5.0 DEVELOPMENT ALTERNATIVES & RECOMMENDED PLAN

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

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

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

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

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

5.1 Development Goals

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

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

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

5.2 Evaluation Criteria

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

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

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

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

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

5.3 Airside Development Concepts & Alternatives

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

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

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

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

TABLE 5-1 - AIRSIDE FACILITY REQUIREMENTS SUMMARY

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

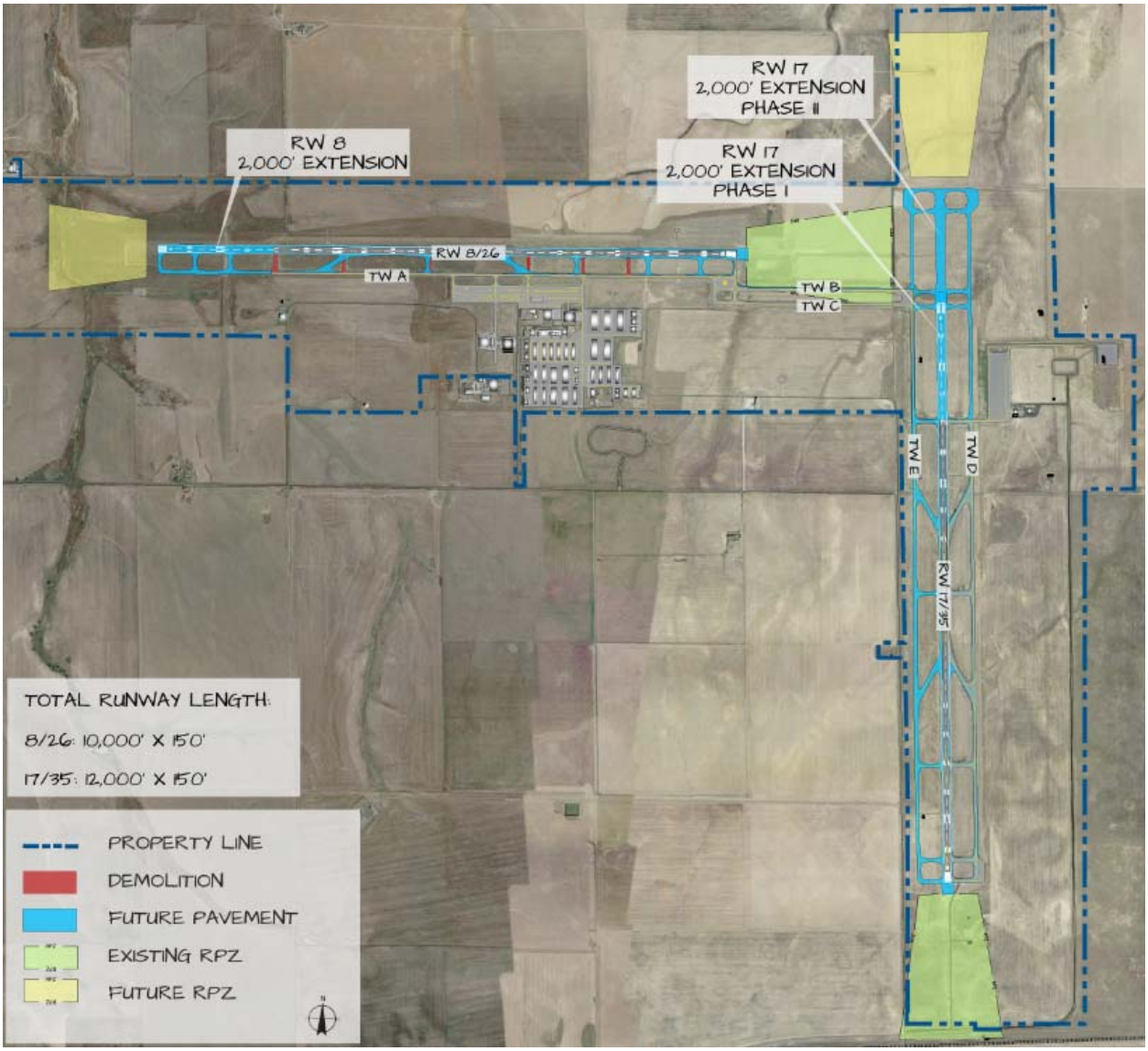
Source: Jviation

5.3.1 Runways

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

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

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



Source: Jviation

5.3.2 Taxiways

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

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

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

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

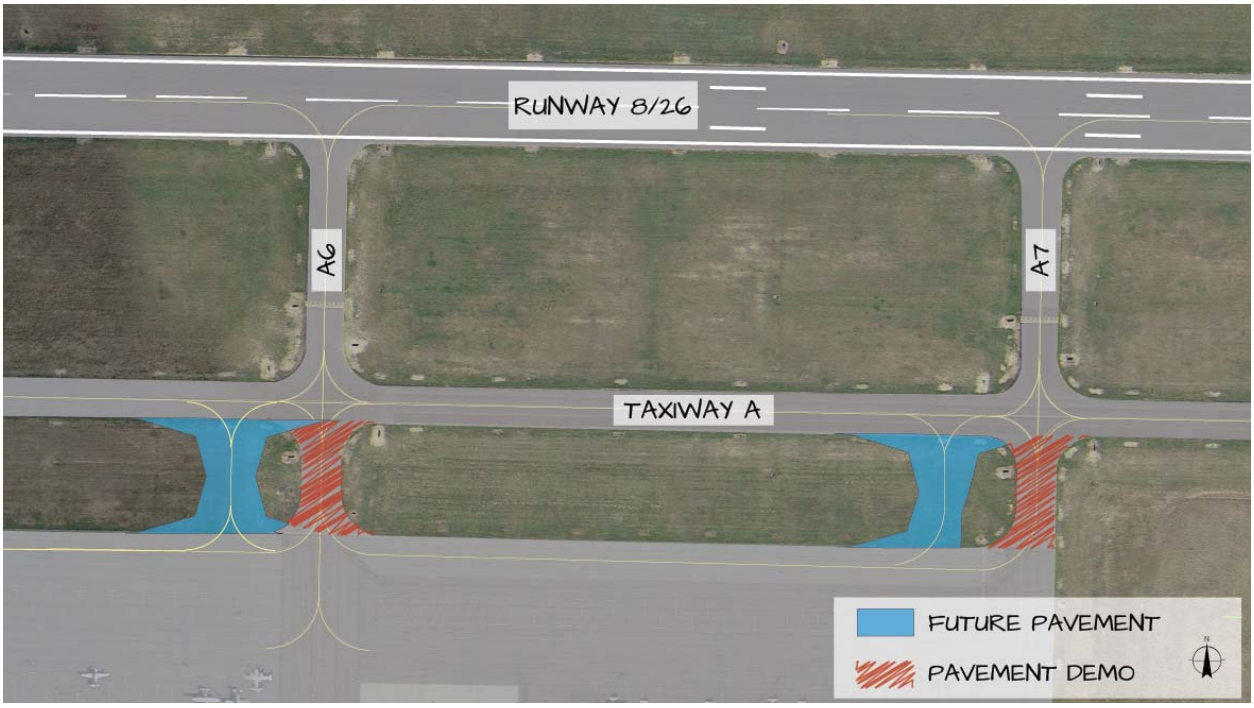
Taxiways A6, A7 and D7 Indirect Access Alternatives

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

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

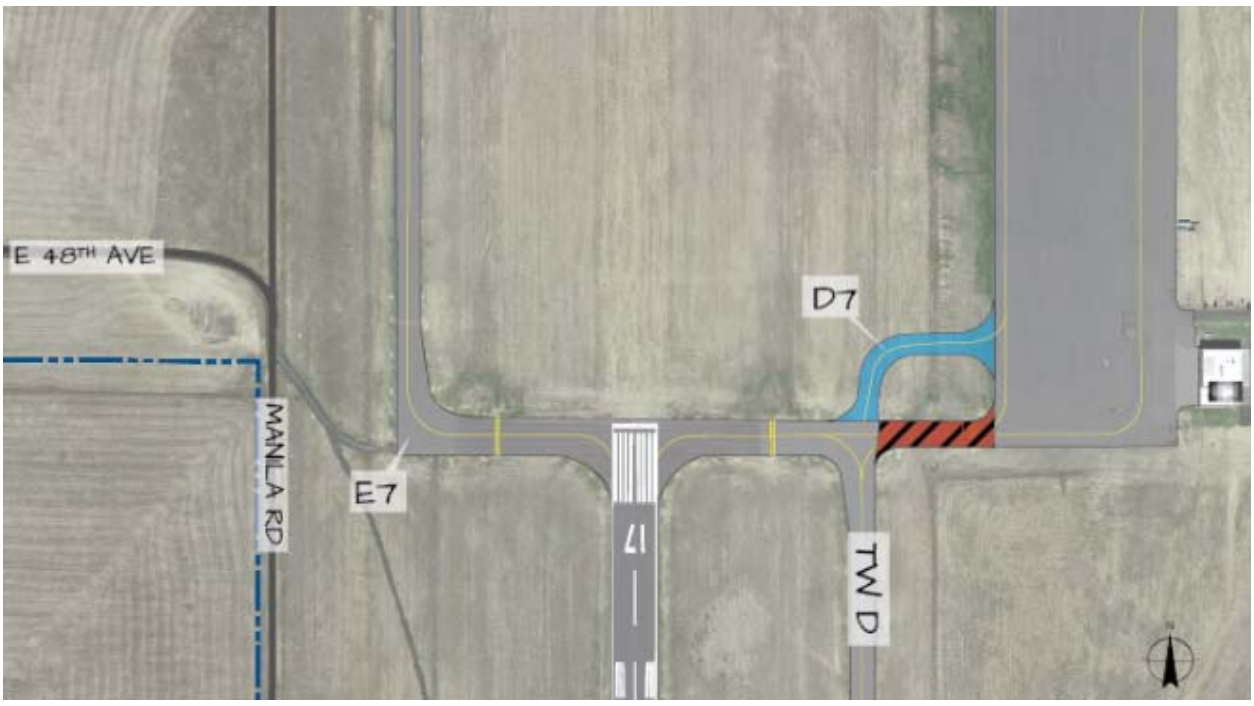
Alternative 2 - Relocate Taxilane connectors for Taxiways A6, A7, and Taxiway D7. This alternative would effectively relocate the apron taxilane connectors associated with Taxiways A6 and A7 by closing/removing the existing taxiways and replacing them approximately 150 feet west of their current location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

