



## Chapter Four

# Alternatives

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In the previous chapter, the aviation facilities required to satisfy airside and landside demand through the long-term planning period of the master plan were identified. In addition, several Federal Aviation Administration (FAA) standards were discussed that apply to airfield design. The next step in the planning process is to evaluate reasonable ways these facilities can be provided while meeting design standards. The purpose of this chapter is to formulate and examine rational development alternatives that address the short-, intermediate-, and long-term planning horizon levels. Because there are multiple possibilities and combinations, it is necessary to focus on the opportunities that have the greatest potential for success. Each alternative provides a different approach to meeting existing and future facility needs; these layouts are presented for evaluation and discussion.

Some airports become constrained due to limited availability of space, while others may be constrained due to adjacent land use development or geographical features. Careful consideration should be given to the layout of future facilities and impacts on potential airfield improvements at Denton Enterprise Airport (DTO). Proper planning at this time can ensure the long-term viability of the airport for aviation and economic growth.

The primary goal of this planning process is to develop a feasible plan for meeting the needs that result from the projected market demand over the next 20 years. The plan of action should be developed in a manner that is consistent with the future goals and objectives of the City of Denton and airport stakeholders, including users of the airport and the local community and region, all of which have a vested interest in the development and operation of DTO.

The goal is to develop an underlying rationale that supports the final recommended concept. Through this process, an evaluation of the highest and best uses of airport property will be made, while also weighing local development goals, efficiency, physical and environmental factors, capacity, and appropriate safety design standards.

The alternatives presented in this chapter have been formulated as potential means to meet the overall program objectives for the airport in a balanced manner. Through coordination with the City of Denton, DTO management, the planning advisory committee (PAC), and the public, an alternative (or combination of alternatives) will be refined and modified, as necessary, into a recommended development concept (Chapter 5); therefore, the planning considerations and alternatives presented in this chapter can be considered a beginning point in the evolution of a recommended concept for the future of DTO.

## **NO-ACTION/NON-DEVELOPMENT ALTERNATIVES**

Prior to the presentation of development alternatives for DTO, several non-development options should be taken into consideration. Non-development alternatives include a “no-build” or “do-nothing” alternative, development of a replacement airport at a new location, or closure of the existing airport and the transfer of services to another existing airport. This section presents a discussion of the primary non-development alternatives.

### **NO-BUILD/DO-NOTHING ALTERNATIVE**

The City of Denton is charged with managing the airport for the economic improvement of the community and region. In some cases, alternatives may include a no-action option; for DTO, this would effectively reduce the quality of services being provided to the public, affect the aviation facility’s ability to meet FAA design standards, and affect the region’s ability to support aviation needs. The ramifications of a no-action alternative expand into impacts on the economic well-being of the region. **An analysis of the economic benefit of the airport was completed in 2018, and it was found that DTO had a total annual economic impact of \$156.3 million and supported more than 1,435 jobs.** If facilities are not maintained and improved so the airport can support general aviation operations, delays become unacceptable, or aircraft storage is not available, aviation activities and business may shift elsewhere. The no-action alternative is also inconsistent with the long-term goal of the FAA and Texas Department of Transportation (TxDOT) Aviation Division to enhance local and interstate commerce.

Furthermore, DTO has received nearly \$22.4 million in state and federal grants since 2005. These grants represent a direct economic stimulus that has lasting positive economic impacts. The City of Denton has a vested interest in maintaining and improving airport facilities for business and general aviation users. Without a commitment to the ongoing improvement of the airport, users of the airport will be constrained from taking full advantage of the airport’s air transportation capabilities; therefore, a no-action alternative is not considered further in this master plan.

### **TRANSFER OF SERVICE/RELOCATE AIRPORT**

This study will not consider the relocation of services to another airport or the development of a new airport site. The development of a new facility is a complex and expensive option. A new site would require greater land area, duplication of investment in facilities, installation of supporting infrastructure that is already available at the existing site, and greater potential for negative impacts to natural, biological, and cultural resources.

