of several vehicles, which is accounted for in the analysis. **Table 4-13** shows the number of required parking spots utilizing this methodology.

TABLE 4-13
PARKING SPACE NUMBER REQUIREMENTS BASED ON ACRP GUIDEBOOK FOR GA FACILITY PLANNING
TERRELL MUNICIPAL AIRPORT

Facility	2021	PAL 1	PAL 2	PAL 3	PAL 4	PAL 5
FBO Terminal Parking						
- Peak Hour Operations	20	20	22	25	28	31
- % of Aircraft Using FBO Terminal Facilities	40%	40%	40%	45%	45%	50%
- Peak Hour Multiplier	2.5	2.5	2.5	3	3	3
Parking Space Need for Passenger/Pilot	20	20	22	34	38	47
Hangar Space Parking						
- Hangar Space Requirement	175,575	178,368	188,128	211,933	233,643	263,170
- Parking Alottment Based on Hangar Space (1 space per 1,000 sq. ft.)	176	178	188	212	234	263
- Reduction for Parking Inside Hangar	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Total Parking Needed for Hangar Space	18	18	19	21	23	26
Tie-Down Space Parking						
- Tie-Down Space Requirements	3	3	4	4	5	5
- % of A/C in Use at One-Time	10%	10%	10%	10%	10%	10%
Total Parking Needed for Tie-Down Space	0	0	0	0	1	1
Total # of Spaces Currently	22	22	22	22	22	22
Total Number of Parking Spaces Needed	**38**	**38**	**41**	**55**	**62**	**73**
Total Deficiency/Surplus	**-16**	**-16**	**-19**	**-33**	**-40**	**-51**

Source: Garver, 2022

As mentioned in the Inventory Chapter, there is a 22-space parking lot at the current TRL terminal building, although, the parking spaces are underutilized unless there is an event in the terminal area. A deficiency exists because the FBO has no paved parking, therefore, all vehicles typically park on the apron or in the grass. Based on this analysis, additional

vehicle parking is expected to be needed during the planning horizon, especially if the FBO were to relocate to be near the existing terminal building. This will be a consideration in the alternatives analysis.

VEHICLE ACCESS

Current vehicle access to TRL is provided via British Flying School Boulevard, which connects to South Virginia Street. The Airport access road is constructed of concrete and is in good condition. Additionally, another access road, Silent Wings Boulevard, exists off Airport Road. It is constructed of asphalt and is in fair condition. This will be a consideration in the alternatives process.

In addition to a marquee sign at the Airport entrance off South Virginia Street, there are airport signs in both directions on nearby Interstate 20. A large sign should be considered on the south end of the Airport adjacent to Interstate 20.

AIRCRAFT APRON

COMPOSITION, LAYOUT, AND CONDITION

Aircraft apron areas are provided for aircraft maneuvering and parking. Typically, aprons utilized for aircraft parking have a blend of based aircraft utilizing the apron as a permanent parking location and itinerant aircraft that are using the apron as a temporary parking location. Currently, the apron at TRL is used for a combination of tenant and itinerant aircraft parking. There are 33 designated tie-downs on the ramp, seven located on the main apron and 26 located on the north apron. The apron is mostly considered to be in good condition, however, the asphalt portions along the north apron need to be rehabilitated. The amount of apron space is currently sufficient to meet the needs of the existing airport users. However, forecasted growth in mid to long term operations indicate that additional apron space will be needed during the planning horizon. Consequently, apron space requirements based on the calculations found later in this section will be a consideration in the Alternatives Chapter.

APRON SPACE REQUIREMENTS

Since the apron at TRL is used for a combination of tenant and itinerant aircraft parking, the calculations regarding the need for future ramp space consider both current and future based aircraft demand as well as the space needed to park itinerant aircraft and the space needed for general aircraft movement. It should also be noted that a significant portion of the current TRL apron is used as a taxilane and is not used for aircraft parking. This

consideration is incorporated into the Aircraft Circulation Factor shown in **Table 4-15**. For the purposes of this analysis, it is assumed that aircraft will primarily park in a single row configuration, wing-to-wing, with pull-through or push-back parking as is common with itinerant aircraft.

To begin the analysis, a weighted average for the number of square feet of pavement needed to park an aircraft was calculated. Additionally, for these calculations' considerations were made for the fleet mix at TRL, the movement of the aircraft into and out of the parking area, and the movement of other aircraft around the parked aircraft. Required clearances on all sides of the aircraft were also taken into consideration. **Table 4-14** provides a weighted average apron space requirement per aircraft.

TABLE 4-14
AIRCRAFT APRON SPACE – WEIGHTED AVERAGE CALCULATION
TERRELL MUNICIPAL AIRPORT

ADG	Average Length (ft)	Average Wingspan (ft)	Additional Clearance (ft)	TLOFA Clearance (ft)	Average Parking Area Required (ft^2)	Fleet Mix	Weighted Average Parking Area (ft^2)
I	26	35	7.50	79	6,000	93.20%	5,592
II	55	60	9.00	110	14,274	6.60%	942
III	100	100	11.00	158	34,160	0.00%	0
Helicopter	35	30	12.00	0	3,186	0.20%	6
						Weighted Average:	**6,540**

Source: Garver, 2022

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

Based on these calculations and the TRL peaking characteristics described in the Forecast Chapter, **Table 4-15** shows the estimated amount of apron space that will be required at TRL during the forecast period.

TABLE 4-15
AIRCRAFT PARKING SPACE REQUIRED CALCULATION
TERRELL MUNICIPAL AIRPORT

Year	Peak Hour Operations	Forecasted % of Itinerant Operations Parking on Apron	Estimated Percentage of Itinerant Ops on Apron at Same Time	Permanemt Tie-Down Aircraft	Weighted Average Aircraft Parking Area (ft^2)	Estimated Parking Apron Required	Aircraft Circulation Factor	Total Apron Area Required (ft^2)	Current Apron Area (ft^2)	Surplus/ Deficiency Based on Current Apron Size (ft^2)
2021	20	50%	50%	3	6,540	37,802	340,221	378,023	499,700	**121,677**
PAL 1	20	50%	50%	3	6,540	37,802	340,221	378,023	499,700	**121,677**
PAL 2	22	50%	50%	4	6,590	43,048	387,428	430,475	499,700	**69,225**
PAL 3	25	50%	50%	4	6,640	48,303	434,726	483,029	499,700	**16,672**
PAL 4	28	50%	50%	5	6,690	55,333	497,999	553,332	499,700	**-53,632**
PAL 5	31	50%	50%	5	6,740	60,739	546,647	607,385	499,700	**-107,685**

Source: Garver, 2022

Note: An assumption was made that no more than 50% of the total number of estimated itinerant operations during the peak hour would be on the ramp at the same time. The estimated parking apron required was calculated by multiplying the peak hour by the forecasted % of itinerant operations, then multiplying that result by the estimated percentage of itinerant OPS on the apron at the same time, and then multiplying that result by the weighted average aircraft parking area. It was also assumed that a total of 4 tie-down spaces would be occupied by long-term leases in PAL 3 and 5 tie-down spaces would be occupied by long-term leases by PAL 4 and 5. A factor of 9 was added to the apron space calculation to account for general aircraft circulation and movement and taxilanes on the apron. This high factor was utilized to account for the significant amount of apron space that is immediately in front of hangars making it only available for aircraft movement and not parking.

These calculations show that the apron will likely need to be expanded in the mid-term and long-term portions of the forecast period, particularly as more hangars are developed. This will be a consideration in the alternatives process.

FUEL STORAGE REQUIREMENTS

Fuel storage requirements are based on the forecast of annual operations, aircraft utilization, average fuel consumption rates, and the forecasted mix of aircraft anticipated at TRL. Market conditions will determine the ultimate need for fuel tanks and their size. The following guidelines should be implemented when planning future airport fuel facilities:

- Aircraft fueling facilities should remain open continually (24-hour access), remain visible and be within close proximity to the terminal building or FBO to enhance security and convenience;
- Fuel storage capacity should be sufficient for average peak-hour month activity;
- Fueling systems should permit adequate wing-tip clearance to other structures, designated aircraft parking areas (tie-downs), maneuvering areas, and OFAs associated with taxilane and taxiway centerlines;
- Fuel facilities should be located beyond all protected surfaces (e.g., RSA, ROFA, TOFA, etc.);

- All fuel storage tanks should be equipped with monitors to meet current state and federal environmental regulations, and be sited in accordance with local fire codes;
- Have a dedicated fuel truck for Jet-A delivery to minimize the liability associated with towing and maneuvering expensive aircraft up to and in the vicinity of fueling facilities; and,
- Maintain adequate truck transport access to the fuel storage tanks for fuel delivery.

As reported in the Inventory Chapter, TRL is equipped with two 12,000-gallon underground storage tanks (USTs), one for 100LL and one for Jet-A. Self-service fueling is not available. The facility was built in the mid-1980s, and the tanks are generally in good condition. Based on forecasted demand, the fuel farm capacity is expected to be sufficient during the planning period. However, relocating the fueling farm to be in closer proximity to the main apron should be considered. Additionally, adding self-service 100LL fueling should be a priority.

AIRPORT TERMINAL/LANDSIDE AREA FACILITY REQUIREMENTS SUMMARY

Based on the terminal/landside area requirements analysis, the following development objectives have been established for the TRL alternatives development process.

- Depending on future development plans a new fuel farm may need to be developed closer to the terminal building
- Additional FBO space is currently needed and the FBO should be relocated to be adjacent to the existing terminal building
- Incremental amounts of apron space will be needed as additional hangars are developed.
- Additional box and T-hangar space will be needed
- Additional vehicle parking will be needed adjacent to the terminal building if the FBO is relocated to that area
- Large sign on south end of the Airport adjacent to Interstate 20 is needed

FACILITY REQUIREMENTS – SUMMARY

Based on the analysis completed in this chapter, the primary development objectives for the Alternatives Chapter are the items defined below:

- Airside
  - Acquire a controlling interest in unowned RPZ property
  - Complete obstruction mitigation in the Airport area to support aircraft performance
  - Replace MIRLs
  - Replace the current electrical vault
  - Replace PAPI to Runway 36
  - Replace REILs and RLLS
  - Reserve land for VTOL aircraft within the terminal area
  - Electrical infrastructure considerations should be integrated for eVTOL aircraft
  - Add taxiway edge lighting

- Terminal/Landside
  - Depending on future development plans a new fuel farm may need to be developed closer to the terminal building
  - Additional FBO space is currently needed and the FBO should be relocated to be adjacent to the existing terminal building
  - Incremental amounts of apron space will be needed as additional hangars are developed.
  - Additional box and T-hangar space will be needed
  - Additional vehicle parking will be needed adjacent to the terminal building if the FBO is relocated to that area
  - Large sign on south end of the Airport adjacent to Interstate 20 is needed

5 Alternatives Analysis

CHAPTER 5: ALTERNATIVES ANALYSIS

INTRODUCTION

This chapter describes the various airside and terminal/landside area development alternatives that were created based on the needs defined in the Facility Requirements Chapter. This chapter also discusses the evaluation process used to select the preferred development alternative for each area (e.g., airside and terminal/landside), reviews the results of the evaluation process, and provides an overview of the anticipated environmental impacts of the preferred development alternative.

ALTERNATIVES DEVELOPMENT PROCESS

The various alternatives described in this chapter were created by reviewing the facility requirements defined in Chapter 4 and devising numerous development options that could potentially satisfy those requirements. Those development options were then consolidated into five airside and three terminal/landside development alternatives that went through the formal evaluation process described herein to select the preferred alternative for each area.

Airside facilities are those that are used for supporting the active movement and circulation of aircraft on the airfield which includes the runways, taxiways, and approach facilities/equipment. Terminal/landside area facilities include the terminal building/FBO facilities, fuel storage/delivery systems, aircraft parking aprons, aircraft hangars, and automobile access and parking.

EVALUATION OVERVIEW

As part of the formal evaluation process, the impact each alternative had in the following areas was considered:

- Ability to Satisfy Established Facility Requirements
- Environmental Impacts
- Residential and/or Business Impacts
- Avigation Easements Required
- Instrument Approach Minimums
- Impacts to Existing and Future Development Areas

These evaluation criteria will be discussed in-depth later in this chapter as well as their application to each alternative.

Since all airport functions relate to and revolve around the runway/taxiway system, airside development alternatives are evaluated before terminal/landside development alternatives. As discussed later in this chapter, the terminal/landside alternatives did not go through a formal evaluation process due to each alternative having similar impacts.

AIRSIDE ALTERNATIVES

The existing Airport Reference Code (ARC) for Terrell Municipal Airport (TRL) is B-II, and the critical aircraft for TRL is expected to remain in that category for the duration of the planning horizon. Several components of the existing airside facilities will likely need to be improved based on the facility requirements analysis. These improvements were used to create development objectives for TRL for the 20-year planning horizon. Each of the established airside development objectives are discussed below:

- Acquire a controlling interest in unowned RPZ property
- Complete obstruction mitigation in the Airport area to support aircraft performance
- Replace Medium Intensity Runway Lights (MIRLs)
- Replace the current electrical vault
- Replace Precision Approach Path Indicator (PAPI) to Runway 36
- Replace Runway End Identifier Lights (REILs) and Runway Lead-In Lighting System (RLLS)
- Reserve land for VTOL aircraft within the terminal area (considered in terminal/landside alternatives)
- Electrical infrastructure considerations should be integrated for eVTOL aircraft (considered in terminal/landside alternatives)
- Add taxiway edge lighting

With these development objectives identified, the following alternatives were developed:

- **Airside Alternative #1**
  Airside Alternative #1 is a status quo alternative that maintains the existing instrument approach procedure (IAP) minimums for each runway end. This results in the presence of a larger Runway Protection Zone (RPZ) on each runway end

(1,000 feet x 1,510 feet x 1,700 feet) and a Building Restriction Line (BRL) – 35 feet that overlaps with a number of existing airport facilities.

- Runway
  - Obtain property acquisitions or easements at the approach end of Runway 18 and Runway 36 to protect for the larger RPZs
  - Mitigate obstacles at the approach end of Runway 18 to improve takeoff performance for specific aircraft models
  - Replace MIRLs for Runway 18/36
  - Replace REILs
  - Replace RLLS system for Runway 18
  - Replace PAPI for Runway 36
- Taxiway
  - Add Medium Intensity Taxiway Lights (MITLs)
- Rehabilitate existing lighting vault
- Add obstruction lights to existing facilities penetrating the 14 CFR Part 77 surfaces at the Airport

Airside Alternative #1 is shown in **Figure 5-1**.

✈ **Airside Alternative #2**

Airside Alternative #2 increases the IAP minimums on the Runway 36 end to 7/8 mile instead of the current ¾ mile. Similar to Airside Alternative #1, this results in the presence of larger RPZs on each runway end (1,000 feet x 1,510 feet x 1,700 feet). However, the expanse of the BRL-35 feet is reduced due to the IAP minimums increase for Runway 36.

- Runway
  - Obtain property acquisitions or easements at the approach end of Runway 18 and Runway 36 to protect for the larger RPZs
  - Mitigate obstacles at the approach end of Runway 18 to improve takeoff performance for specific aircraft models
  - Replace MIRLs for Runway 18/36
  - Replace REILs
  - Replace RLLS for Runway 18
  - Replace PAPI for Runway 36

- Taxiway
  - Add MITLs
- Rehabilitate existing lighting vault

Airside Alternative #2 is shown in **Figure 5-2**.

✈ **Airside Alternative #3**

Airside Alternative #3 increases the IAP minimums on both runway ends to 1 mile. This reduces the size of the RPZs to 500 feet x 700 feet x 1,000 feet and reduces the expanse of the BRL-35 feet as shown in Airside Alternative #2.

- Runway
  - Obtain property acquisitions or easements at the approach end of Runway 36 to protect the RPZ
  - Mitigate obstacles at the approach end of Runway 18 to improve takeoff performance for specific aircraft models
  - Replace MIRLs for Runway 18/36
  - Replace REILs
  - Replace RLLS for Runway 18
  - Replace PAPI for Runway 36
- Taxiway
  - Add MITLs
- Rehabilitate existing lighting vault

Airside Alternative #3 is shown in **Figure 5-3**.

✈ **Airside Alternative #4**

Airside Alternative #4 increases the IAP minimums on Runway 36 end to 7/8 mile instead of the current ¾ mile (similar to Alternative #2) and includes the development of a partial parallel taxiway east of Runway 18/36 to support long-term development. Similar to Airside Alternative #1, this results in the presence of larger RPZs on each runway end (1,000 feet x 1,510 feet x 1,700 feet). However, the expanse of the BRL-35 feet is reduced due to the IAP minimums increase for Runway 36.

- Runway
  - Obtain property acquisitions or easements at the approach end of Runway 18 and Runway 36 to protect for the larger RPZs

- Mitigate obstacles at the approach end of Runway 18 to improve takeoff performance for specific aircraft model.
- Replace MIRLs for Runway 18/36
- Replace REILs
- Replace RLLS for Runway 18
- Replace PAPI for Runway 36

- Taxiway
  - Develop Taxiway G
  - Add MITLs
- Rehabilitate existing lighting vault

Airside Alternative #4 is shown in **Figure 5-4**.