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



Source: Jviation

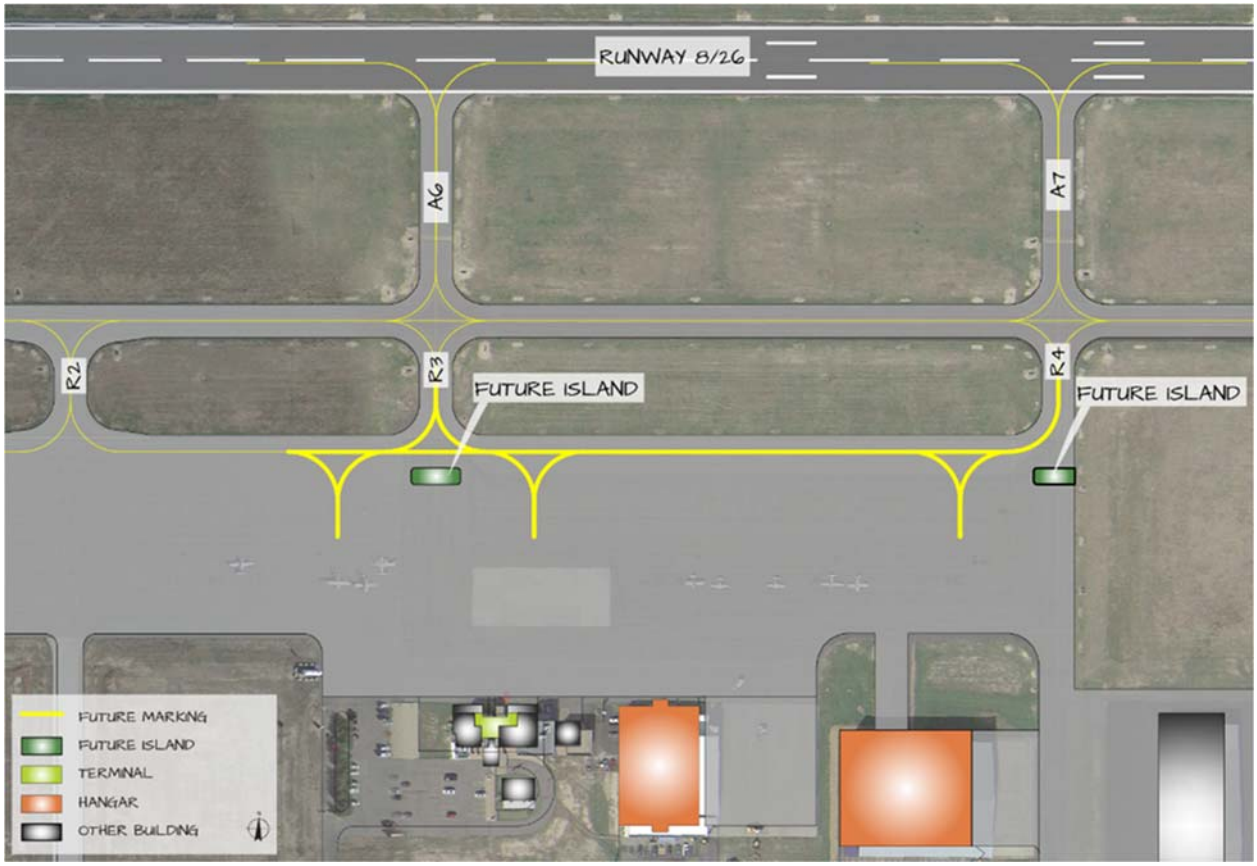
FIGURE 5-3 - TAXIWAY D7: ALTERNATIVE 2



Source: Jviation

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

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



Source: Jviation

FIGURE 5-5 - TAXIWAY D7: ALTERNATIVE 3

Source: Jviation

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

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

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

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

Source: Jviation
* Cost estimates are in 2017 dollars.