As previously mentioned, the City of Denton has accepted nearly \$22.4 million in federal and state development grant funding over the past 20 years, including the construction of a new parallel runway. Through grant assurances, the acceptance of these grants obligates the airport sponsor to maintain the airport as an airport. Closing the existing airport and transferring services to another existing airport would be considered a violation of the grant assurances and would require repayment of grants that are not yet fully depreciated. The investments made and the economic benefits received from the airport (both public and private) could not readily be shifted or regenerated to another airport without significant costs/losses. As such, this alternative is not considered practical, reasonable, or financially feasible.

## NON-DEVELOPMENT ALTERNATIVES SUMMARY

The purpose of this master plan is to examine aviation needs at DTO over the course of the next 20 years; therefore, this master plan will examine the needs of the existing airport and present a program of needed capital improvement projects to cover the scope of the plan. The airport is a lucrative business, transportation utility, and economic asset for the region. It can accommodate existing and future demand and should be developed accordingly to support the interests of the residents and businesses that rely upon it. Ultimately, the final decision regarding development rests with the City of Denton, TxDOT, and the FAA on an individual project basis. DTO is a vibrant facility with abundant remaining growth potential; as such, the non-development alternatives will not be considered further in this planning process. The following analysis covers airside and landside development alternatives that consider an array of facility demands, including safety, capacity, access, and efficiency.

## PLANNING OBJECTIVES

A set of basic planning objectives has been established to guide the alternatives development process. It is the goal of this master planning effort to produce a development plan for the airport that addresses the forecasted aviation demand and meets FAA design standards to the greatest degree possible. As the owner and operator of the airport, the City of Denton provides overall guidance for its operation and development. It is of primary concern that DTO is marketed, developed, and operated for the betterment of the community and users of the airport. The following basic planning principles and objectives are utilized as general guidelines during this planning effort:

- Develop a safe, attractive, and efficient aviation facility in accordance with applicable federal, state, and local regulations.
- Preserve and protect public and private investments in existing airport facilities.
- Provide a means for the airport to grow as dictated by demand.
- Establish a plan to ensure the long-term viability of the airport and promote compatible land uses surrounding the airport.
- Develop a facility that is readily responsive to the changing needs of all aviation users.
- Reflect and support the long-term planning efforts that currently apply to the region.

- Develop a facility with a focus on achieving self-sufficiency in operational and developmental cost recovery.
- Ensure future development is environmentally compatible.

## REVIEW OF PREVIOUS AIRPORT PLANS

The previous master plan for DTO was completed in 2015. Recommendations from this study are depicted on **Exhibit 4A**, and include the following:

- Development of a new parallel runway (18R-36L) along with associated parallel taxiways to support landside facilities on the west side of the airport.
- Maintain existing Runway 18L-36R at its existing dimensions.
- Realign Taxiway B to allow for the expansion of the terminal apron.
- Realign Taxiways A3 and A6 to align with the future (now existing) connecting taxiways to the parallel runway.
- Proposed helicopter training site at the south end of the existing landside area.
- Hangar development throughout the east landside area.
- Reflecting the proposed Loop 288 extension on the west side of the airfield planned by TxDOT.
- Develop infrastructure (roads/utilities) to allow for development of the west side of the airport.

The analysis presented in this chapter revisits the recommendations presented in the previous master plan. Since the completion of the last plan, the parallel runway has been constructed and taxiways A3 and A6 have been realigned as proposed. In addition, several new hangars have been developed within the east landside areas and a new firefighting station has been constructed adjacent to the terminal.