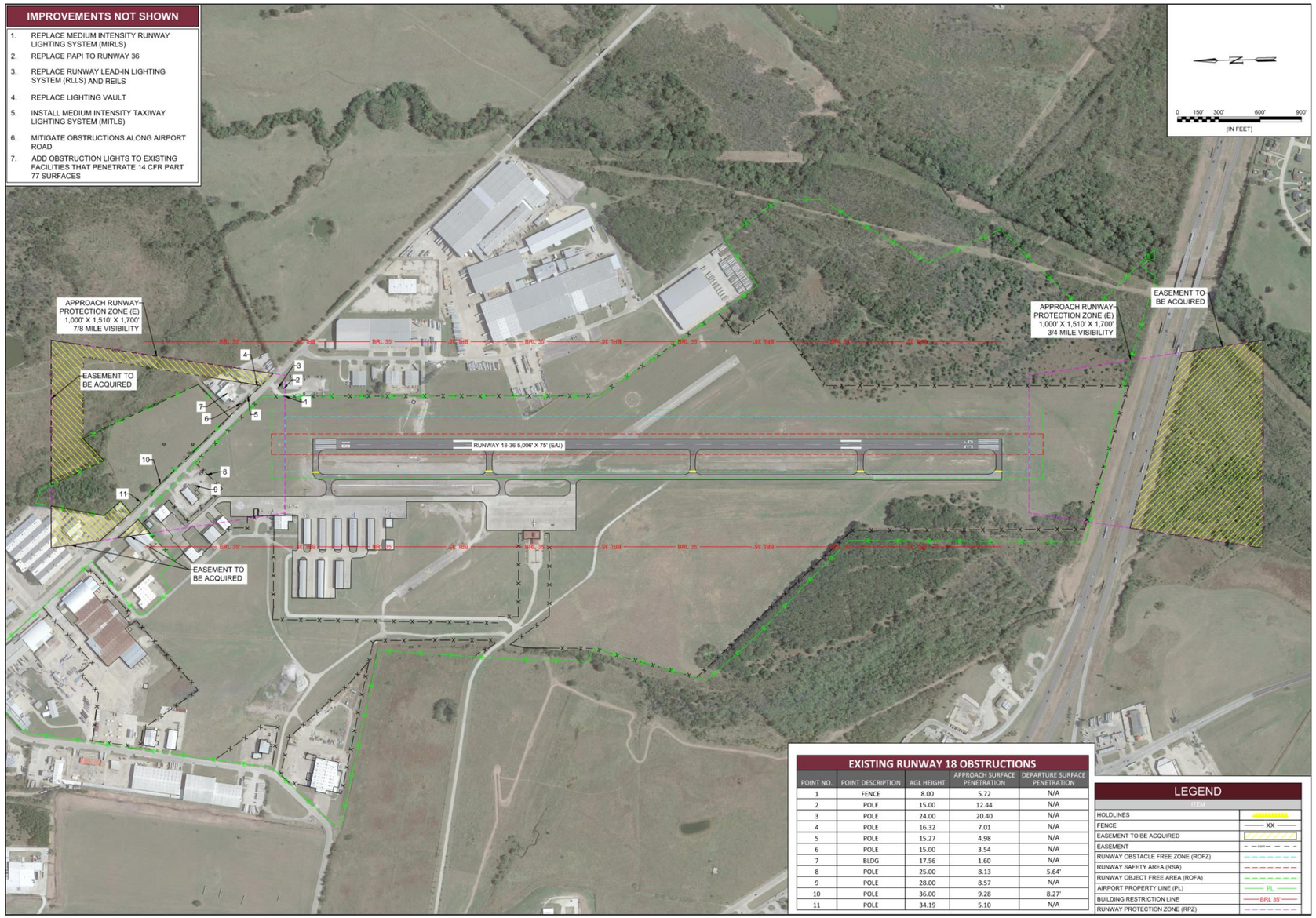
✈ **Airside Alternative #5**

Airside Alternative #5 increases the IAP minimums on the Runway 36 end to 7/8 mile instead of the current ¾ mile, increases the IAP minimums on Runway 18 to 1 mile, and includes the development of a partial parallel taxiway east of Runway 18/36 to support long-term development. This alternative eliminates the larger RPZ associated with Runway 18 that encroaches on existing non-aeronautical development in the area.

- Runway
  - Obtain property acquisitions or easements at the approach end of Runway 36 to protect the RPZ
  - Mitigate obstacles at the approach end of Runway 18 to improve takeoff performance for specific aircraft models
  - Replace MIRLs for Runway 18/36
  - Replace REILs
  - Replace RLLS system for Runway 18
  - Replace PAPI for Runway 36
- Taxiway
  - Develop Taxiway G
  - Add MITLs
- Rehabilitate existing lighting vault.

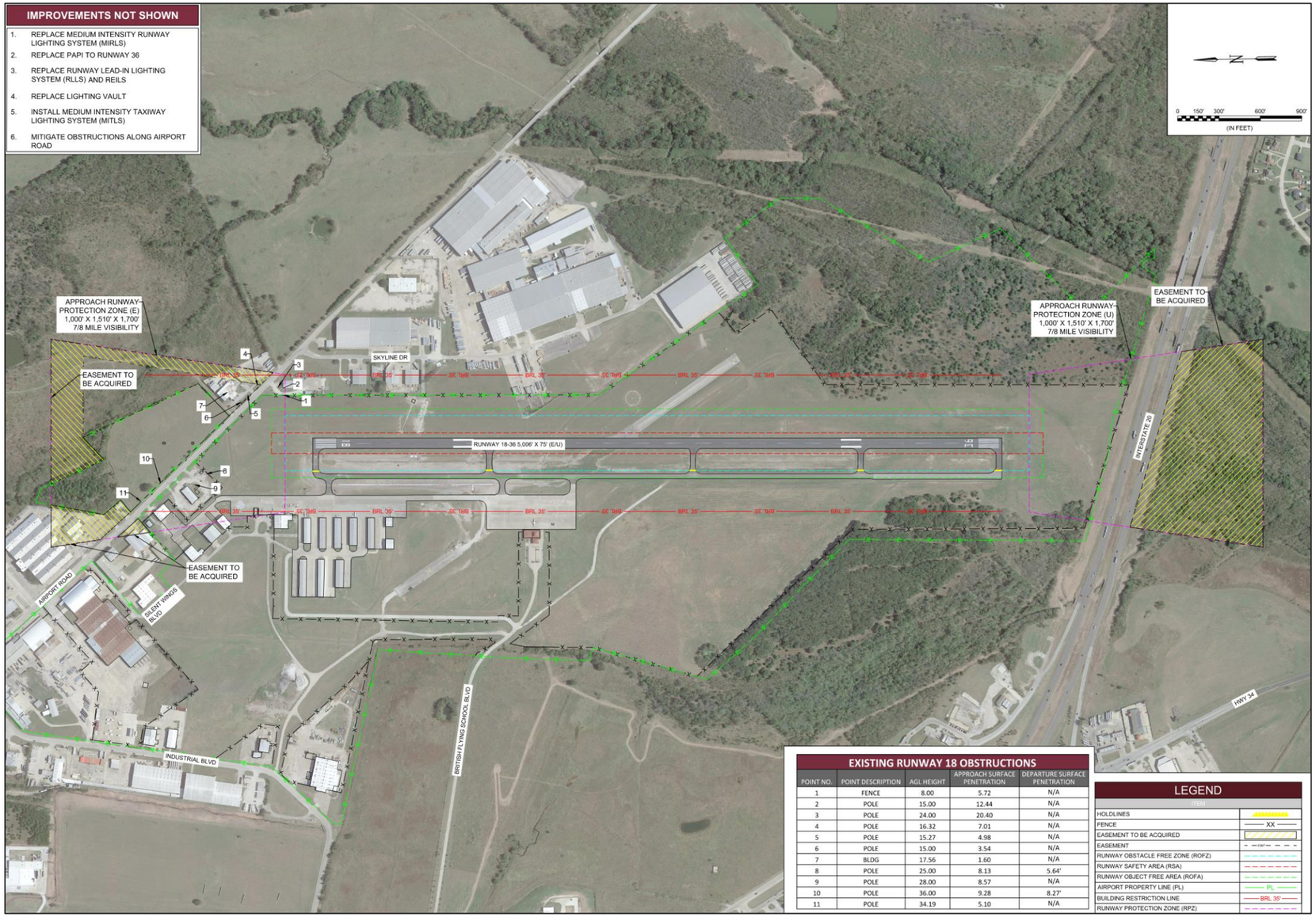
Airside Alternative #5 is shown in **Figure 5-5**.