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

Taxiway E Operational Conflicts

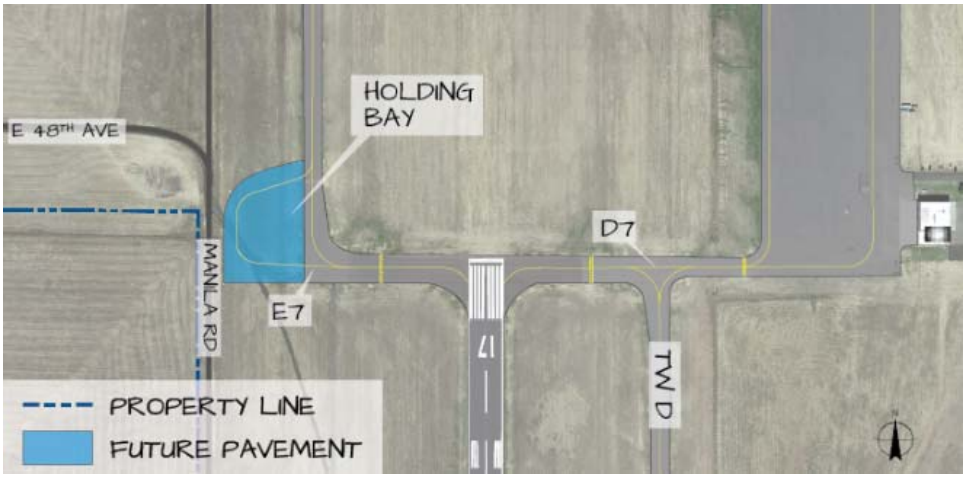
Representatives of the FTG Air Traffic Control Tower (ATCT) have indicated that FTG experiences occasional taxiway conflicts centered on Taxiway E, which can be a bottleneck for multiple aircraft simultaneously transitioning between the Terminal Apron to Runway 17/35. This is both a safety and an efficiency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

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

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

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

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



Source: Jviation

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

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

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

Source: Jviation

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

TABLE 5-3 - TAXIWAY E OPERATIONAL CONFLICTS ALTERNATIVES COMPARISON

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

Source: Jviation
* Cost estimates are in 2017 dollars.

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

Ultimate Taxiway Configuration

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

5.3.3 Airfield Pavement Strength

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

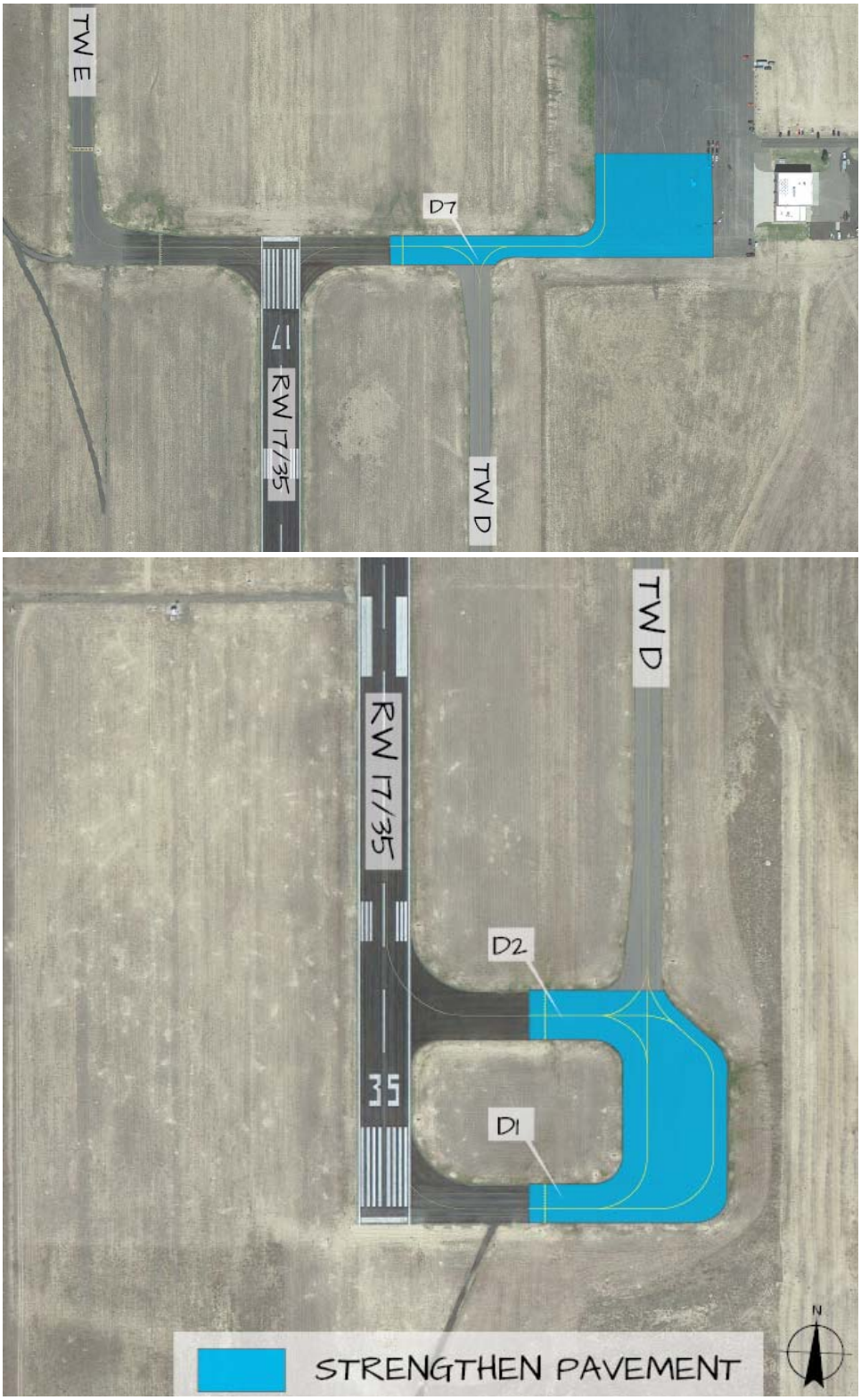
- Runway 8/26: 28,000 pounds (Single Wheel or SW), 40,000 pounds (Dual Wheel or DW)
- Runway 17/35: 34,000 pounds (SW), 75,000 pounds (DW)
- Taxiways: 28,000 pounds (SW), 40,000 pounds (DW)