## AIRSIDE ALTERNATIVES

Development alternatives are categorized into two functional areas: airside and landside. Airside considerations relate to elements such as runways, taxiways, navigational aids, lighting, and marking aids, and require the greatest commitment of land area to meet the physical layout of the airport, as well as the required airfield safety standards. The design of the airfield also defines minimum setback distances from the runway and object clearance standards. These criteria are defined first to ensure the fundamental needs of the airport are met. Landside considerations include hangars, aircraft parking aprons, and terminal services, as well as utilization of remaining property to provide revenue support for the airport and benefit the economic development and well-being of the regional area.

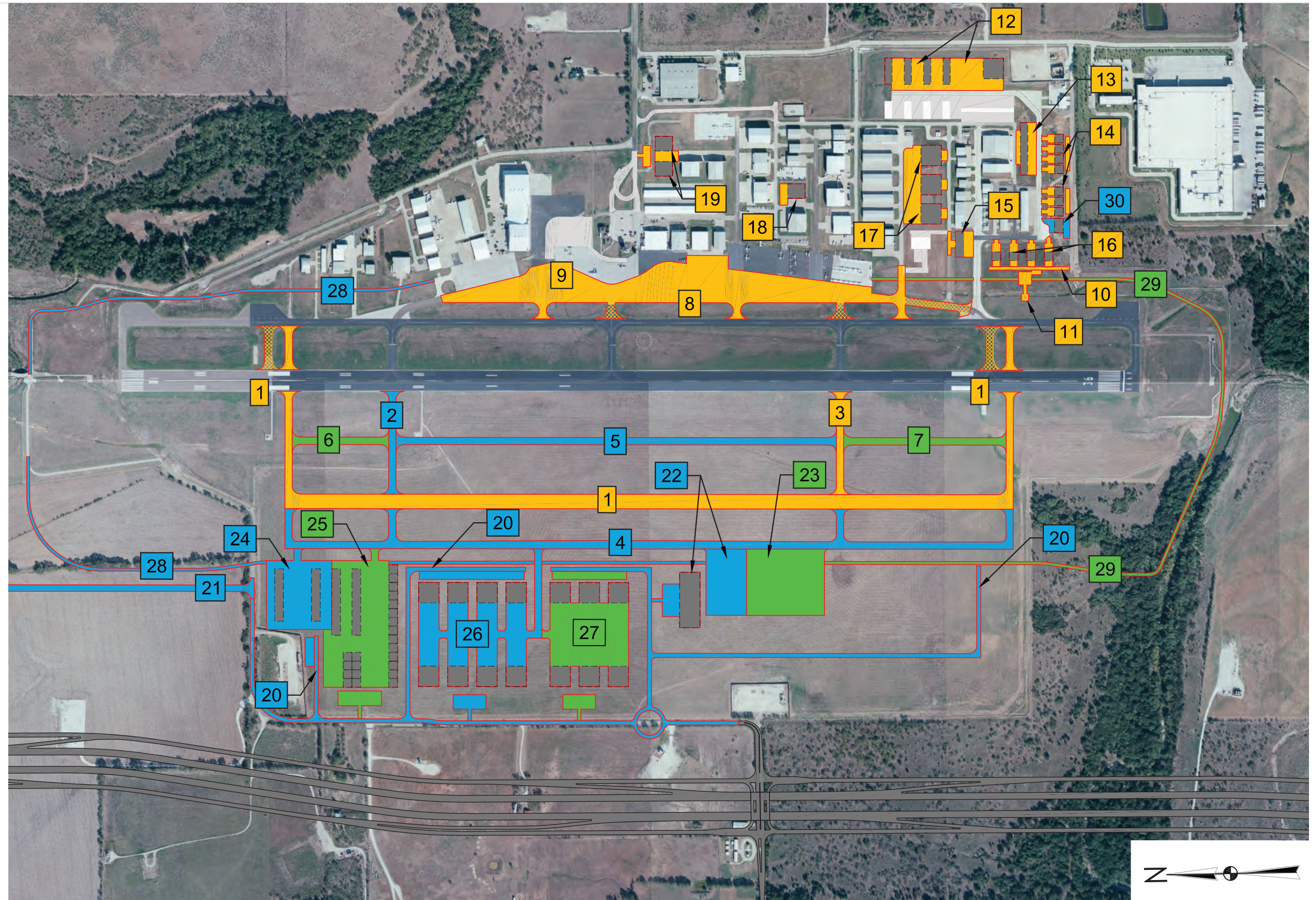
The remainder of this chapter describes various development alternatives for airside and landside facilities. Although each area is treated separately, ultimate planning will integrate the individual requirements so they can complement one another.