FIGURE 5-1
AIRSIDE ALTERNATIVE #1
TERRELL MUNICIPAL AIRPORT



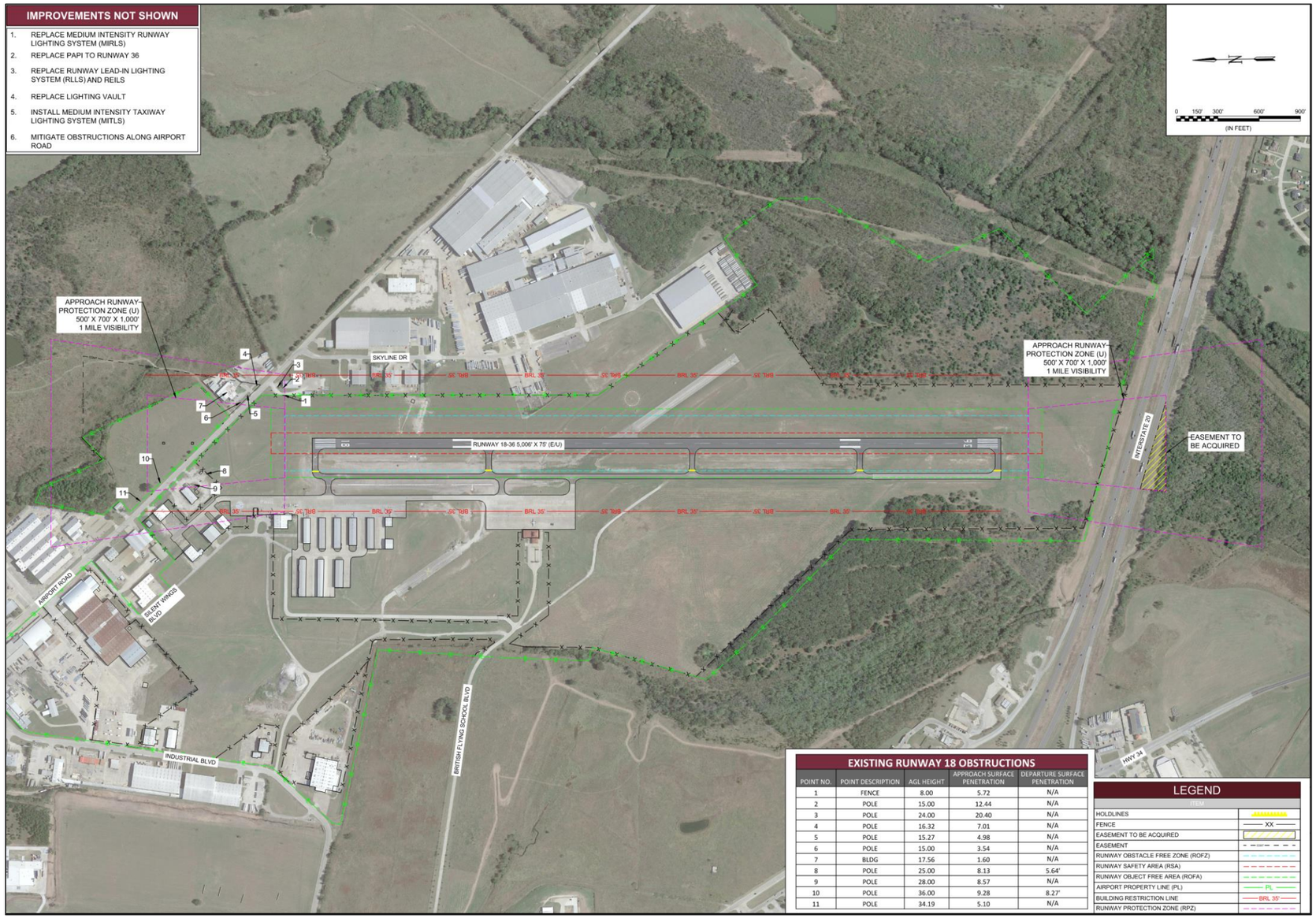
Source: Garver, 2023

FIGURE 5-2
AIRSIDE ALTERNATIVE #2
TERRELL MUNICIPAL AIRPORT



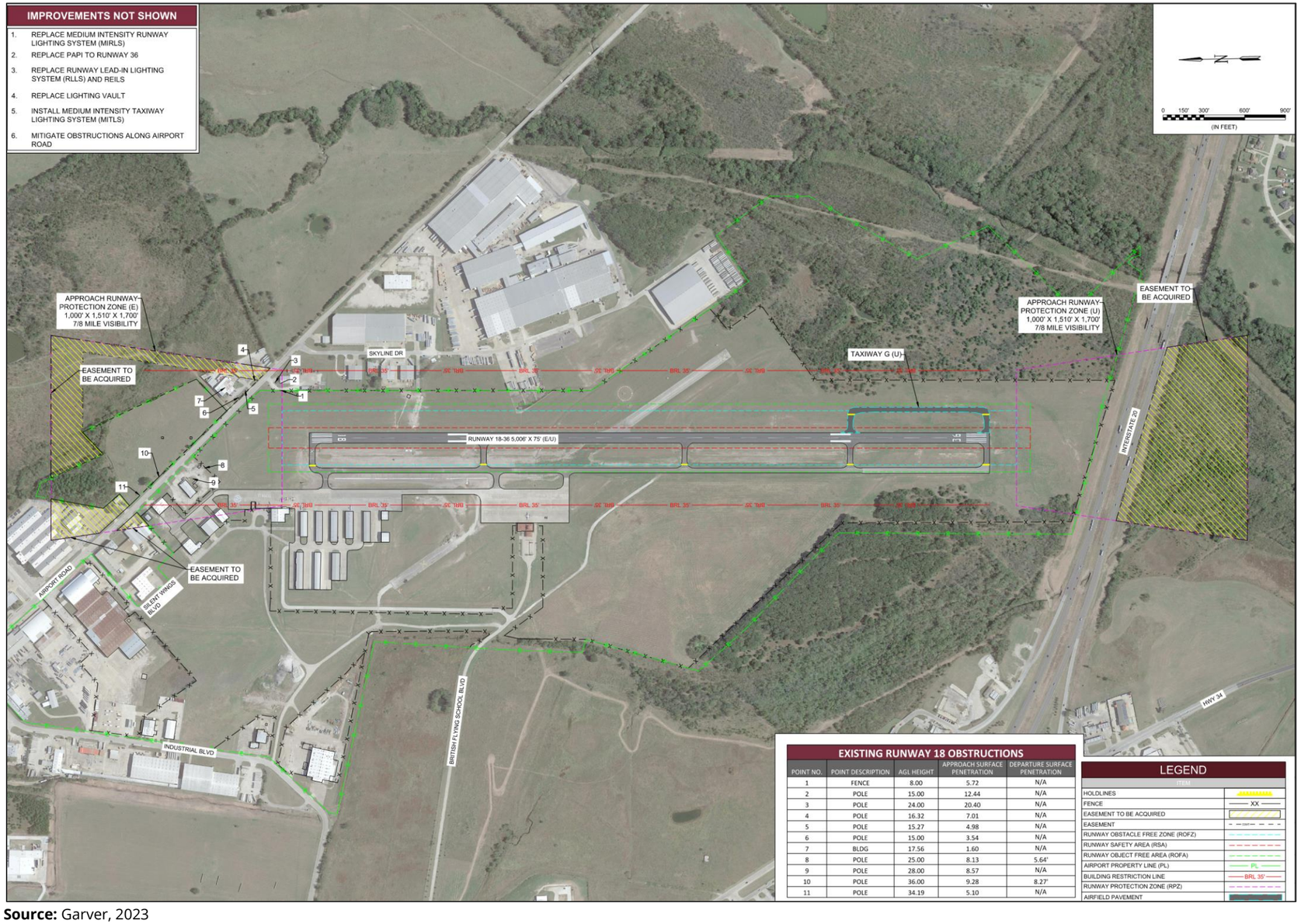
Source: Garver, 2023

FIGURE 5-3
AIRSIDE ALTERNATIVE #3
TERRELL MUNICIPAL AIRPORT



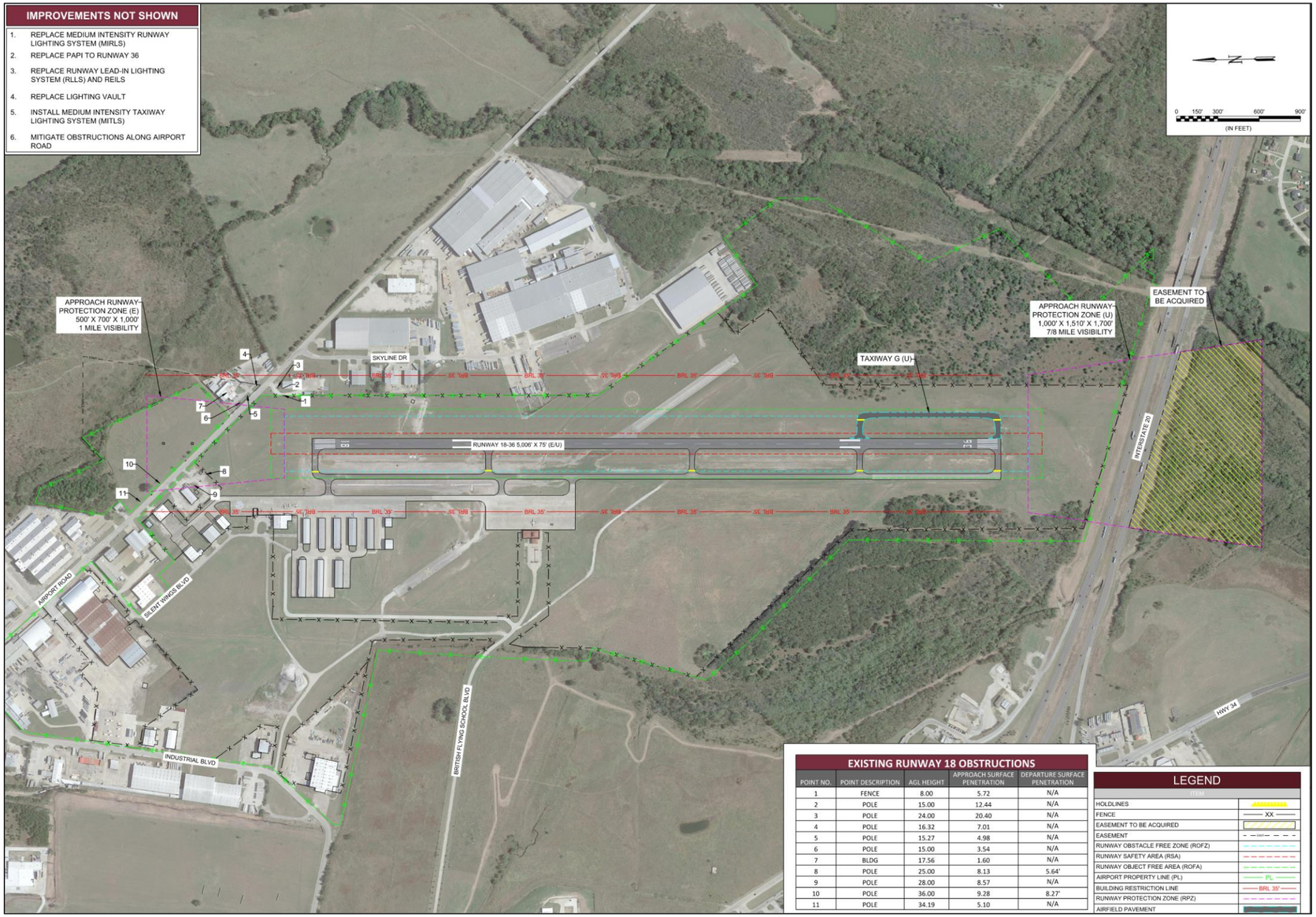
Source: Garver, 2023

FIGURE 5-4
AIRSIDE ALTERNATIVE #4
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2023

FIGURE 5-5
AIRSIDE ALTERNATIVE #5
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2023

AIRSIDE ALTERNATIVES EVALUATION

One of the tasks of an Airport Master Plan is to analyze the airside alternatives to determine which alternative provides a realistic and feasible plan that will allow the Airport to meet future demand in a safe and efficient manner while also protecting for future growth beyond the 20-year planning horizon. To facilitate this analysis, evaluation criteria were established, and an evaluation matrix was developed showing how each airside alternative compared based on the evaluation criteria. The evaluation criteria used for this analysis are discussed below.

The following evaluation criteria are rated on a High (red), Moderate (yellow), or Low (green) level of impact scale:

- Ability to Satisfy Established Facility Requirements – Does the alternative meet the facility requirements established based on the forecast of future aeronautical activity? Ideally, the preferred alternative should enable the Airport to meet all established facility requirements.
- Environmental Impacts – How will the proposed airside alternative impact the environment and how might these impacts influence the feasibility of future development? Environmental factors that should be evaluated for impacts include farmland, wetlands, floodplains, soil, wildlife, noise, and cultural environmental factors as well as any other factors applicable to the Airport. Ideally, the preferred alternative should minimize environmental impacts to the greatest extent practical while still meeting the Airport's future development needs.
- Residential and/or Business Impacts – Will the proposed airside alternative have any known impacts on residential or business areas? Will it require their relocation? Ideally, the preferred alternative should minimize the impact to existing residences or businesses to the greatest extent practical while still meeting the Airport's future development needs.
- Avigation Easements Required – Will the proposed airside alternative require the establishment of any additional avigation easements? Ideally, the need for additional avigation easements should be minimized especially in areas with existing development.
- Instrument Approach Minimums – Will the proposed airside alternative provide the lowest practical instrument approach minimums? Ideally, lower approach minimums are generally favored.

- ✈ Impact to Existing and Future Development Areas – How much does the proposed airside alternative encroach upon existing development space for the airport? In general, the preferred alternative should provide a satisfactory balance of open development space and lower approach minimums.

AIRSIDE EVALUATION RESULTS

Based on the evaluation criteria, the following matrix (**Table 5-1**) was developed showing the proposed rating of each alternative. Green indicates a "low" impact. Yellow indicates a "moderate" impact. Red indicates a "high" impact.

TABLE 5-1
AIRSIDE EVALUATION
TERRELL MUNICIPAL AIRPORT

Evaluation Criteria	Airside Development Alternative # 1	2	3	4	5
Ability to Satisfy Facility Requirements					
Environmental Impacts					
Residential and/or Business Impacts					
Avigation Easements Required					
Insturment Approach Minimums					
Impact to Existing and Future Development Areas					

- Low Impact **or** Meets Requirements

- Moderate Impact **or** Fails to Meet Some Requirements

- High Impact **or** Fails to Meet Most Requirements

Source: Garver, 2023

EVALUATION COMMENTARY FOR ALTERNATIVE #1

Alternative #1 received "green" ratings related to its ability to meet the established facility requirements, environmental impacts, and residential and/or business impacts. These ratings were given because the alternative meets established facility requirements without expanding the airport's current property limits or impacting any environmental resources. Additionally, the alternative received a "green" rating related to instrument approach minimums because it maintains the existing approach minimums of 7/8 mile for Runway 18 and 3/4 mile for Runway 36 which are likely the lowest instrument approach minimums that could be achieved without significant modifications. However, as a result of the lower approach minimums, the alternative received a "red" rating related to impact to existing and future development areas. This rating was given because maintaining the 3/4 mile minimums for Runway 36 requires a 1,000 feet wide primary surface for the runway which greatly expands the limits of the Building Restriction Line (BRL) limiting the existing and future development area. The alternative also received a "yellow" rating related to avigation easements because it requires the establishment of an avigation easement over existing developments at the approach end of Runway 18.

EVALUATION COMMENTARY FOR ALTERNATIVE #2

Alternative #2 received "green" ratings related to its ability to meet the established facility requirements, environmental impacts, and residential and/or business impacts. These ratings were given because the alternative meets established facility requirements without expanding the airport's current property limits or impacting any environmental resources. The alternative received a "yellow" rating related to instrument approach minimums because the visibility minimums for Runway 36 are increased to 7/8 mile vs. the 3/4 mile minimums that currently exist. However, increasing the approach minimums for Runway 36 also reduces the width of the primary surface to 500 feet which resulted in a "green" rating related to the alternative's impact on existing and future development areas. The alternative also received a "yellow" rating related to avigation easements as the alternative requires the establishment of an avigation easement over property with existing development at the approach end of Runway 18.

EVALUATION COMMENTARY FOR ALTERNATIVE #3

Alternative #3 received "green" ratings related to its ability to meet the established facility requirements, environmental impacts, and residential and/or business impacts. These ratings were given because the alternative meets established facility requirements without expanding the airport's current property limits or impacting any environmental resources. The alternative received a "red" rating related to instrument approach minimums because the visibility minimums for both runways are increased to 1 mile in this alternative. The increase of the

instrument approach minimums to 1 mile reduces the width of the primary surface to 500 feet and reduces the size of the Runway Protection Zones (RPZ) at the approach end of each runway. This resulted in "green" ratings related to the avigation easement and impact on existing and future development area criterion.

EVALUATION COMMENTARY FOR ALTERNATIVE #4

Alternative #4 is essentially the same as Alternative #2 with the exception of the new partial parallel taxiway east of Runway 18/36. As a result, the alternative received the same evaluation ratings as Alternative #2.

EVALUATION COMMENTARY FOR ALTERNATIVE #5

Alternative #5 received "green" ratings related to its ability to meet the established facility requirements, environmental impacts, and residential and/or business impacts. These ratings were given because the alternative meets established facility requirements without expanding the Airport's current property limits or impacting any environmental resources. The alternative received a "yellow" rating related to instrument approach minimums because the visibility minimums for Runway 36 are increased to 7/8 mile vs. the 3/4-mile minimums that currently exist, and the Runway 18 minimums are increased to 1 mile vs. the 7/8-mile minimums that currently exist. However, increasing the approach minimums for Runway 36 also reduces the width of the primary surface to 500 feet which resulted in a "green" rating related to the alternative's impact on existing and future development areas. The alternative also received a "green" rating related to avigation easements as the alternative eliminates the need to obtain additional avigation easements over developed properties.

PREFERRED AIRSIDE DEVELOPMENT ALTERNATIVE

The results of the alternative evaluation concluded that Alternative #5 is the preferred airside alternative for the Terrell Municipal Airport. The increase in instrument approach minimums is expected to only impact operations approximately 52.8 hours in an average year based on historic weather data obtained from the existing ASOS system.

TERMINAL/LANDSIDE DEVELOPMENT CONCEPTS

With the framework of the Airport's ultimate airside development plan identified, concepts involving the placement of terminal/landside facilities were prepared and analyzed. The overall objective of terminal/landside development is to identify and illustrate the highest and best use of existing land holdings and surrounding land for new development or redevelopment.

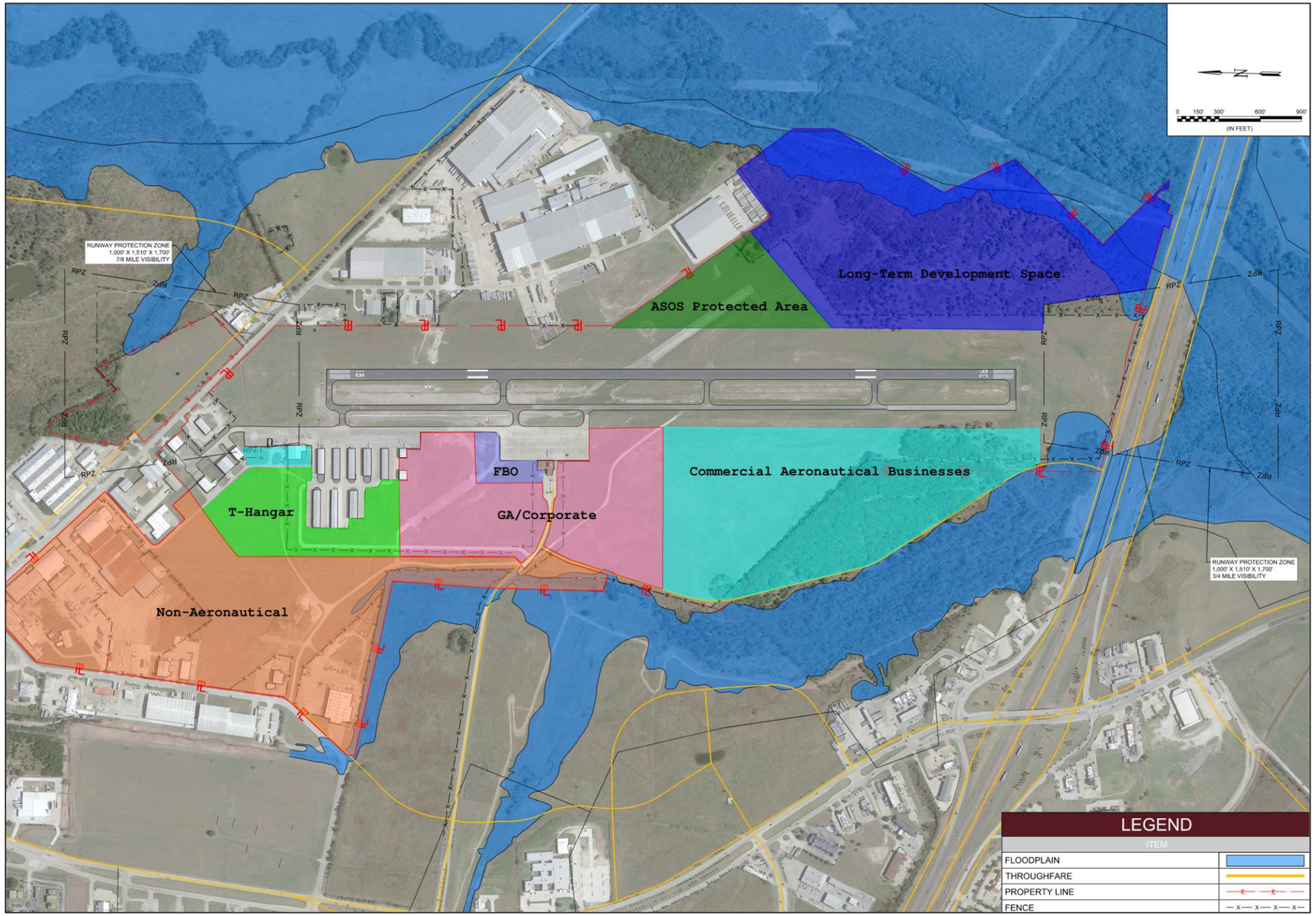
The primary objectives that were considered during the development of the terminal/landside alternatives were:

- Depending on future development plans, a new fuel farm may need to be developed closer to the terminal building
- Additional FBO space is currently needed and the FBO should be relocated to be adjacent to the existing terminal building
- Incremental amounts of apron space will be needed as additional hangars are developed
- Additional box and T-hangar space will be needed
- Additional vehicle parking will be needed adjacent to the terminal building if the FBO is relocated to that area
- Large sign on south end of the Airport adjacent to Interstate 20 is needed

These items were identified and discussed in-depth in the Facility Requirements Chapter.

Additionally, in conjunction with the Airport Master Plan, an Airport Business Plan was created that identified a preferred land-use plan for TRL. The preferred land-use plan was utilized to guide the layout of the terminal/landside alternatives discussed in this chapter. The land-use plan is shown as **Figure 5-6**. Additionally, the land-use plan and all the proposed alternatives recommend the acquisition of additional land located adjacent to the commercial aeronautical business area identified at the south end of the Airport. The acquisition of this property will provide a significant amount of greenfield development space that can be utilized for commercial aeronautical development. Additional land may also need to be purchased to support the location of a vertiport facility.

FIGURE 5-6
PREFERRED LAND USE PLAN
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2023

The following terminal/landside alternatives were developed:

- **Terminal/Landside Alternative #1**
  - 4 – nested 12 bay T-hangars
    - Apron providing ADG I clearances
  - 1 – nested 11 bay T-hangar
  - 12 – 50 feet x 50 feet common wall box hangars
  - 1 – 40 feet x 60 feet box hangar
  - 1 – 50 feet x 60 feet box hangar
  - 7 – 80 feet x 70 feet box hangar
  - 1 – 80 feet x 100 feet box hangar
  - 13 – 100 feet x 100 feet box hangars
  - 1 – 120 feet x 100 feet FBO/box hangar
  - 4 – 120 feet x 170 feet box hangars
  - 10 – 225 feet x 150 feet box hangars
  - New full-service and self-service fuel farm adjacent to main apron
  - Additional roadways, apron, and vehicle parking provided in multiple locations to support hangar development
  - Large roadway sign installed at the south end of the Airport adjacent to IH-20 (not depicted)
  - VTOL facility with necessary electrical infrastructure located along British Flying School Blvd

Terminal/Landside Alternative #1 is shown in **Figure 5-7**.