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

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

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

FIGURE 5-8 - TAXIWAY STRENGTHENING AT FTG



Source: Jviation

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

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

5.3.4 Airfield Visual Aids

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

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

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

5.3.5 Airspace Obstructions

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

5.4 Landside & Airport Support Facilities Development Concepts & Alternatives

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

TABLE 5-4 - LANDSIDE FACILITY REQUIREMENTS SUMMARY

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

Source: Jviation

5.4.1 Aircraft Hangar Development

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

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

Source: Jviation

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

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

Source: Jviation

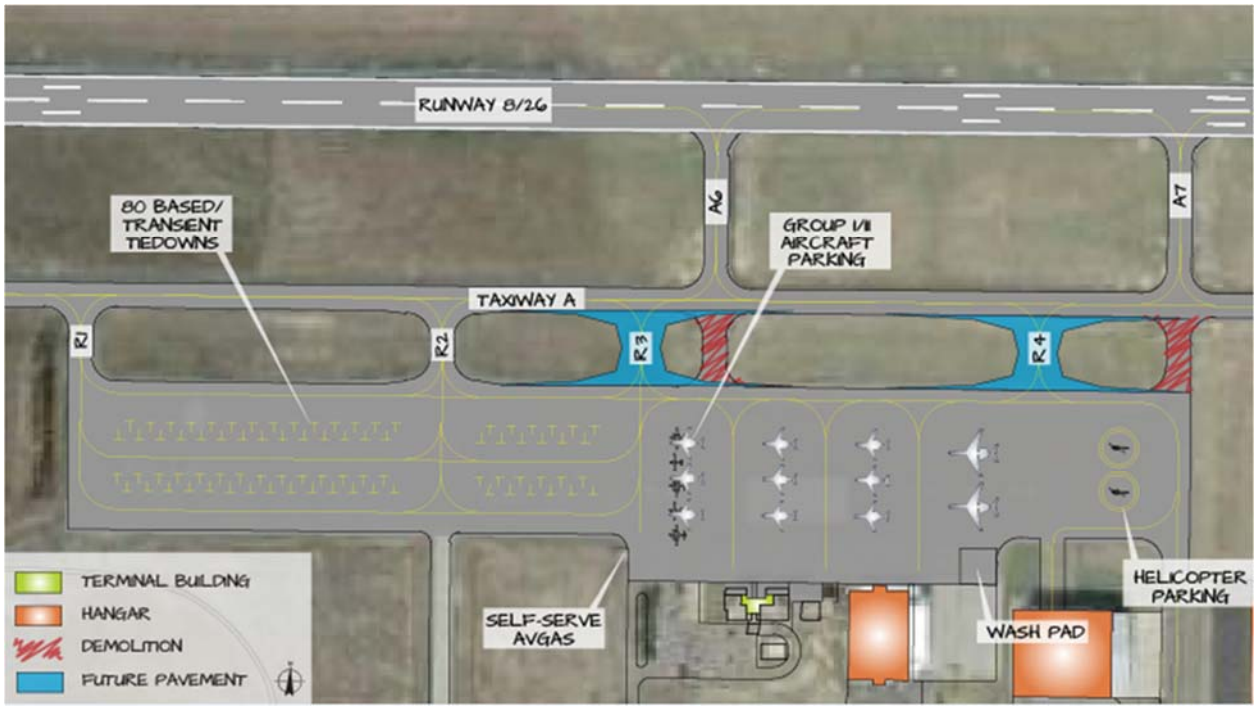
5.4.2 Terminal Apron Layout

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

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

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

FIGURE 5-11 - TERMINAL APRON RECOMMENDED REDESIGN



Source: Jviation

This apron development concept has several key features:

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

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

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

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

5.4.3 Airport Security & Perimeter Fencing

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

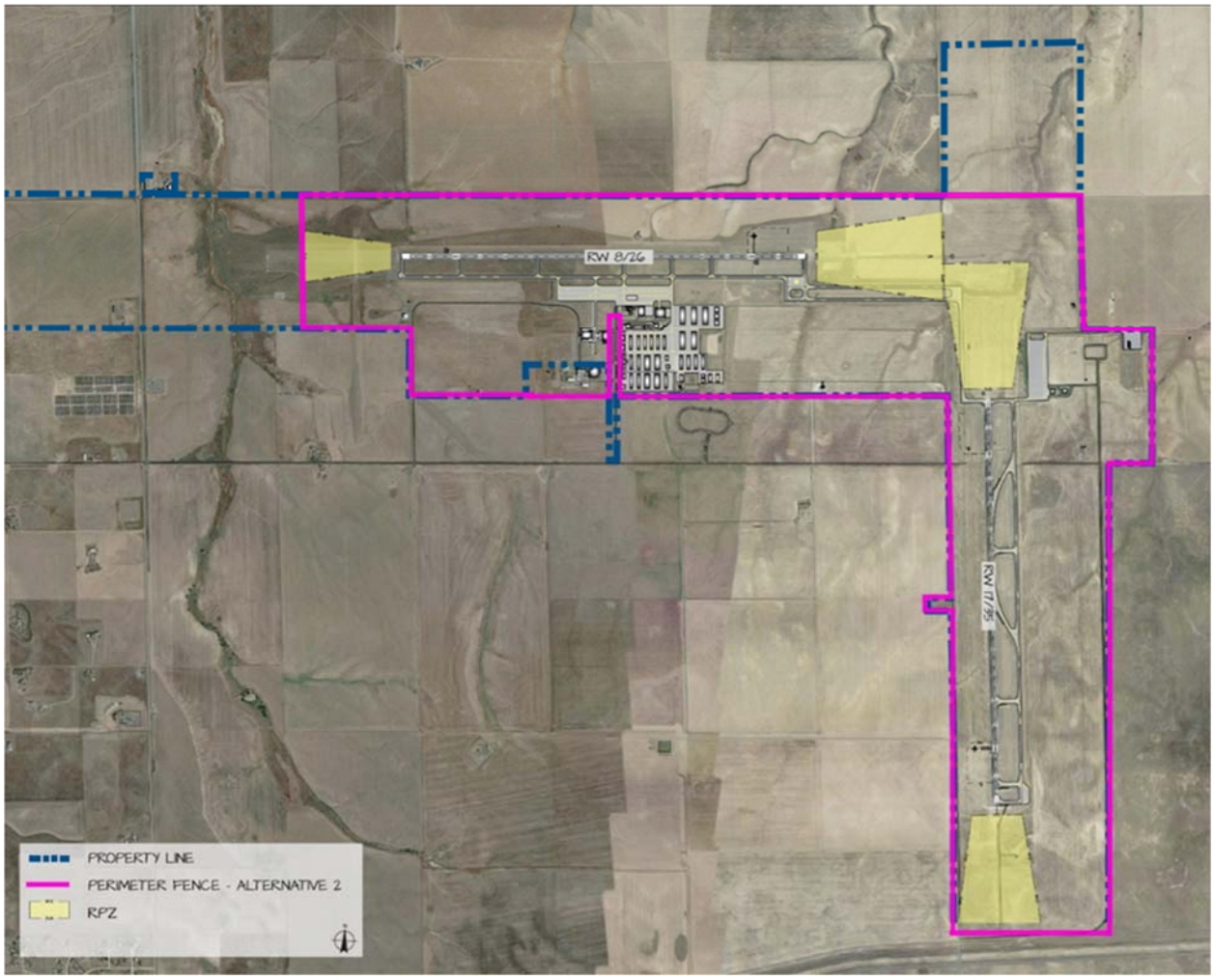
- Limit the ability of unauthorized persons and ground vehicles to access sensitive areas of airport property (i.e. Air Operations Area).
- Limit the ability to move between areas within the Air Operations Area.
- Separate/segregate persons and ground vehicles from aircraft, fueling facilities and other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