LEGEND

	PROPOSED BUILDING
	PAL 1 PROJECT
	PAL 2 PROJECT
	PAL 3 PROJECT
	PAVEMENT DEMOLITION

AIRFIELD	
1	New Parallel Runway 18R-36L
2	Extend Taxiway A3
3	Extend Taxiway A5
4	New West Parallel Taxiway
5	New Interior Parallel Taxiway
6	Extend Parallel Taxiway North
7	Extend Parallel Taxiway South
8	Realign Taxiway B
11	New Helicopter Training Area
GENERAL AVIATION	
9	Expand East Aprons
10	Extend Schweizer Street
12	Construct Hangars East of Q
13	Construct Hangars North of P
14	Construct Hangars South of P
15	Construct Hangar North of L
16	Construct Hangars West of M
17	Construct Hangars South of K
18	Construct Hangar North of J
19	Construct Hangars North of H
20	Construct West Side Access Roads
21	Relocate Tom Cole Road
22	New GA Ramp, Support Facility
23	Expand GA Ramp
24	Construct Small Box / T-Hangars
25	Expand Box / T-Hangars
26	Conventional Hangar Development 1
27	Conventional Hangar Development 2
MISCELLANEOUS	
28	North Vehicle Service Road
29	South Vehicle Service Road
30	ARFF Facility and Vehicle



Source: Geodetix, Inc. 2012 (Aerial Photography)

Scale: 1" = 700'

Source: Denton Enterprise Airport Master Plan, 2015



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## AIRSIDE CONSIDERATIONS

**Table 4A** presents the airside considerations that are specifically addressed in this analysis. Landside planning considerations are outlined later in this chapter. These issues are the result of the findings of the aviation demand forecasts and facility requirements evaluations, as well as input from the PAC, airport management, the City of Denton, and the public. In addition to these considerations, both runways are planned to meet applicable runway design code (RDC) standards.<sup>1</sup> Runway 18L-36R is planned to meet RDC C-II-2400 standards in the existing condition and C/D-III-2400 standards in the ultimate condition. Runway 18R-36L is planned to meet RDC B-II-4000 design standards in both the existing and ultimate condition.