- **Terminal/Landside Alternative #2**
  - 4 – nested 12 bay T-hangars
    - Apron providing ADG I clearances
  - 16 – 80 feet x 80 feet box hangars
  - 22 – 100 feet x 100 feet box hangars
  - 1 – 120 feet x 100 feet FBO/box hangar
  - 16 – 225 feet x 150 feet box hangars
  - New full-service and self-service fuel farm adjacent to main apron
  - Additional roadways, apron, and vehicle parking provided in multiple locations to support hangar development

- Large roadway sign installed at the south end of the Airport adjacent to IH-20 (not depicted)
- VTOL facility with necessary electrical infrastructure located west of existing T-hangar area

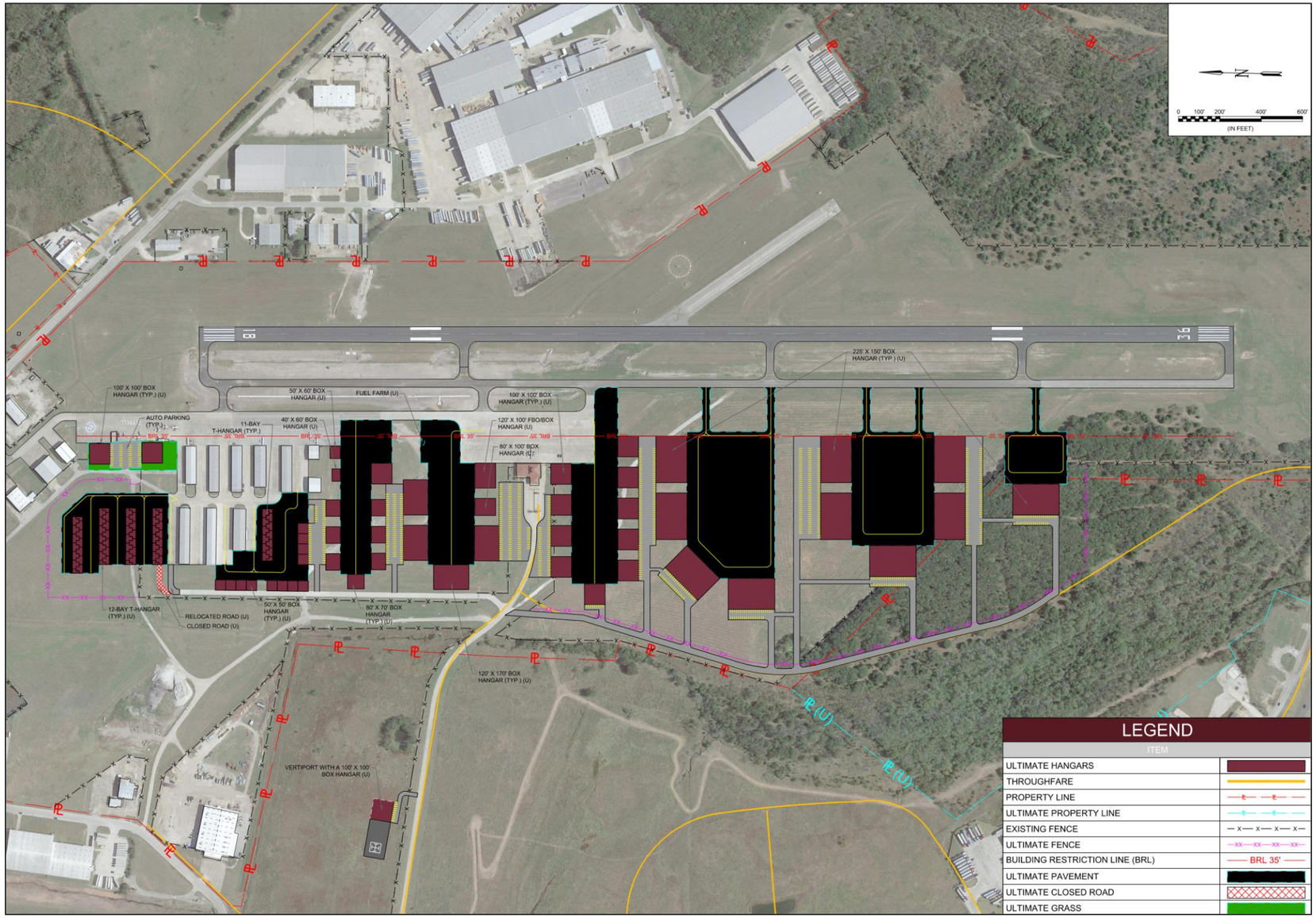
Terminal/Landside Alternative #2 is shown in **Figure 5-8**.

✈ **Terminal/Landside Alternative #3**

- 5 – nested 12 bay T-hangars
  - Apron providing ADG I clearances
- 1 – nested 7 bay T-hangar
  - Apron providing ADG I clearances
- 4 – 60 feet x 60 feet box hangars
- 14 – 80 feet x 80 feet box hangars
- 21 – 100 feet x 100 feet box hangars
- 1 – 120 feet x 100 feet FBO/box hangar
- 11 – 225 feet x 150 feet box hangars
- New full-service and self-service fuel farm adjacent to main apron
- Additional roadways, apron, and vehicle parking provided in multiple locations to support hangar development.
- Large roadway sign installed at the south end of the Airport adjacent to IH-20 (not depicted)
- VTOL facility with necessary electrical infrastructure located in new southern development area.

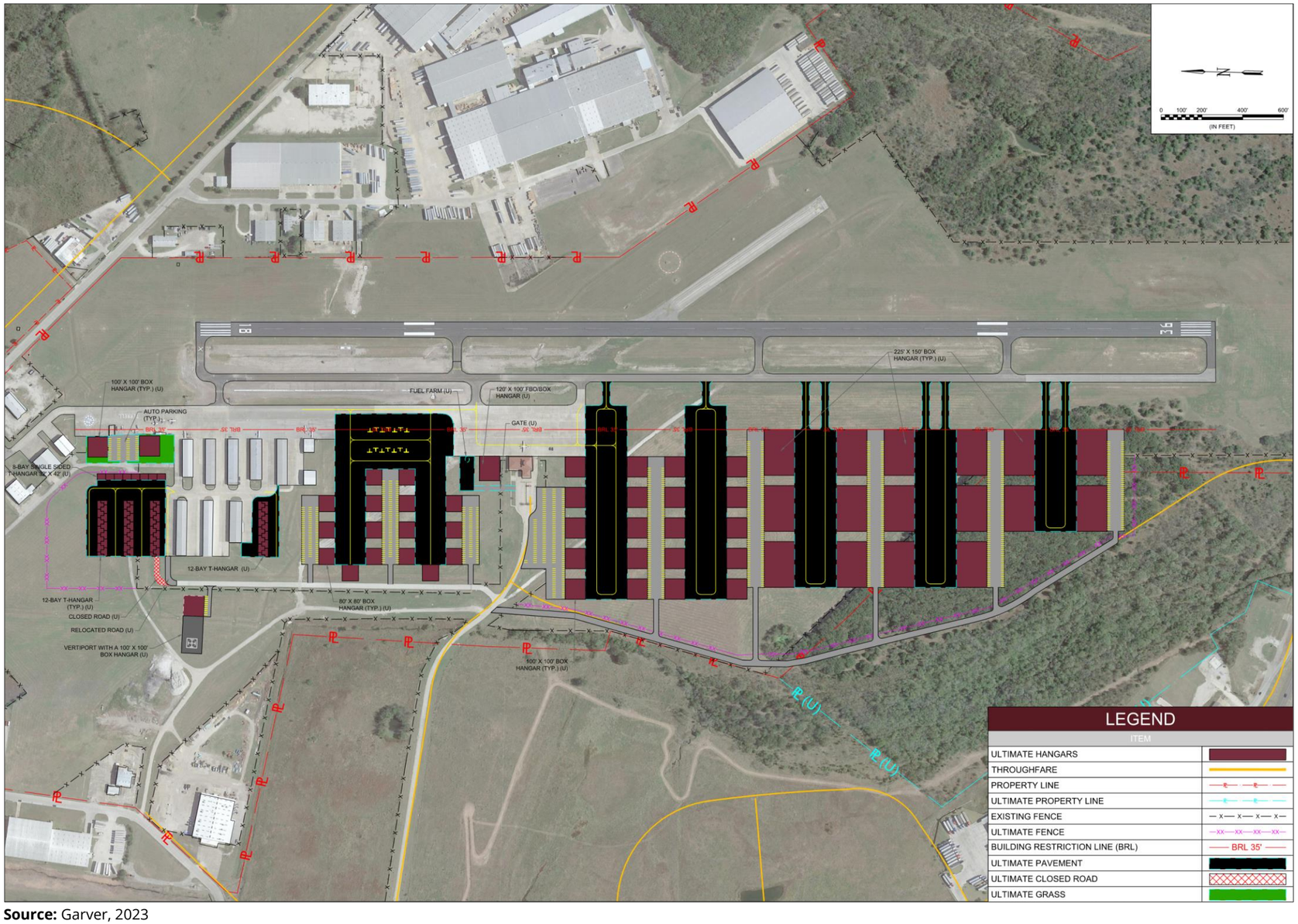
Terminal/Landside Alternative #2 is shown in **Figure 5-9**.

FIGURE 5-7
TERMINAL/LANDSIDE ALTERNATIVE #1
TERRELL MUNICIPAL AIRPORT



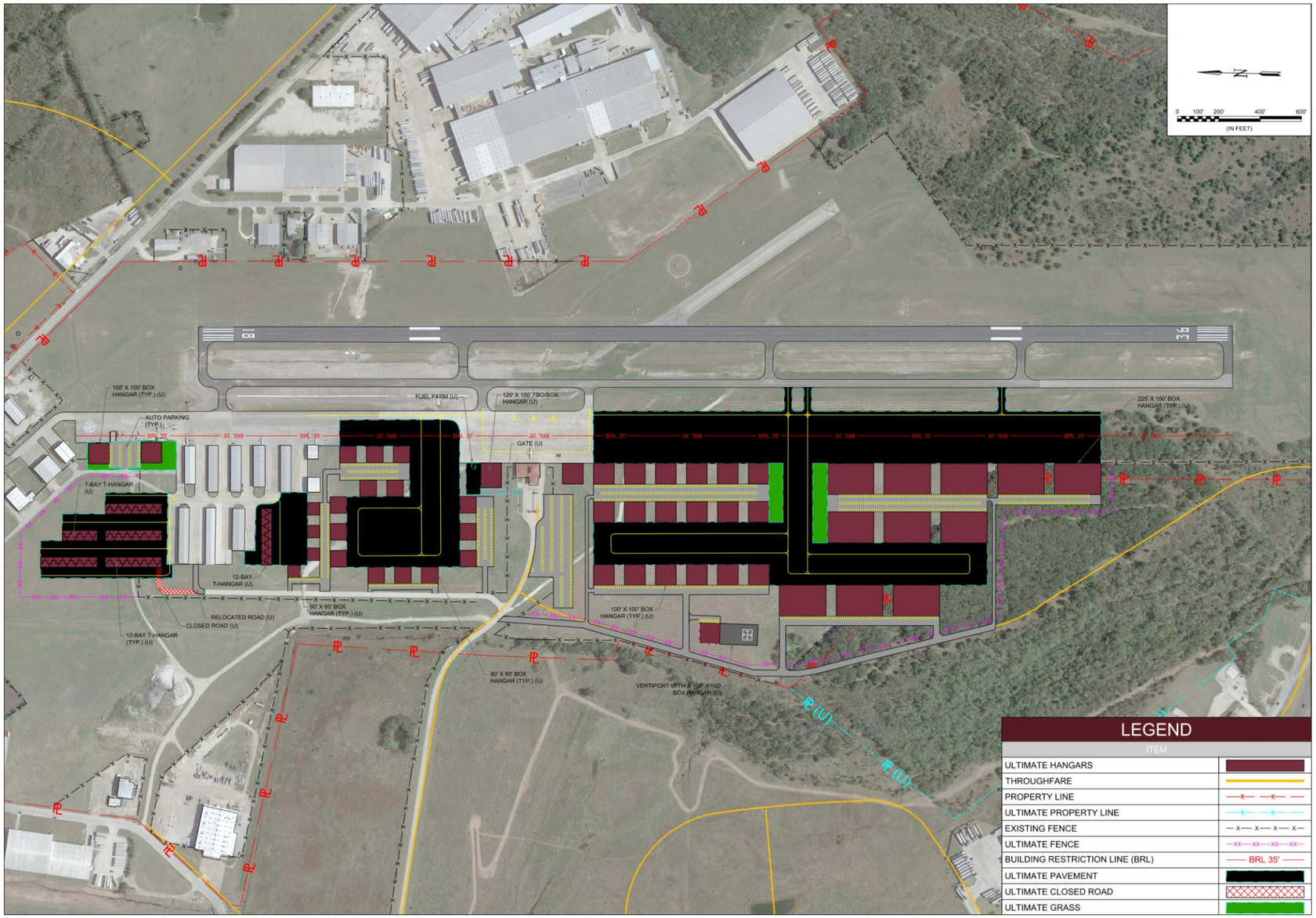
Source: Garver, 2023

FIGURE 5-8
TERMINAL/LANDSIDE ALTERNATIVE #2
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2023

FIGURE 5-9
TERMINAL/LANDSIDE ALTERNATIVE #3
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2023

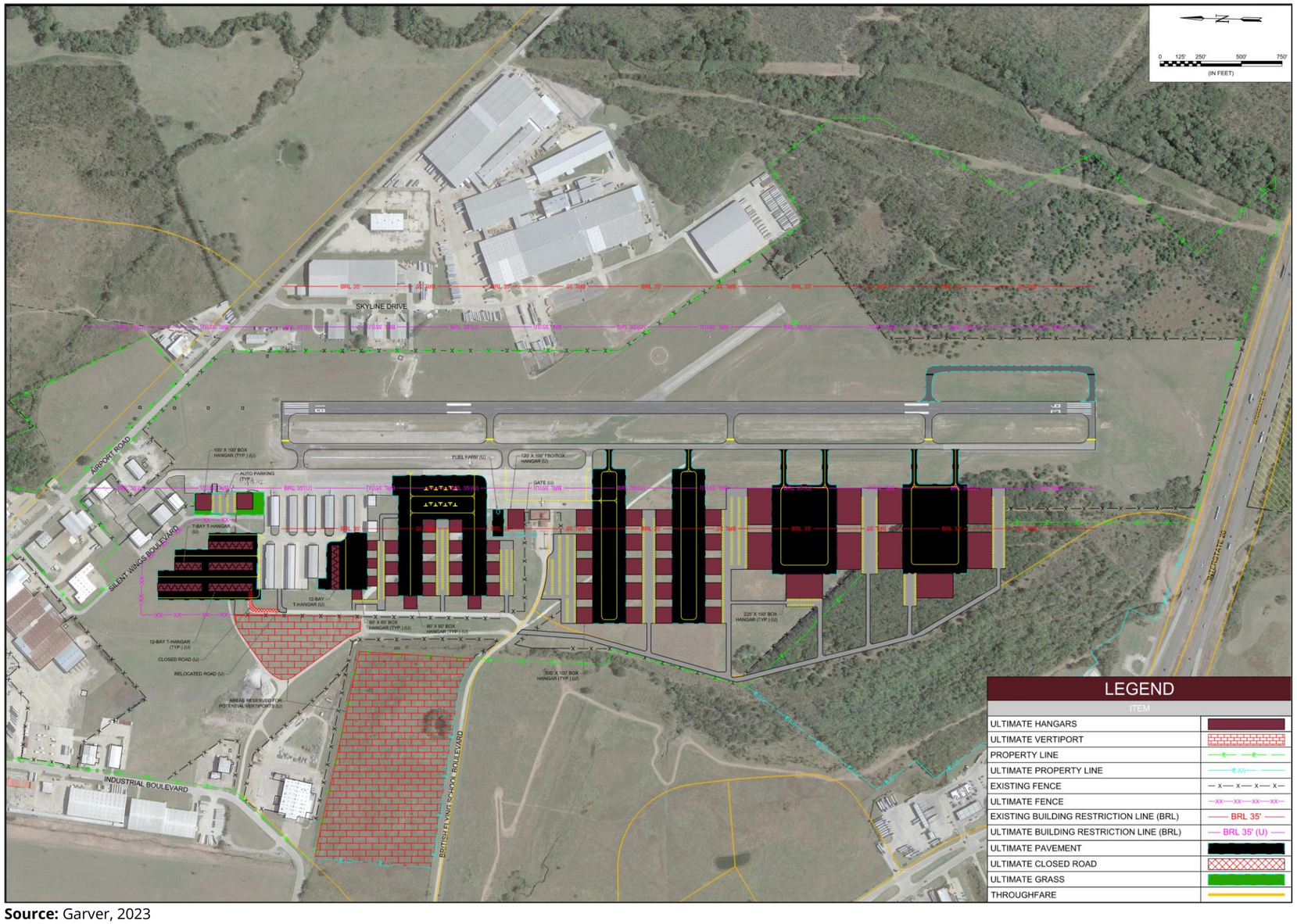
TERMINAL/LANDSIDE ALTERNATIVES EVALUATION

Due to the similar nature of all the terminal/landside alternatives, a formal evaluation of each alternative was not performed as all the alternatives would have received very similar ratings. Consequently, the potential pros and cons of each alternative were discussed with the project steering committee and the Airport Board to establish the preferred terminal/landside alternative concept shown in **Figure 5-10**. This alternative combines the following elements of the three aforementioned terminal/landside alternatives:

- T-hangar and small box hangar arrangement for the northern development area as shown in Terminal/Landside Alternative #3
- Small and mid-size box hangar development for the midfield area as shown in Terminal/Landside Alternative #2
- Large hangar "pod" development layout for the southern area as shown in Terminal/Landside Alternative #1

Even though it is not shown on the map, this alternative also includes the establishment of a large roadway sign installed at the south end of the Airport adjacent to IH-20. Additionally, two protected areas are identified for potential VTOL aircraft operations.