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

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

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

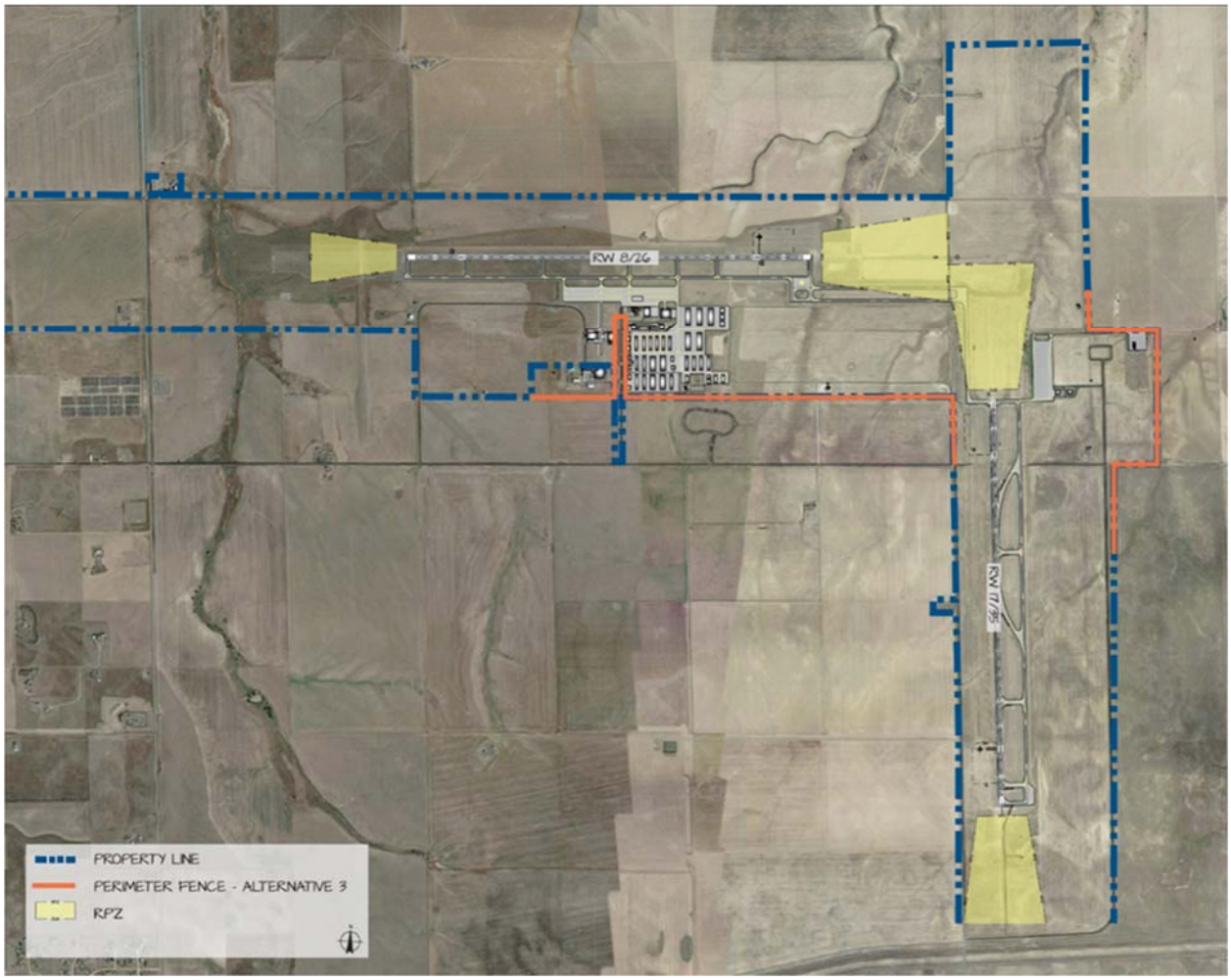
FIGURE 5-12 - PERIMETER SECURITY FENCING: ALTERNATIVE 2



Source: Jviation

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

FIGURE 5-13 - PERIMETER SECURITY FENCING: ALTERNATIVE 3



Source: Jviation

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

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

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

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

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

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

5.4.4 Airport Support Facilities

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

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

The following alternatives have been identified for consideration:

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

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

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

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

FIGURE 5-14 - AIRPORT SUPPORT FACILITIES ALTERNATIVES

Source: Jviation

TABLE 5-6 - AIRPORT SUPPORT FACILITIES COMPARISON MATRIX

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

Source: Jviation
* Cost estimates are in 2017 dollars.