**TABLE 4A | Airside Planning Considerations**

#	Non-Standard/Deficient Condition	Applicable Design Standard	Proposed Action(s) to be Evaluated
1	Runway 18L-36R has only one exit taxiway within the designated 2,000' to 4,000' range from the landing threshold for airfield capacity calculation purposes.	FAA AC 150/5060-5, Change 2, <i>Airfield Capacity and Delay</i>	Consider adding additional exits within the target range to enhance airfield capacity.
2	Runway 18L-36R has applied declared distances to meet FAA RSA/ROFA design standards. A standard RSA/ROFA on a RDC C-II-2400 and C/D-III-2400 runway extend 1,000 feet from the end of the runway. There are currently only 500' of RSA/ROFA to the south of the runway and only 600' of RSA/ROFA to the north of the runway.	FAA AC 150/5300-13B, <i>Airport Design</i> , Appendix H, H.1.5.b	As part of the master plan process, the FAA expects a review of reasonable mitigation measures to reduce or eliminate the use of declared distances.
3	At 5,003 feet long, Runway 18R-36L is limited in its ability to serve small and mid-sized business jet aircraft at 60 percent useful loads.	FAA AC 150/5325-4B, <i>Runway Length Requirements for Airfield Design</i> , Paragraph 306	Consider extension options to a minimum length of 5,500 feet to satisfy the FAA recommended length to accommodate 75 percent of business jets operating at 60 percent useful loads.
4	Portions of the RPZs on each runway are not controlled by the airport via fee ownership or avigation easement. Affected property totals approximately 10 acres.	FAA AC 150/5190-4B, <i>Airport Land Use Compatibility Planning</i> , §2.2.5	Establish control via new avigation easements or fee ownership of all properties within the RPZs.
5	Runway 18R-36L is not equipped with a full-length parallel taxiway, which is required for runways with instrument approaches with visibility minimums down to ¾-mile.	FAA AC 150/5300-13B, <i>Airport Design</i> , Appendix K, Table K-1	Consider adding a parallel taxiway to Runway 18R-36L.
6	The north and south intersections of Taxiway B and Taxiway A result in non-standard taxiway geometry conditions, including direct-access and irregular turning angles.	FAA AC 150/5300-13B, <i>Airport Design</i> , Paragraph 4.3	Consider taxiway design improvements to mitigate non-standard geometry.
REIL = runway end identifier lights ROFA = runway object free area RPZ = runway protection zone RSA = runway safety area			

Source: Coffman Associates analysis

<sup>1</sup> Applicable RDC standards are detailed in Chapter 3.

## AIRFIELD ALTERNATIVES

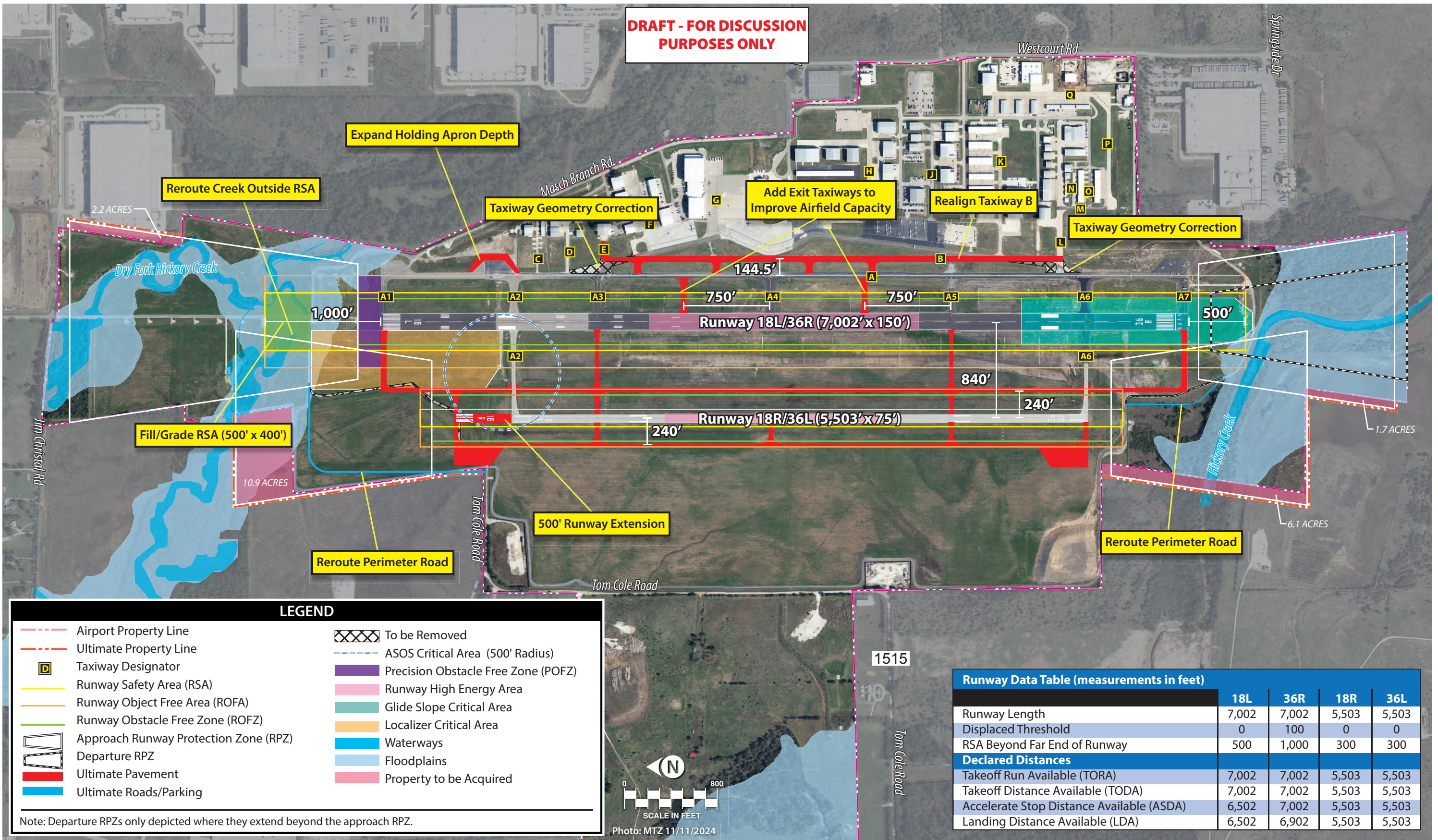
Three alternatives have been prepared to address the items outlined in **Table 4A**. The details of each alternative, including associated advantages and disadvantages, are described as follows.