FIGURE 5-10
PREFERRED TERMINAL/LANDSIDE ALTERNATIVE
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2023

PREFERRED DEVELOPMENT CONCEPT – ENVIRONMENTAL OVERVIEW

The preferred development concept as outlined in **Figures 5-5** (preferred airside) and **5-10** (preferred terminal/landside) have been reviewed to identify as early as possible any potential environmental issues. FAA orders and SOPs related to environmental clearances were used to conduct the analysis described below.

The environmental resources evaluated are grouped into the following three categories: 1) No Impact or Minor/Temporary Impact, 2) Moderate Impacts, and 3) Moderate/High Impact potential.

NO IMPACT OR MINOR/TEMPORARY

- Air Quality – Temporary impacts during construction are expected. An air emissions inventory may be required by the Texas Commission on Environmental Quality (TCEQ) and, if necessary, will be completed as part of the preliminary engineering/design processes prior to construction activities taking place.
- Coastal Barriers & Coastal Zone Barriers – The coast is approximately 244 miles from the Airport; therefore, these resources are not affected.
- Federally Listed Endangered and Threatened Species – There are no known protected species at the Airport. However, future coordination may be required with the U.S. Fish and Wildlife Service (USFWS) and the Texas Parks and Wildlife Department (TPWD) to confirm this as part of future projects.
- Energy Supplies, Natural Resources and Sustainable Design – The project is anticipated to have minimal impacts on the area's natural resources and energy supplies.
- Light Emissions and Visual Effects – The future development of TRL is not expected to have a significant impact on light emissions or other visual effects in the area.
- Historical and Archeological – No previously recorded historical or archeological sites were found to be located within the project area during a file search for cultural, historical, and archeological sites. The closest historical site that was identified through an online query utilizing the National Achieves Catalog website is located 1.5 miles north-northwest of the Airport at 108 South Catherine Street.
- Wild and Scenic Rivers – There are no wild and scenic rivers in the project area.
- Hazardous Materials – There are no known hazardous material sites in the area.

- Solid Waste – There are no known locations involved in the preferred development alternative where solid waste is present.
- Water Quality – Water quality is not expected to be impacted by the development. However, a more in-depth review may be necessary for specific development projects.
- Compatible Land Use – None of the areas impacted by development are expected to have any land use compatibility issues outside of those noted elsewhere in this analysis.
- Biotic Resources – No new impacts to biotic resources are anticipated, however additional review may be necessary prior to project design.
- Farmlands – Parts of existing TRL property and some areas proposed for acquisition are considered farmland of statewide importance on the USDA Natural Resource Conservation Service – Web Soil Survey. However, since much of these areas are already allocated for airport use, there are no expected impacts to farmland.
- Floodplains – While there are some areas of floodplain within airport property, development related to the preferred alternative is not expected to directly impact these areas.
- Department of Transportation Act, Section 4(f) – No Section 4(f) impacts are anticipated as part of the preferred development alternative.
- Induced Socioeconomic – The proposed property to be acquired (via an easement) is currently undeveloped. Consequently, no socioeconomic impacts are expected as a result of the preferred development alternative.
- Noise – Residences located south of the Airport may experience elevated noise levels if larger aircraft begin using TRL. However, this impact is expected to be limited.
- Social Impacts – The preferred development alternative is not expected to have any social impacts.
- Environmental Justice – The preferred development alternative is not expected to have any environmental justice impacts.

MODERATE PROBABILITY FOR IMPACT

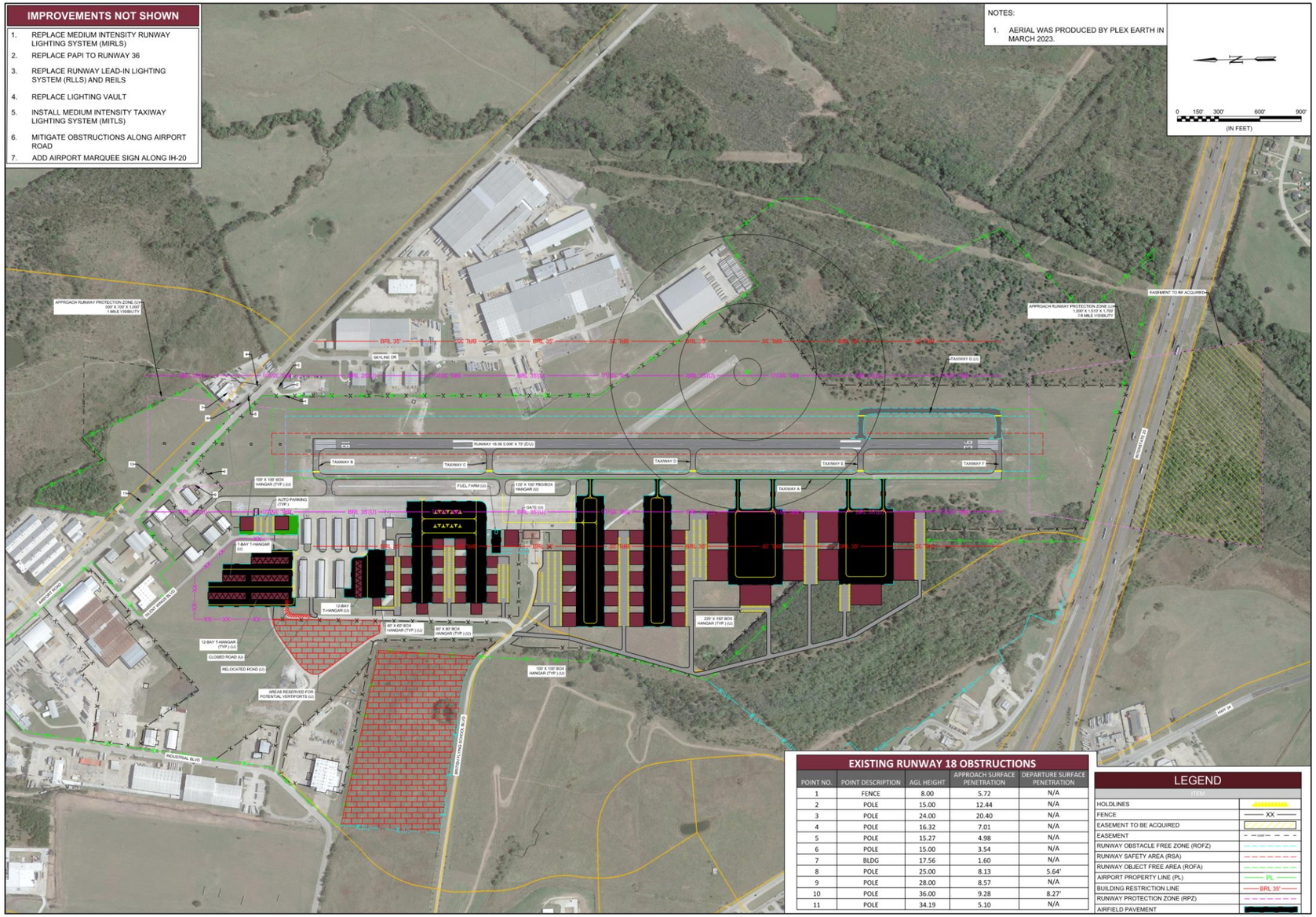
- Wetlands – There are several wetland areas on or adjacent to airport property. Some of the future terminal/landside hangar development may impact these areas.

MODERATE TO HIGH POTENTIAL FOR IMPACT

- None anticipated.

A composite showing the combined preferred development alternative is shown in **Figure 5-11**.

FIGURE 5-11
PREFERRED COMBINED ALTERNATIVE
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2023

6 Capital Improvement Program and Financial Plan

CHAPTER 6: CAPITAL IMPROVEMENT PROGRAM AND FINANCIAL PLAN

The Capital Improvement Program (CIP) and Financial Plan Chapter breaks down the preferred development alternative into a series of capital projects for implementation and funding purposes. As a result, the chapter describes the phasing, planning level cost estimates, and trigger mechanisms associated with each capital project needed to achieve the preferred development concept and a proposed funding strategy for each project.

CAPITAL FUNDING SOURCES

Airport capital projects can be funded by several sources. These sources include Federal Aviation Administration (FAA) Airport Improvement Program (AIP) and Bi-Partisan Infrastructure Law (BIL) grants, state aviation grants, private/third party financing, local funding, and economic/community development grants. Each of these capital funding sources are described in the following sections.

FAA AIRPORT IMPROVEMENT PROGRAM

The FAA's grant funding program for improving, maintaining, and developing airport infrastructure is commonly referred to as the Airport Improvement Program (AIP). The program was originally established in the early 1980's when Congress passed the Airport and Airway Improvement Act of 1982. Under the AIP Program, the FAA provides grant funds to airports based on numerous factors including the airport's size, activity level, and development needs. The FAA typically provides 90% of the funding for AIP projects with the remainder of the funds supplied by the state aviation agency and the airport's sponsor.

Texas is a block grant state under the FAA's AIP program. As a block grant state, the Texas Department of Transportation - Aviation Division (TxDOT) is responsible for administering AIP grants to general aviation airports within the State of Texas. In Texas, AIP grant funded capital projects at general aviation airports that are part of the National Plan of Integrated Airport Systems (NPIAS) are generally eligible for 90% federal funding with a 10% local match provided by the Airport sponsor.

The FAA classifies airports with annual passenger enplanements of 10,000 or less as Non-Primary Airports for funding purposes. Currently, Terrell Municipal Airport (TRL) qualifies as a Non-Primary Airport. As a Non-Primary Airport, TRL is eligible to receive Non-Primary Entitlement (NPE) funds that are appropriated on an annual basis. NPEs were originally

created as part of the Aviation Investment and Reform Act (AIR-21) that was passed by Congress in April 2000. The NPE program was revised in 2018 as part of the FAA Reauthorization Act. Under the NPE Program, Non-Primary Airports with less than 8,000 enplanements receive NPE funding equal to 20% of the eligible cost of their five-year capital improvement program up to a maximum of $150,000 per year. NPEs are available in the year granted and can be carried over for up to three additional years (e.g., four years of funding in total). Currently, TRL receives a $150,000 annually in NPE funds. Unless modified by Congress, it is expected that TRL will continue to accrue NPE funds at a rate of $150,000 per year throughout the planning horizon.

In addition to NPEs, TRL is eligible to receive AIP discretionary grants. AIP discretionary funds are distributed based on a project prioritization process developed by the FAA. It is reasonable to assume that TRL will receive discretionary funding during the planning period for higher priority, eligible projects, such as runway, taxiway, safety, and security improvements. However, since the future availability of AIP discretionary grants is not certain until an actual grant is awarded, it should be noted that any future capital projects requiring AIP discretionary funds may need to be delayed until the funds become available.

BI-PARTISAN INFRASTRUCTURE LAW PROGRAM

In 2021, Congress passed the Bi-Partisan Infrastructure Law (BIL) which supplies additional capital funding opportunities for airports. The BIL will provide Airport Infrastructure Grants (AIG) for the next five years to airports listed in the National Plan of Integrated Airport System (NPIAS). This money can be used for runways, taxiways, safety, and sustainability projects, as well as terminal, airport-transit connections, and roadway projects. TRL is classified as a "local" airport in the NPIAS and therefore it is expected to receive $145,000 per year for the next four years including this year (2023), however this amount may fluctuate from year to year. Additional BIL grants are similar to AIP discretionary grants, in that airports must compete for them. The BIL also provides additional funding opportunities for the development of airport terminal building projects which may be a potential funding source for terminal building improvement projects at TRL.

The CIP assumes the Airport will receive a combination of AIP/BIL grants in the amount of $7.53 million in the short-term phase (0-5 years), $7.98 million in mid-term phase (6-10 years), and $8.8 million in long-term phase (11+ years). The CIP further assumes that the current AIP funding levels will continue to be extended during the planning horizon and that future program authorizations will provide similar funding levels. BIL funding is assumed to only be available for the next four years including this year.

TxDOT Aviation Division Grants

TxDOT sponsors the Routine Airport Maintenance Program (RAMP) that provides partial funding for lower cost projects and airport maintenance activities. RAMP funding is limited to $50,000 per year per airport. The Airport sponsor is required to match the RAMP grant funds dollar for dollar up to a total of $50,000. The CIP assumes that TxDOT RAMP grant program will continue during the planning horizon.

TxDOT also provides partial funding for general aviation terminal building improvements and parking lots. The maximum grant available is $600,000 ($500,000 for the terminal building and $100,000 for the parking lot). Grants are limited to 50% of total project costs up to $1.2 million with costs over $1.2 million remaining the responsibility of the sponsor.

Additionally, TxDOT provides state grants, that are separate from the FAA AIP/BIL program, to support other aeronautical development needs at the Airport including items which may have limited eligibility under the FAA AIP Program (e.g., revenue producing facilities).

The CIP assumes that most RAMP grant funds will be utilized for airport maintenance activities and will not be utilized for the development of new infrastructure. State grants may be received for non-AIP eligible developments, but this is expected to be limited.

Private/Third Party Financing

Many airports use private/third party financing when the planned improvements will be primarily used by a private business and/or are not grant eligible. Projects of this kind typically include private hangars, FBO facilities, exclusive use aircraft parking aprons, industrial development areas, non-aviation related commercial areas, and various other projects.

The AIP eligibility of revenue-producing projects is very limited and typically comes with future funding restrictions. Consequently, the use of federal funds for revenue producing projects should only be considered under special circumstances.

The CIP assumes private/third parties will provide $5.89 million in funding to support private aircraft hangar developments and related projects in the short-term phase (0-5 years), $89.86 million in the mid-term phase (6-10 years), and $88.15 million in long-term phase (11+ years). The availability of private/third-party funds are highly dependent on the type of development being pursued and the availability of a private equity source interested in financing the project. As a result, some of the projects identified for

private/third-party funding may require other funding sources (e.g., other grants, local funds, etc.) if private equity is not available.

OTHER GRANTS

Sometimes airports are eligible to apply for economic development or community development grants that can be used to improve various airside and landside aspects of the airport. However, since airports commonly compete with other non-aviation agencies for these grants, they are typically difficult to obtain. Consequently, the CIP assumes very limited grant funds will be received from non-aviation agencies. However, it is highly recommended that the airport pursues non-aviation specific grants because, if successful, the awarding of these grants will reduce the Airport's dependence on aviation grant funds. TRL should consider pursuing funding for revenue producing projects through the North East Texas Regional Mobility Authority (NET RMA).

LOCAL FUNDING

As previously discussed, airport capital projects funded under the FAA's AIP and BIL grant programs typically require a local match that is funded by the airport's revenues or by the municipality that owns the airport. For projects that are not funded under the FAA's AIP or BIL grant programs, airports are typically required to bear the full cost of the capital project unless another source of financing (e.g., state grant funding, private/third party financing, or other non-aviation grant funds) can be secured. Since local funding is often constrained, it is generally recommended that other non-local funding sources should be pursued to the greatest extent possible for capital projects that are not eligible under the AIP/BIL program. As a result, the 20-year CIP set forth in this Airport Master Plan focuses on the use of local funds for AIP/BIL grant matches and uses other funding sources for most non-AIP/BIL eligible projects. However, during the implementation of this CIP, it may become necessary to fund some non-AIP/BIL eligible projects with local funds if other funding mechanisms are not available at the time the facility is needed.

CAPITAL IMPROVEMENT PLAN (CIP)

The CIP and phased development plan establish an orderly series of improvements intended to support the growth and development of TRL in alignment with the preferred development alternative defined in the Alternatives Chapter.

It is important to note market demand, instead of the passage of time, should be the driver for when facilities are constructed, making this CIP flexible to changes that may occur during the 20-year planning horizon. Consequently, "trigger mechanisms" have been

established to help guide TRL on when they should consider implementing the various improvement projects set forth in the CIP. These "trigger mechanisms" should be reviewed annually by TxDOT Aviation and the City of Terrell to determine if any of the project "triggers" could feasibly be reached in the next 1-5 years. If it is expected that a project trigger could be reached within the next 5 years, the project should be included in the Airport's 5-year CIP. This exercise will aid TxDOT Aviation and the City of Terrell in building and updating the rolling 5-year CIP for TRL based on market demand.

In developing the Terrell Municipal Airport's CIP and phased development plan, the following guidelines were used:

- The scheduling of projects is prioritized to permit improvements in a coordinated approach. The phasing and priority of each project has been determined with respect to airport safety, demand, compatibility with other airport projects, and FAA/TxDOT programming schedules.
- Overall, the CIP has been structured to provide the flexibility to meet short and long-range goals.
- The development plan does not represent an obligation of any funds, nor does it imply a funding commitment without justification of sufficient demand or need.