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

5.5 Miscellaneous Planning Recommendations

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

5.5.1 Spaceport Colorado

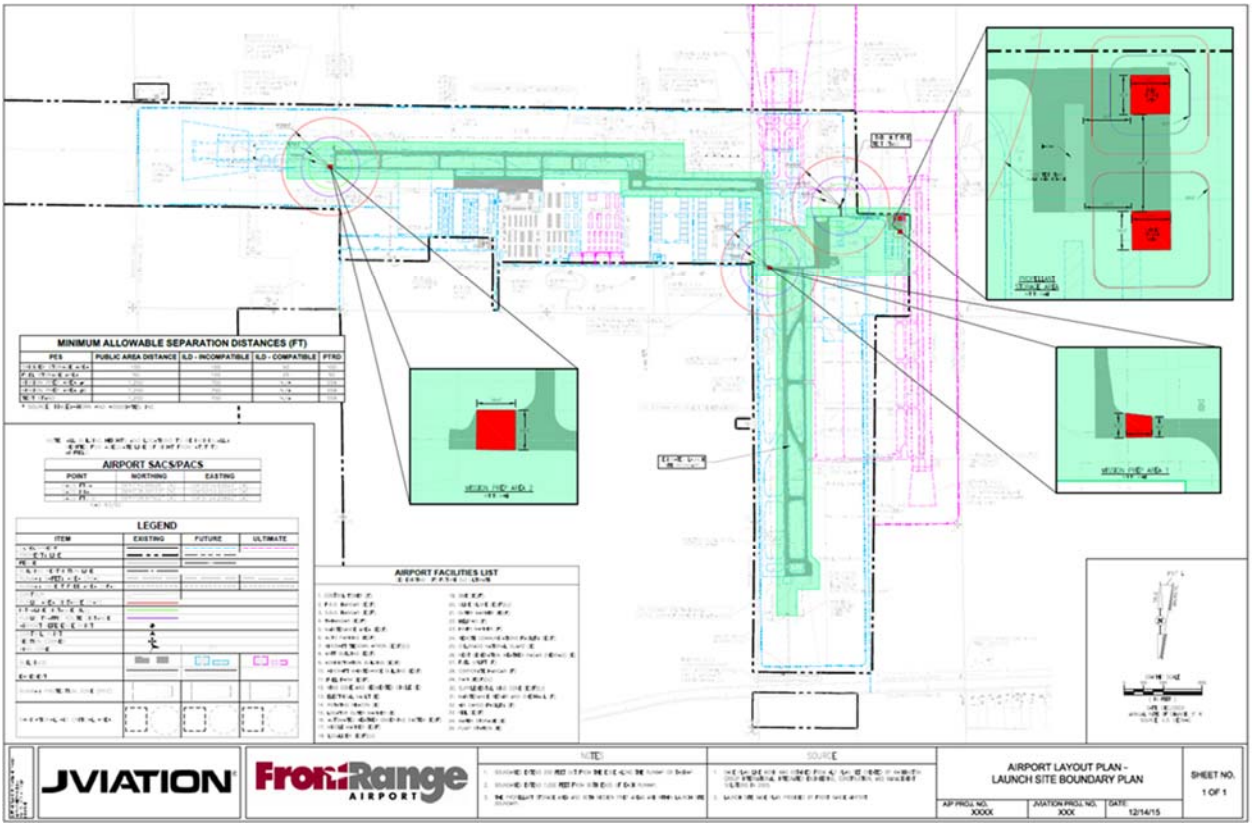
Front Range Airport is actively engaged with the FAA's Office of Commercial Space Transportation for a Commercial Launch Site Operator License to conduct spaceport launch activities based on a horizontal takeoff, horizontal landing, manned, reusable launch vehicle (RLV) based at FTG. In that the commercial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

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

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

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

FIGURE 5-15 - FTG LAUNCH SITE BOUNDARY PLAN



Source: Jviation

5.5.2 Pavement Management Recommendations

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

TABLE 5-7 - MAJOR PAVEMENT REHABILITATION SCHEDULE

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

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

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

5.6 Non-Aeronautical Development

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

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

5.6.1 Equipment Replacement Schedule

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

TABLE 5-8 - AIRFIELD EQUIPMENT REPLACEMENT SCHEDULE

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

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

5.7 Recommended Development Plan

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

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

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

TABLE 5-9 - RECOMMENDED DEVELOPMENT PLAN

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

Source: Jviation

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

5.8 Environmental Review

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

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

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

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

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

This Page Intentionally Left Blank