### Airfield Alternative 1

Airfield Alternative 1 is depicted on **Exhibit 4B** and considers the following:

- Adding fill and grading the full 1,000 feet of RSA beyond the north end of the runway. The airport already maintains 600 feet of RSA off the north end of the runway, so this project extends the graded RSA area an additional 400 feet north at a width of 500 feet. This will require the rerouting of the Dry Fork Hickory Creek in this area. Providing a standard RSA increases usable takeoff and landing distances on Runway 36R (see declared distances table on the exhibit). The Runway 36R accelerate stop distance available (ASDA) increases from 6,602 feet to 7,002 feet (the full runway length) and the landing distance available (LDA) increases from 6,502 feet to 6,902 feet (accounts for the 100-foot displaced threshold). The increased Runway 36R utility, while beneficial, is minimal and is only applied to one runway end. To increase utility on Runway 18L, the more frequently used runway end, Hickory Creek, a much more substantial waterway, would need to be rerouted and significant amounts of fill material would need to be added to meet grading standards (terrain drops  $\pm 34$  feet in elevation south of the runway). Due to the significant terrain issues and needing to reroute a major waterway, extending the RSA further to the south of the runway is not feasible and is not considered further in the alternatives analysis.
- Two new exit taxiways serving Runway 18L-36R are added within the middle 1/3<sup>rd</sup> of the runway to allow landing aircraft to exit the runway more quickly, thereby reducing runway occupancy times. The exits are spaced at a minimum of 750 feet separation (minimum spacing requirement to be considered as a capacity enhancement).
- Runway 18R-36L is extended 500 feet to the north for a full length of 5,503 feet. At this length, the parallel runway meets the FAA recommended length to accommodate 75 percent of business jets at 60 percent useful loads. This length would also accommodate the existing and future critical aircraft at useful loads of between 60 and 70 percent. Improving the utility of the parallel runway builds redundancy into the airfield if Runway 18L-36R is closed for maintenance or emergency situations.
- Additional taxiways to be located between the parallel runways and on the west side of Runway 18R-36L. These taxiways will enhance airfield circulation and support landside development of the west side of airport property. The taxiways are at a 240-foot separation distance from Runway 18R-36L, meeting RDC B-II-4000 design standards. Taxiways A1, A3, A5, and A7 are extended west to provide additional access points to the parallel runway and to aid in circulation of aircraft across the airfield.
- The Taxiway A taxiway object free area (TOFA) width is planned to increase from 124 feet (ADG II) to 171 feet (ADG III), which will restrict the use of the existing holding bay located adjacent to Taxiway A2. Expanding the depth of the holding bay will allow it to be used by aircraft without impacting the TOFA. Two new holding aprons are planned along the west parallel taxiway serving Runway 18R-36L to allow aircraft to perform preflight engine checks and to enhance circulation.