The Phased Development Plan is divided into the following phases:

- Short-Term Phase – 2024-2028
- Mid-Term Phase – 2029-2033
- Long-Term Phase – 2034-2043

Each phase consists of projects and improvements categorized by the following areas: 1) airside improvements and 2) terminal/landside improvements. The airside and terminal/landside development projects within each phase and their associated trigger mechanisms are shown in **Table 6-1** through **Table 6-6**. The majority of the grant funded projects within the short-term phase of the CIP have also been segmented into separate "Design" and "Construction" projects to make them easier to use for future grant planning.

It should be noted that each project has a unique identifier that consists of the phase the project is associated with (e.g., S, M, or L) followed by a project number (e.g., 1, 2, 3, etc.). These project identifiers have been established to make it easier for users to reference specific projects. The project numbers do not provide an indication of a project's prioritization within the CIP.

TABLE 6-1
AIRSIDE PROJECTS – SHORT-TERM
TERRELL MUNICIPAL AIRPORT

Project Reference #	Design/Construction/ Land Acquisition/Easement/ Other	Airside or Terminal/ Landside	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
S1	**DESIGN**	**Airside**	**Airfield Lighting Improvement Project** (Replace Electrical Vault, Replace MIRLs on Runway 18/36, Replace PAPIs for Runway 36, Replace RLLS, Replace REILs)	Megger test conducted in October 2022 showed the circuit megged at 0.0 megaohms. According to FAA AC 150/5340-26C, any circuit that measures less than 1 megaohm is destined for "rapid failure" (see section 5.1.3.1e). Circuit should be replaced immediately.	Yes
S2	**CONSTRUCTION**	**Airside**	**Airfield Lighting Improvement Project** (Replace Electrical Vault, Replace MIRLs on Runway 18/36, Replace PAPIs for Runway 36, Replace RLLS, Replace REILs)	Megger test conducted in October 2022 showed the circuit megged at 0.0 megaohms. According to FAA AC 150/5340-26C, any circuit that measures less than 1 megohm is destined for "rapid failure" (see section 5.1.3.1e). Circuit should be replaced immediately.	Yes
S3	**EASEMENT**	**Airside**	**Acquire Easement** (Establish easement on 25.02 Acre RPZ Area South of Interstate 20 at the Approach End of Runway 36)	RPZ is currently non-compliant as the airport does not own or have an easement for the property.	Yes
S4	**DESIGN**	**Airside**	**North Apron Rehabilitation** (Rehabilitate Existing North Apron Pavement. Does not include T-hangar area.)	Some pavement in the north apron area was rated fair (70-51 PCI) to poor (50-31 PCI) as part of the airport's March 2021 Pavement Condition Assessment completed by Schaumburg & Polk, Inc.	Yes
S5	**CONSTRUCTION**	**Airside**	**North Apron Rehabilitation** (Rehabilitate Existing North Apron Pavement. Does not include T-hangar area.)	Some pavement in the north apron area was rated fair (70-51 PCI) to poor (50-31 PCI) as part of the airport's March 2021 Pavement Condition Assessment completed by Schaumburg & Polk, Inc.	Yes

Source: Garver, 2023

The airside projects within this phase of the CIP primarily focus on airfield lighting rehabilitation, pavement rehabilitation (north apron), and the acquisition of a property easement associated with the Runway Protection Zone for Runway 36. All of the projects have hit their implementation triggers.

TABLE 6-2
TERMINAL/LANDISDE PROJECTS – SHORT-TERM
TERRELL MUNICIPAL AIRPORT

Project Reference #	Design/Construction/ Land Acquisition/Easement/ Other	Airside or Terminal/ Landside	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
S6	**LAND ACQUISITION**	**Terminal/ Landside**	**LAND ACQUISITION - 62 Acres** (Purchase Approximately 62 Acres of Property on Southwest Side of the Airport)	Property needed to facilitate the full build out of the south development area.	Yes
S7	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**FBO Hangar/Building** (Design and Construction 120' x 100' FBO hangar and office area adjacent to the existing Terminal Building.)	New FBO facility is needed as the existing facility is space constrained and lacks amenities.	Yes
S8	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**Fuel Farm** (Design and Construction of new fuel farm adjacent to the new FBO hangar/building on the main apron. Fuel farm will provide self service and full service fuel. Includes access road to fuel farm. Assume 12,000 gallon AST for both 100LL and Jet A.)	Existing fuel farm is old and does not provide self-service fueling. Self-service fueling is critical to increasing airport revenue and attracting additional aircraft operations.	Yes
S9	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**T-Hangar** (Design and Construction of 12-bay T-Hangar adjacent to the existing T-hangar area. Includes asphalt pavement on each side of the hangar and tie-ins to existing pavement.)	Hangar waiting list exists for aircraft that would utilize T-hangars. As of August 2022, 37 small GA aircraft are on the T-hangar waiting list.	Yes
S10	**DESIGN**	**Terminal/ Landside**	**Northern Apron Expansion and Roadway Infrastructure** (Includes the expansion of the northern apron and the development of the roadway and utility infrastructure necessary to support new facilities.	Additional demand is present for small box hangars at TRL. Interviews with tenants in July 2022 identified demand for additional small box hangar development at TRL.	Yes
S11	**CONSTRUCTION**	**Terminal/ Landside**	**Northern Apron Expansion and Roadway Infrastructure** (Includes the expansion of the northern apron and the development of the roadway and utility infrastructure necessary to support new facilities.	Additional demand is present for small box hangars at TRL. Interviews with tenants in July 2022 identified demand for additional small box hangar development at TRL.	Yes
S12	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**60' X 60' Box Hangar** (Includes the development of a 60' x 60' box hangar. Assumes no special facilities or systems for the hangar)	Additional demand is present for small box hangars at TRL. Interviews with tenants in July 2022 identified demand for additional small box hangar development at TRL.	Yes
S13	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**60' X 60' Box Hangar** (Includes the development of a 60' x 60' box hangar. Assumes no special facilities or systems for the hangar)	Additional demand is present for small box hangars at TRL. Interviews with tenants in July 2022 identified demand for additional small box hangar development at TRL.	Yes
S14	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**60' X 60' Box Hangar** (Includes the development of a 60' x 60' box hangar. Assumes no special facilities or systems for the hangar)	Additional demand is present for small box hangars at TRL. Interviews with tenants in July 2022 identified demand for additional small box hangar development at TRL.	Yes

Source: Garver, 2023 (CONTINUED ON NEXT PAGE)

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Project Reference #	Design/Construction/ Land Acquisition/Easement/ Other	Airside or Terminal/ Landside	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
S15	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**60' X 60' Box Hangar** (Includes the development of a 60' x 60' box hangar. Assumes no special facilities or systems for the hangar)	Additional demand is present for small box hangars at TRL. Interviews with tenants in July 2022 identified demand for additional small box hangar development at TRL.	Yes
S16	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**ASOS Relocation** (Relocate the ASOS for the existing location to the east side of the Runway.)	ASOS must be relocated to facilitate the development of the mid-field hangar expansion area.	Yes
S17	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**Industrial Park Drainage Improvements** (Improve drainage in the industrial park area)	Flooding occurs in the industrial park area from time-to-time during heavy rain events. Drainage improvements are necessary.	Yes
S18	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**British Flying School Drainage Improvements** (Improve drainage in the British Flying School area)	Flooding occurs in the British Flying School area from time-to-time during heavy rain events. Drainage improvements are necessary.	Yes
S19	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**IH-20 Sign** (Install large marquee sign at the south end of the airport adjacent to IH-20.)	Establishment of a marquee sign at the south end of airport property adjacent to IH-20 will support improved awareness of the airport.	Yes

Source: Garver, 2023

The terminal/landside projects identified in this phase focus on addressing aircraft storage demand, the relocation of the FBO to the main apron, acquiring additional land to support future development, and establishing a new full-service/self-service fuel farm. All of the projects have hit their implementation triggers.

TABLE 6-3
AIRSIDE PROJECTS – MID-TERM
TERRELL MUNICIPAL AIRPORT

Project Reference #	Design/Construction/ Land Acquisition/Easement/ Other	Airside or Terminal/ Landside	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
M1	**DESIGN/ CONSTRUCTION**	**Airside**	**MITL Installation** - Install Medium Intensity Taxiway Edge Lights (MITLs) Along All Existing Taxiway Infrastructure	TRL has at least 100 based aircraft.	No
M2	**DESIGN/ CONSTRUCTION**	**Airside**	**Runway 18 Obstruction Mitigation** - Mitigate Existing Obstructions (Identified as 1 - 11 in Preferred Alternative)	TRL has demand for aircraft to fly further distances which require the mitigation of obstructions in close proximity to the approach end of Runway 18. This need is only expected to occur if specific aircraft begin using TRL on a regular basis that are known to have less efficient takeoff performance.	No
M3	**DESIGN/ CONSTRUCTION**	**Airside**	**Taxiway A South Rehabilitation** - Rehabilitation of Existing Taxiway Pavement South of the Taxiway E Intersection	Pavement should be rehabilitated when pavement condition becomes "fair".	No

Source: Garver, 2023

The mid-term airside projects focus on adding a medium intensity taxiway edge lighting circuit, mitigating obstructions for Runway 18 (if needed), and the rehabilitation of the south end of Taxiway A. None of the projects have reached their implementation triggers.

TABLE 6-4
TERMINAL/LANDSIDE PROJECTS – MID-TERM
TERRELL MUNICIPAL AIRPORT

Project Reference #	Design/Construction/ Land Acquisition/Easement/ Other	Airside or Terminal/ Landside	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
M4	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**Old FBO Area Redevelopment** - This includes the redevelopment of the existing FBO Area. The existing FBO hangar and fuel farm will be removed. Two 100' x 100" box hangars will be developed that are suitable for commercial aeronautical businesses. Additionally, a parking lot will be developed between the two buildings.	FBO is relocated to main apron and there is interest in redeveloping the existing FBO area.	No
M5	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**Northern T-Hangar Development (Phase 1)** - This includes the development of two 12-bay T-hangars, the associated pavement and the relocation of the southern T-hangar access road. Additionally this includes the relocation of the Airport Beacon to be behind the old FBO area.	Demand for additional T-hangars is present once previously developed T-hangars are filled.	No
M6	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**Mid-Field Apron and Roadway Expansion** - This includes the development of the tie-down area and common-use apron pavements necessary to support additional mid-field development. Also includes the extension of the access road and access gate to enter the apron.	ASOS is relocated and there is demand for additional small to mid-sized box hangars in the mid-field area.	No
M7	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**Mid-Field Hangar Expansion Area (Phase 1)** - This includes the development of the apron, eight 80' x 80' box hangars, and roadway access/parking lots.	ASOS is relocated and there is demand for additional small to mid-sized box hangars in the mid-field area.	No
M8	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**Roadway Connection Between IH-20 and British Flying School Blvd and Fencing**- This includes the development of the roadway from the frontage road for IH-20 to British Flying School Blvd. Additionally, fencing will be installed through this area on the east side of the roadway to protect the AOA.	IH-20 frontage road has been developed and the property acquisition identified in project S6 has been completed.	No

Source: Garver, 2023 (CONTINUED ON NEXT PAGE)

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Project Reference #	Design/Construction/ Land Acquisition/Easement/ Other	Airside or Terminal/ Landside	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
M9	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**South Apron (Phase 1)** - This includes the development of the common-use apron pavements necessary to support the development of additional 100' x 100' box hangars.	Demand for additional mid-sized box hangars exists in the south apron area.	No
M10	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**South Apron (Phase 2)** - This includes the development of the common-use taxilanes to access the large development pod including five 225' x 150' box hangars.	Demand for large box hangars exists in the south apron area.	No
M11	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**South Apron - Hangar Development (Phase 1)** - This includes the development of the apron, roadway, parking, and ten 100' x 100' hangars.	Demand for additional mid-sized box hangars exists in the south apron area.	No
M12	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**South Apron - Hangar Development (Phase 2)** - This includes the development of the apron, roadway, parking, and five 225' x 150' hangars.	Demand for large box hangars exists in the south apron area.	No

Source: Garver, 2023

The mid-term terminal/landside projects focus on hangar development in the southern, mid-field, and northern development areas. None of the terminal/landside projects identified in this phase have hit their implementation triggers.

TABLE 6-5
AIRSIDE PROJECTS – LONG-TERM
TERRELL MUNICIPAL AIRPORT

Project Reference #	Design/Construction/ Land Acquisition/Easement/ Other	Airside or Terminal/ Landside	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
L1	**DESIGN/ CONSTRUCTION**	**Airside**	**Taxiway G Development** - Development of Taxiway G on Eastside of Runway 18/36	Demand for development on the east side of the airport is present.	No
L2	**DESIGN/ CONSTRUCTION**	**Airside**	**Runway 18/36 and Taxiway Rehabilitation** - Rehabilitation of Runway 18/36, Taxiway A (North of Taxiway E), and Stub Taxiways B, C, D, E, and F that connect Taxiway A to the Runway. Also includes rehabilitation of Taxilanes G, H, and J which connect Taxiway A to the aprons.	Pavement should be rehabilitated when pavement condition becomes "fair".	No
L3	**DESIGN/ CONSTRUCTION**	**Airside**	**Rehabilitation of Main Apron** - Rehabilitation of the Existing Apron and Portion of the Taxilane Connecting to the North Apron	Pavement should be rehabilitated when pavement condition becomes "fair".	No
L4	**DESIGN/ CONSTRUCTION**	**Airside**	**Rehabilitation of T-Hangar Apron** - Rehabilitation of the Existing-Hangar Apron Area Pavement	Pavement should be rehabilitated when pavement condition becomes "fair".	No

Source: Garver, 2023

The long-term airside projects focus on the development of Taxiway G (the east side parallel taxiway) and pavement rehabilitation. None of the projects have reached their implementation triggers.

TABLE 6-6
TERMINAL/LANDSIDE PROJECTS – LONG-TERM
TERRELL MUNICIPAL AIRPORT

Project Reference #	Design/Construction/ Land Acquisition/Easement/ Other	Airside or Terminal/ Landside	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
L5	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**Northern T-Hangar Development (Phase 2)** - This includes the development of two 12-bay T-hangars and a 7 bay T-hangar. Also includes is the associated pavement around the T-hangars.	Demand for additional T-hangars is present once previously developed T-hangars are filled.	No
L6	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**Mid-Field Hangar Expansion Area (Phase 2)** - This includes the development of the apron, eight 80' x 80' box hangars, and roadway access/parking lots.	ASOS is relocated and there is demand for additional small to mid-sized box hangars in the mid-field area beyond what has previously been developed.	No
L7	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**South Apron (Phase 3)** - This includes the development of the common-use apron pavements necessary to support the development of additional 100' x 100' box hangars.	Demand for additional mid-sized box hangars exists in the south apron area beyond what has previously been developed.	No
L8	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**South Apron (Phase 4)** - This includes the development of the common-use taxilanes to access the large development pod including five 225' x 150' box hangars.	Demand for additional large box hangars exists in the south apron area beyond what has previously been developed.	No
L9	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**South Apron - Hangar Development (Phase 3)** - This includes the development of the apron, roadway, parking, and ten 100' x 100' hangars.	Demand for additional mid-sized box hangars exists in the south apron area beyond what has previously been developed.	No
L10	**DESIGN/ CONSTRUCTION**	**Terminal/ Landside**	**South Apron - Hangar Development (Phase 4)** - This includes the development of the apron, roadway, parking, and five 225' x 150' hangars.	Demand for additional large box hangars exists in the south apron area beyond what has previously been developed.	No

Source: Garver, 2023

The long-term terminal/landside projects focus on hangar development in the southern, mid-field, and northern development areas. None of the terminal/landside projects identified in this phase have hit their implementation triggers.

PROJECT COST ESTIMATES AND FUNDING SOURCES

Rough Order of Magnitude (ROM) cost estimates for each individual project identified in Tables 6-1 through 6-6 were prepared as part of the development of the 20-year TRL CIP. These cost estimates are based on current year (2023) dollars and are intended for planning purposes only and should not be used or construed as formal construction cost estimates.

Formalized opinions of probable cost will be developed as part of each project's scoping process during the design and engineering phase.

SHORT-TERM PHASE

Short-term phase cost estimates are shown in **Table 6-7** and a funding breakdown is shown in **Figure 6-1.** A breakdown of these costs indicates a need for approximately $7.53 million in capital funding assistance from state/federal aviation grants. The matching share for these grants from the Airport sponsor as well as sponsor funded projects total $5.84 million. The grant funding in the short-term phase is used primarily for airfield lighting rehabilitation, pavement rehabilitation (north apron), and the acquisition of a property easement associated with the Runway Protection Zone for Runway 36.

Private funding for the hangar developments in this phase totals $5.89 million.

MID-TERM PHASE

Mid-term phase cost estimates are shown in **Table 6-8** and a funding breakdown is shown in **Figure 6-2**. A breakdown of these costs indicates a need for approximately $7.98 million in capital funding assistance from state/federal aviation sources. The matching share for these grants from the Airport sponsor total $0.88 million. Grant funding in this phase supports construction of new apron and taxilanes, pavement rehabilitation, and the addition of taxiway edge lights.

Private funding for two hangar developments totals $89.86 million in this phase.

LONG-TERM PHASE

Long-term phase cost estimates are shown in **Table 6-9** and a funding breakdown is shown in **Figure 6-3**. A breakdown of these costs indicates a need for approximately $8.8 million in capital funding assistance from state/federal aviation sources. The matching share for these grants from the Airport sponsor total $0.97 million. Grant funding in this phase supports additional pavement and pavement rehabilitation.

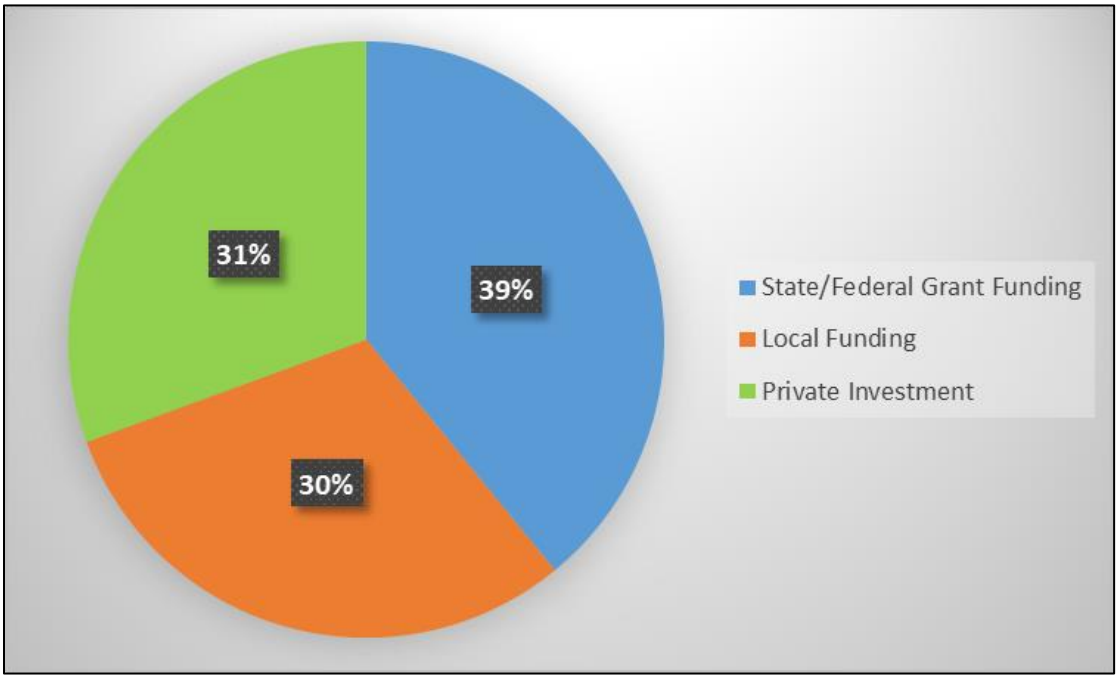
Private funding for two hangar developments totals $88.15 million in this phase.

TABLE 6-7
SHORT-TERM DEVELOPMENT COSTS
TERRELL MUNICIPAL AIRPORT

Project Reference #	Project Name/Description	Estimated Cost	State/Federal Grant Funding	Local Funding	Private Funding
S1	**Airfield Lighting Improvement Project** (Replace Electrical Vault, Replace MIRLs on Runway 18/36, Replace PAPIs for Runway 36, Replace RLLS, Replace REILs)	$196,000.00	$176,400.00	$19,600.00	
S2	**Airfield Lighting Improvement Project** (Replace Electrical Vault, Replace MIRLs on Runway 18/36, Replace PAPIs for Runway 36, Replace RLLS, Replace REILs)	$2,051,000.00	$1,845,900.00	$205,100.00	
S3	**Acquire Easement** (Establish easement on 25.02 Acre RPZ Area South of Interstate 20 at the Approach End of Runway 36)	$174,000.00	$156,600.00	$17,400.00	
S4	**North Apron Rehabilitation** (Rehabilitate Existing North Apron Pavement. Does not include T-hangar area.)	$235,000.00	$211,500.00	$23,500.00	
S5	**North Apron Rehabilitation** (Rehabilitate Existing North Apron Pavement. Does not include T-hangar area.)	$2,464,000.00	$2,217,600.00	$246,400.00	
S6	**LAND ACQUISITION - 62 Acres** (Purchase Approximately 62 Acres of Property on Southwest Side of the Airport)	$1,361,000.00	$1,224,900.00	$136,100.00	
S7	**FBO Hangar/Building** (Design and Construction 120' x 100' FBO hangar and office area adjacent to the existing Terminal Building.)	$2,468,400.00		$2,468,400.00	
S8	**Fuel Farm** (Design and Construction of new fuel farm adjacent to the new FBO hangar/building on the main apron. Fuel farm will provide self service and full service fuel. Includes access road to fuel farm. Assume 12,000 gallon AST for both 100LL and Jet A.)	$1,471,600.00		$1,471,600.00	
S9	**T-Hangar** (Design and Construction of 12-bay T-Hangar adjacent to the existing T-hangar area. Includes asphalt pavement on each side of the hangar and tie-ins to existing pavement.)	$2,905,800.00			$2,905,800.00
S10	**Northern Apron Expansion and Roadway Infrastructure** (Includes the expansion of the northern apron and the development of the roadway and utility infrastructure necessary to support new facilities.	$139,000.00	$125,100.00	$13,900.00	
S11	**Northern Apron Expansion and Roadway Infrastructure** (Includes the expansion of the northern apron and the development of the roadway and utility infrastructure necessary to support new facilities.	$1,451,600.00	$1,306,440.00	$145,160.00	
S12	**60' X 60' Box Hangar** (Includes the development of a 60' x 60' box hangar. Assumes no special facilities or systems for the hangar)	$747,000.00			$747,000.00
S13	**60' X 60' Box Hangar** (Includes the development of a 60' x 60' box hangar. Assumes no special facilities or systems for the hangar)	$747,000.00			$747,000.00
S14	**60' X 60' Box Hangar** (Includes the development of a 60' x 60' box hangar. Assumes no special facilities or systems for the hangar)	$747,000.00			$747,000.00
S15	**60' X 60' Box Hangar** (Includes the development of a 60' x 60' box hangar. Assumes no special facilities or systems for the hangar)	$747,000.00			$747,000.00
S16	**ASOS Relocation** (Relocate the ASOS for the existing location to the east side of the Runway.)	$297,000.00	$267,300.00	$29,700.00	
S17	**Industrial Park Drainage Improvements** (Improve drainage in the industrial park area)	$250,600.00		$250,600.00	
S18	**British Flying School Drainage Improvements** (Improve drainage in the British Flying School area)	$474,600.00		$474,600.00	
S19	**IH-20 Sign** (Install large marquee sign at the south end of the airport adjacent to IH-20.)	$344,000.00		$344,000.00	

Source: Costs reflect current 2023 dollars without any inflation factor applied for out years and should be used for planning purposes only. Engineering/design and construction costs are inclusive. All hangar development is shown as being privately financed. However, the Airport may choose to utilize NPE funds if all other aeronautical needs are met.

FIGURE 6-1
SHORT-TERM PHASE DEVELOPMENT COSTS
TERRELL MUNICIPAL AIRPORT



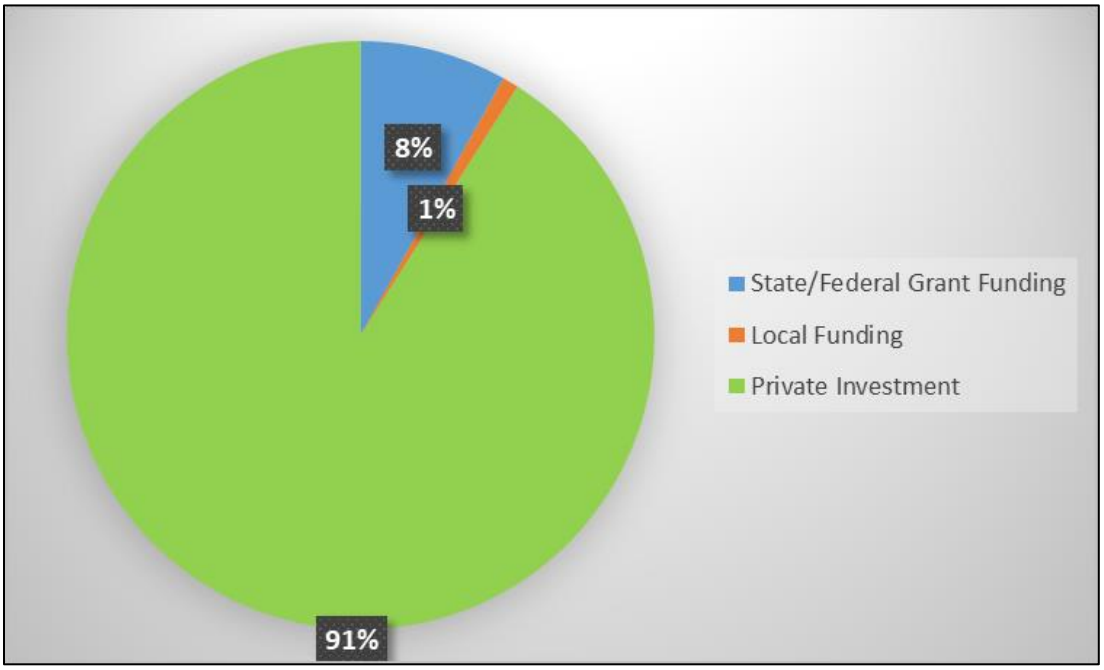
Source: Garver, 2023

TABLE 6-8
MID-TERM PHASE DEVELOPMENT COSTS
TERRELL MUNICIPAL AIRPORT

Project Reference #	Project Name/Description	Estimated Cost	State/Federal Grant Funding	Local Funding	Private Funding
M1	**MITL Installation** - Install Medium Intensity Taxiway Edge Lights (MITLs) Along All Existing Taxiway Infrastructure	$1,000,000.00	$900,000.00	$100,000.00	
M2	**Runway 18 Obstruction Mitigation** - Mitigate Existing Obstructions (Identified as 1 - 11 in Preferred Alternative)	$87,000.00	$78,300.00	$8,700.00	
M3	**Taxiway A South Rehabilitation** - Rehabilitation of Existing Taxiway Pavement South of the Taxiway E Intersection	$289,000.00	$260,100.00	$28,900.00	
M4	**Old FBO Area Redevelopment** - This includes the redevelopment of the existing FBO Area. The existing FBO hangar and fuel farm will be removed. Two 100' x 100" box hangars will be developed that are suitable for commercial aeronautical businesses. Additionally, a parking lot will be developed between the two buildings.	$3,500,000.00			$3,500,000.00
M5	**Northern T-Hangar Development (Phase 1)** - This includes the development of two 12-bay T-hangars, the associated pavement and the relocation of the southern T-hangar access road. Additionally this includes the relocation of the Airport Beacon to be behind the old FBO area.	$6,000,000.00			$6,000,000.00
M6	**Mid-Field Apron and Roadway Expansion** - This includes the development of the tie-down area and common-use apron pavements necessary to support additional mid-field development. Also includes the extension of the access road and access gate to enter the apron.	$3,726,000.00	$3,353,400.00	$372,600.00	
M7	**Mid-Field Hangar Expansion Area (Phase 1)** - This includes the development of the apron, eight 80' x 80' box hangars, and roadway access/parking lots.	$10,591,000.00			$10,591,000.00
M8	**Roadway Connection Between IH-20 and British Flying School Blvd and Fencing**- This includes the development of the roadway from the frontage road for IH-20 to British Flying School Blvd. Additionally, fencing will be installed through this area on the east side of the roadway to protect the AOA.	$1,615,000.00	$1,453,500.00	$161,500.00	
M9	**South Apron (Phase 1)** - This includes the development of the common-use apron pavements necessary to support the development of additional 100' x 100' box hangars.	$1,392,000.00	$1,252,800.00	$139,200.00	
M10	**South Apron (Phase 2)** - This includes the development of the common-use taxilanes to access the large development pod including five 225' x 150' box hangars.	$764,000.00	$687,600.00	$76,400.00	
M11	**South Apron - Hangar Development (Phase 1)** - This includes the development of the apron, roadway, parking, and ten 100' x 100' hangars.	$21,020,000.00			$21,020,000.00
M12	**South Apron - Hangar Development (Phase 2)** - This includes the development of the apron, roadway, parking, and five 225' x 150' hangars.	$48,750,000.00			$48,750,000.00

Source: Costs reflect current 2023 dollars without any inflation factor applied for out years and should be used for planning purposes only. Engineering/design and construction costs are inclusive. All hangar development is shown as being privately financed. However, the Airport may choose to utilize NPE funds if all other aeronautical needs are met.

FIGURE 6-2
MID-TERM PHASE DEVELOPMENT COSTS
TERRELL MUNICIPAL AIRPORT



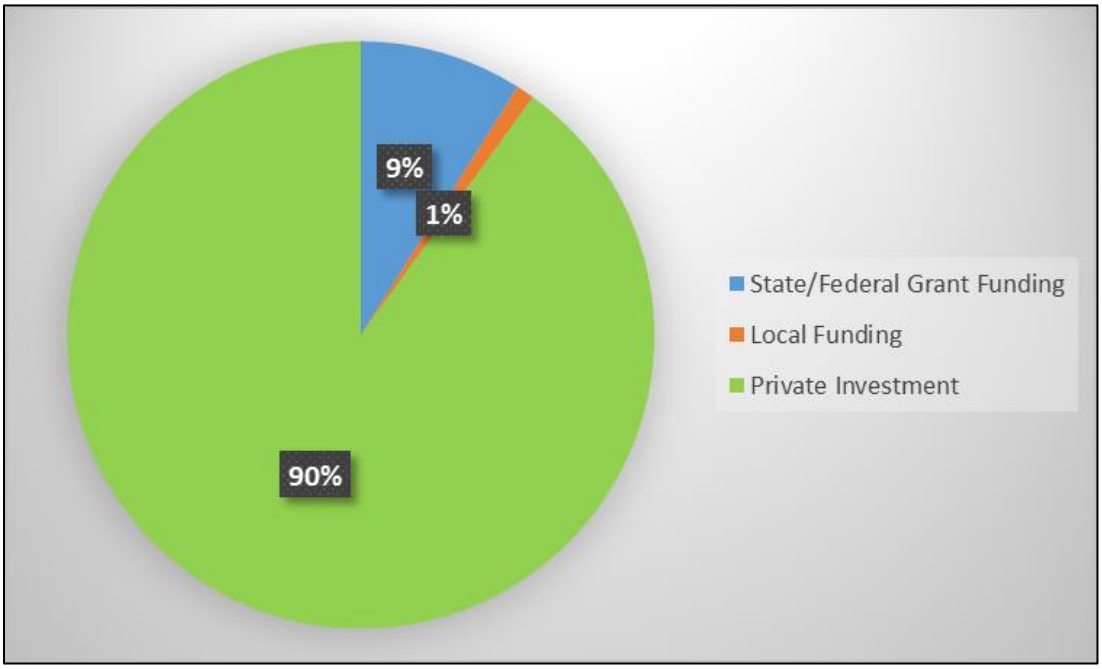
Source: Garver, 2023

TABLE 6-9
LONG-TERM PHASE DEVELOPMENT COSTS
TERRELL MUNICIPAL AIRPORT

Project Reference #	Project Name/Description	Estimated Cost	State/Federal Grant Funding	Local Funding	Private Funding
L1	**Taxiway G Development** - Development of Taxiway G on Eastside of Runway 18/36	$1,438,000.00	$1,294,200.00	$143,800.00	
L2	**Runway 18/36 and Taxiway Rehabilitation** - Rehabilitation of Runway 18/36, Taxiway A (North of Taxiway E), and Stub Taxiways B, C, D, E, and F that connect Taxiway A to the Runway. Also includes rehabilitation of Taxilanes G, H, and J which connect Taxiway A to the aprons.	$2,300,000.00	$2,070,000.00	$230,000.00	
L3	**Rehabilitation of Main Apron** - Rehabilitation of the Existing Apron and Portion of the Taxilane Connecting to the North Apron	$1,900,000.00	$1,710,000.00	$190,000.00	
L4	**Rehabilitation of T-Hangar Apron** - Rehabilitation of the Existing-Hangar Apron Area Pavement	$1,920,000.00	$1,728,000.00	$192,000.00	
L5	**Northern T-Hangar Development (Phase 2)** - This includes the development of two 12-bay T-hangars and a 7 bay T-hangar. Also includes is the associated pavement around the T-hangars.	$7,838,800.00			$7,838,800.00
L6	**Mid-Field Hangar Expansion Area (Phase 2)** - This includes the development of the apron, eight 80' x 80' box hangars, and roadway access/parking lots.	$10,462,000.00			$10,462,000.00
L7	**South Apron (Phase 3)** - This includes the development of the common-use apron pavements necessary to support the development of additional 100' x 100' box hangars.	$1,456,000.00	$1,310,400.00	$145,600.00	
L8	**South Apron (Phase 4)** - This includes the development of the common-use taxilanes to access the large development pod including five 225' x 150' box hangars.	$764,000.00	$687,600.00	$76,400.00	
L9	**South Apron - Hangar Development (Phase 3)** - This includes the development of the apron, roadway, parking, and ten 100' x 100' hangars.	$20,747,500.00			$20,747,500.00
L10	**South Apron - Hangar Development (Phase 4)** - This includes the development of the apron, roadway, parking, and five 225' x 150' hangars.	$49,110,000.00			$49,110,000.00

Source: Costs reflect current 2023 dollars without any inflation factor applied for out years and should be used for planning purposes only. Engineering/design and construction costs are inclusive. All hangar development is shown as being privately financed. However, the Airport may choose to utilize NPE funds if all other aeronautical needs are met.