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- Taxiway B is realigned to a parallel configuration with Taxiway A with a separation distance of 144.5 feet, meeting ADG III separation standards. Realigning Taxiway B opens the possibility of expanding the aprons on the east landside area. It also allows for reconfiguring the intersection of Taxiway B with Taxiway A, thereby creating 90-degree intersections and mitigating non-standard geometry.
- Fee simple or avigation easement acquisition of approximately 20.9 acres of property to protect the runway protection zones (RPZs) for each runway.
- The perimeter road is rerouted to the north and south of the parallel runway to avoid impacts to expanded runway/taxiway pavements.

## Airfield Alternative 2

Airfield Alternative 2 is depicted on **Exhibit 4C** and considers the following:

- Extending Runway 18L-36R 500 feet to the north, adding fill material, and grading the full 1,000-foot RSA. This alternative requires rerouting Dry Fork Hickory Creek to the north of the runway to a greater degree than what was proposed in Alternative 1. The runway extension results in a full length of 7,502 feet while maintaining the south end of the runway in its existing condition. The resulting declared distances provide 7,002 feet of ASDA and LDA on Runway 18L, and 7,502 feet of ASDA and 7,402 feet of LDA on Runway 36R. At these lengths, the runway's utility is enhanced to accommodate the existing and ultimate critical aircraft at useful loads of up to 90 percent. A result of extending the runway to the north is the shifting of the RPZ over uncontrolled property north of Jim Christal Road, which includes properties currently developed or under development. These areas would need to be cleared from the RPZ. The Runway 18L medium intensity approach lighting system (MALSR) and the glide slope antenna would also need to be shifted north to align to the ultimate runway end, and the precision approach path indicator (PAPI-4) would need to be relocated.
- Two new exit taxiways serving Runway 18L-36R are added within the middle 1/3<sup>rd</sup> of the runway to allow landing aircraft to exit the runway more quickly, thereby reducing runway occupancy times. The exits are spaced at a minimum of 750 feet separation (minimum spacing requirement to be considered as a capacity enhancement).
- Runway 18R-36L is extended 1,000 feet to the north for a full length of 6,003 feet. At this length, the parallel runway meets the FAA recommended length to accommodate 100 percent of business jets at 60 percent useful loads. This length would also accommodate the existing and future critical aircraft at useful loads of between 70 and 80 percent. Improving the utility of the parallel runway builds redundancy into the airfield if Runway 18L-36R is closed for maintenance or emergency situations.
- Additional taxiways to be located between the parallel runways and on the west side of Runway 18R-36L. These taxiways will enhance airfield circulation and support landside development of the west side of airport property. The taxiways are at a 240-foot separation distance from Runway 18R-36L, meeting RDC B-II-4000 design standards. Taxiways A3, A5, A7, and the new entrance taxiway at the ultimate Runway 18L threshold are extended west to provide additional access points to the parallel runway and to aid in circulation of aircraft across the airfield.