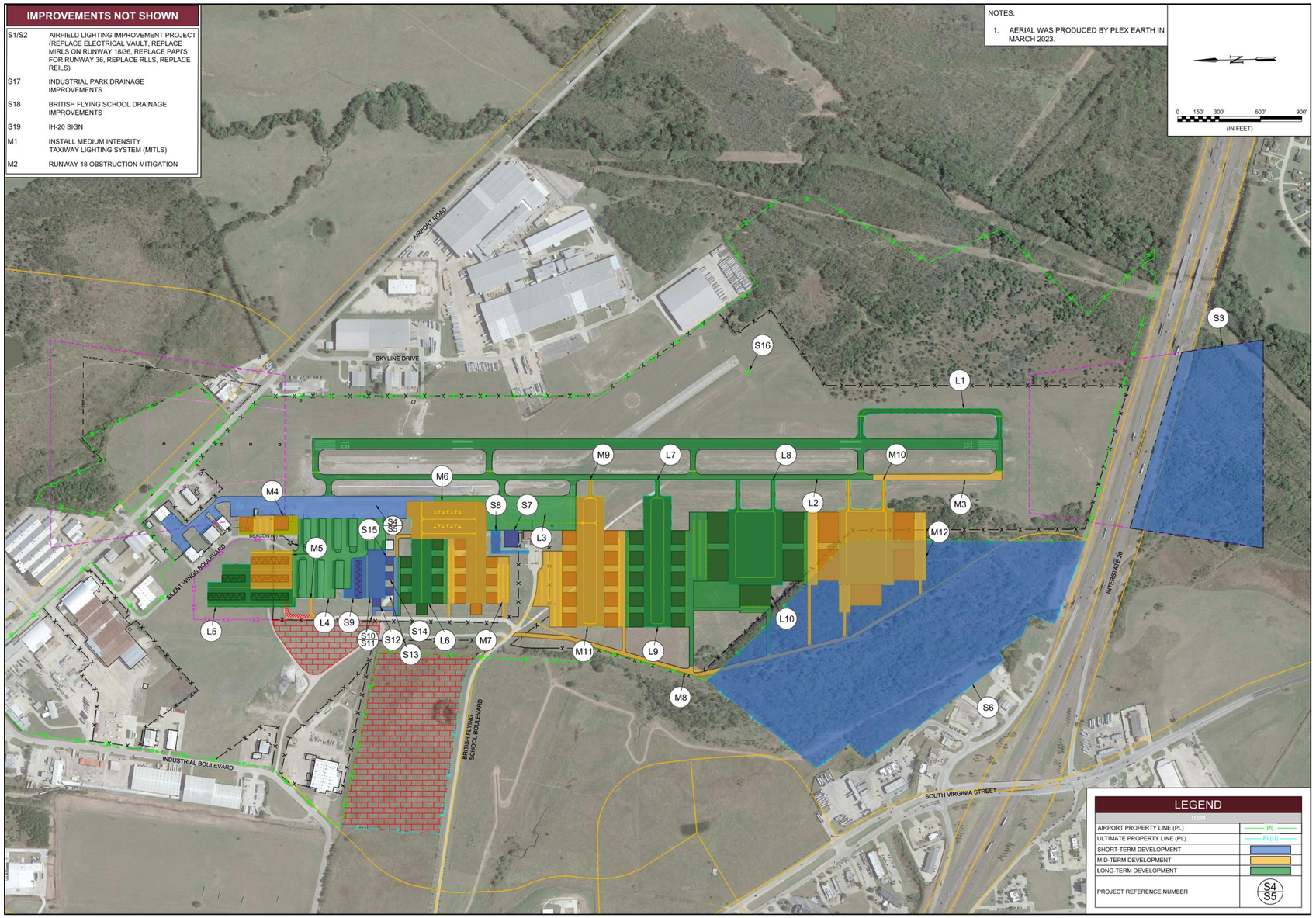
FIGURE 6-3
LONG-TERM PHASE DEVELOPMENT COSTS
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2023.

To supplement the information provided by the phased project list and development cost estimates, a composite CIP graphic has been created that depicts the development projects shown in the CIP (**Figure 6-4**).

FIGURE 6-4
CIP COMPOSITE DRAWING
TERRELL MUNICIPAL AIRPORT



Source: Garver, 2023

CIP 2024-2028

Table 6-10 provides a year-by-year CIP for TRL for key projects from 2024–2028. The trigger point for all of these projects has already been achieved. These projects primarily focus on the rehabilitation of airfield lighting and pavement, the relocation of the fuel farm and FBO to the main apron, and the acquisition of additional land/easements.

TABLE 6-10
5 YEAR CIP
TERRELL MUNICIPAL AIRPORT

CIP Year	Project Type	Project Name	Total Cost	Federal/ State Grants	Local Funding	Trigger
FY 24	Design/ Construction	**Airfield Lighting Improvement Project** (Replace Electrical Vault, Replace MIRLs on Runway 18/36, Replace PAPIs for Runway 36, Replace RLLS, Replace REILs)	$2,247,000	$2,022,300	$224,700	Megger test conducted in October 2022 showed the circuit megged at 0.0 megaohms. According to FAA AC 150/5340-26C, any circuit that measures less than 1 megaohm is destined for "rapid failure" (see section 5.1.3.1e). Circuit should be replaced immediately.
	Design/ Construction	**Fuel Farm** (Design and Construction of new fuel farm adjacent to the new FBO hangar/building on the main apron. Fuel farm will provide self service and full service fuel. Includes access road to fuel farm. Assume 12,000 gallon AST for both 100LL and Jet A.)	$1,471,600		$1,471,600	Existing fuel farm is old and does not provide self-service fueling. Self-service fueling is critical to increasing airport revenue and attracting additional aircraft operations.
FY 25	Land Acquisition/ Easement	**Acquire Land and Easement** (Purchase Approximately 62 Acres of Property on Southwest Side of the Airport and establish easement on 25.02 Acre RPZ Area South of Interstate 20 at the Approach End of Runway 36)	$1,535,000	$1,381,500	$153,500	RPZ is currently non-compliant as the airport does not own or have an easement for the property. Property needed to facilitate the full build out of the south development area.
	Design/ Construction	**FBO Hangar/Building** (Design and Construction 120' x 100' FBO hangar and office area adjacent to the existing Terminal Building.)	$2,468,400		$2,468,400	New FBO facility is needed as the existing facility is space constrained and lacks amenities.
FY 26	Design	**North Apron Rehabilitation** (Rehabilitate Existing North Apron Pavement. Does not include T-hangar area.)	$235,000	$211,500	$23,500	Some pavement in the north apron area was rated fair (70-51 PCI) to poor (50-31 PCI) as part of the airport's March 2021 Pavement Condition Assessment completed by Schaumburg & Polk, Inc.
	Design/ Construction	**Industrial Park and British Flying School Drainage Improvements** (Improve drainage in the industrial park and British Flying School area)	$725,200		$725,200	Flooding occurs in the industrial park and British Flying School area from time-to-time during heavy rain events. Drainage improvements are necessary.
FY 27	Construction	**North Apron Rehabilitation** (Rehabilitate Existing North Apron Pavement. Does not include T-hangar area.)	$2,464,000	$2,217,600	$246,400	Some pavement in the north apron area was rated fair (70-51 PCI) to poor (50-31 PCI) as part of the airport's March 2021 Pavement Condition Assessment completed by Schaumburg & Polk, Inc.
FY 28	Design/ Construction	**ASOS Relocation** (Relocate the ASOS for the existing location to the east side of the Runway.)	$297,000	$267,300	$29,700	ASOS must be relocated to facilitate the development of the mid-field hangar expansion area.
		Totals:	**$11,443,200**	**$6,100,200**	**$5,343,000**	

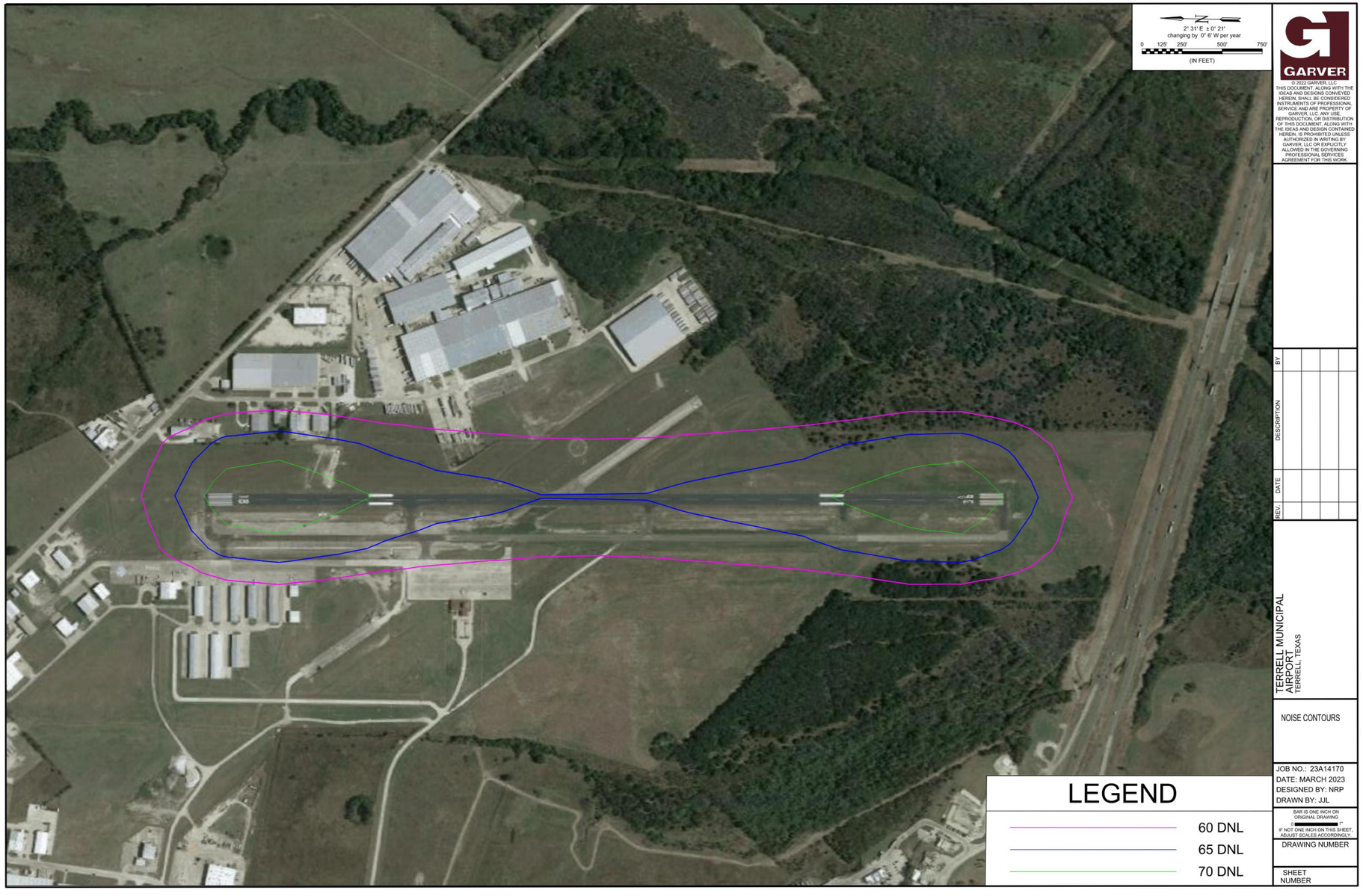
Source: Garver, 2023

A Noise Contours

APPENDIX A: NOISE CONTOURS

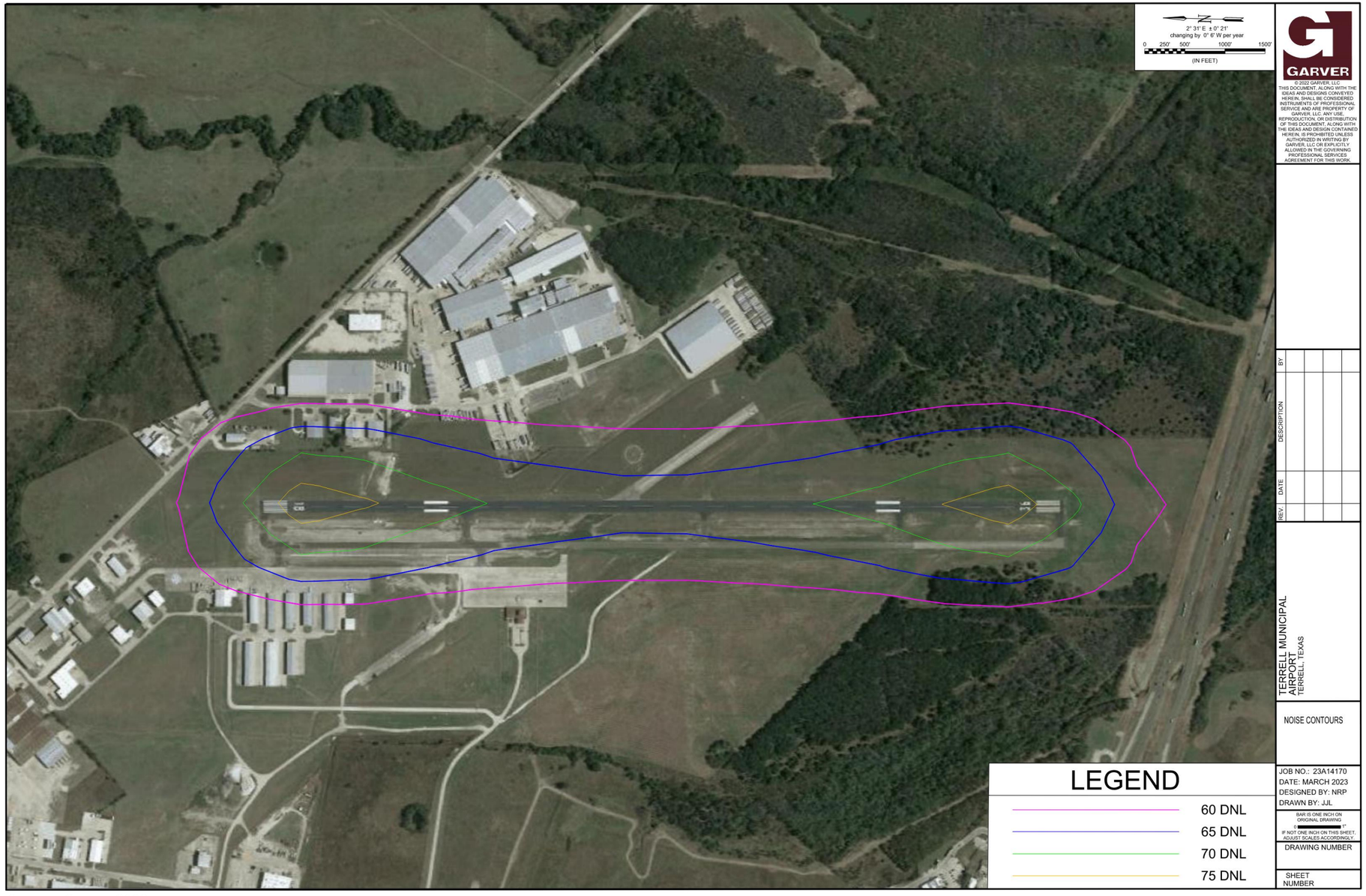
This appendix provides graphical depictions of the existing and ultimate noise contours at TRL. The existing condition noise contour model is based on 2021 operational estimates for the airport. The ultimate condition noise contour is based on 2041 operational estimates from the forecast chapter.

TERRELL MUNICIPAL AIRPORT
EXISTING CONDITION – NOISE CONTOUR MODEL



Source: Garver, 2023

TERRELL MUNICIPAL AIRPORT
ULTIMATE CONDITION – NOISE CONTOUR MODEL



Source: Garver, 2023

B Airport Layout Plan

GARVER

TERRELL
MUNICIPAL AIRPORT