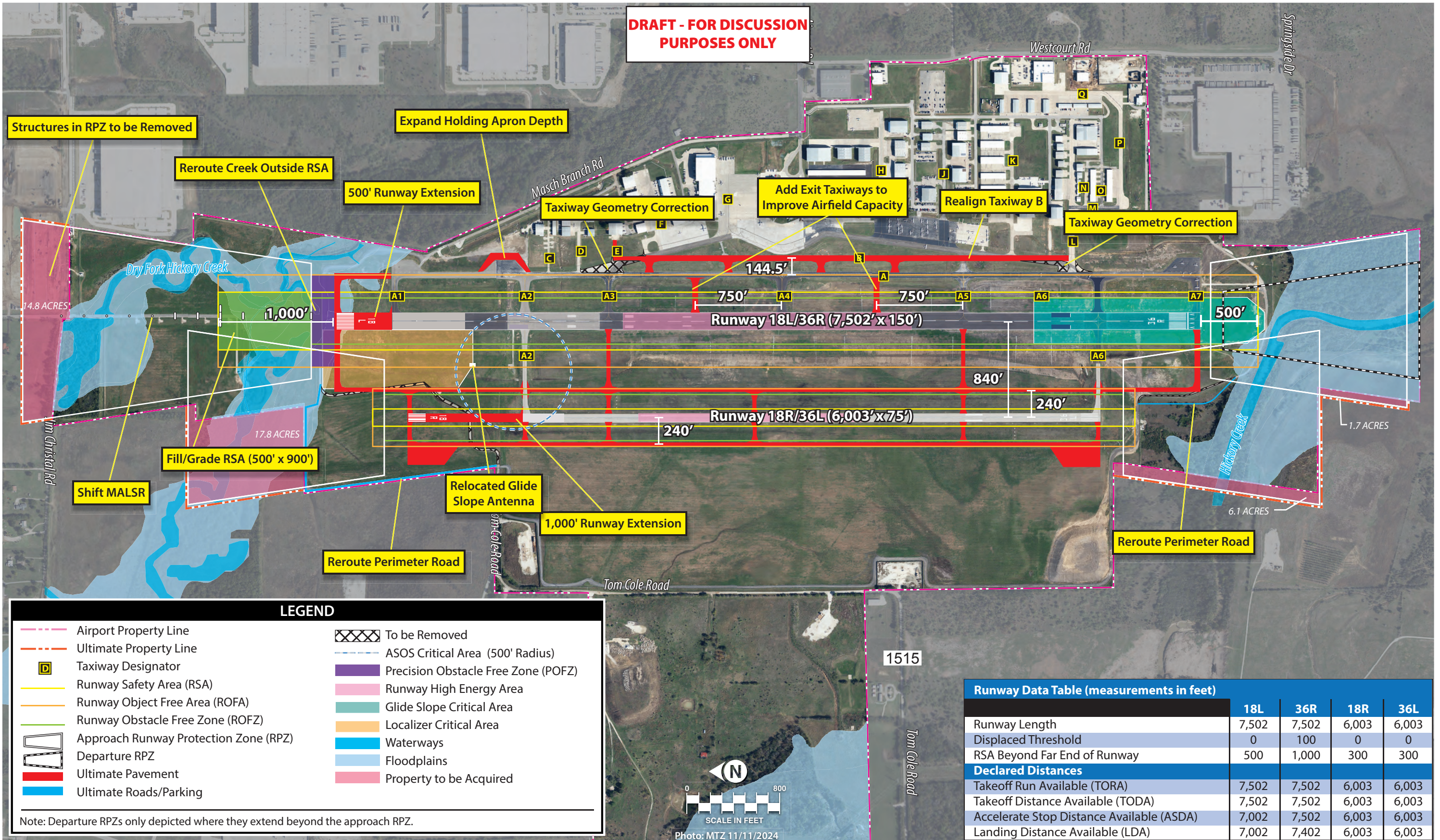
- The Taxiway A taxiway object free area (TOFA) width is planned to increase from 124 feet (ADG II) to 171 feet (ADG III), which will restrict the use of the existing holding bay located adjacent to Taxiway A2. Expanding the depth of the holding bay will allow it to be used by aircraft without impacting the TOFA. Two new holding aprons are planned along the west parallel taxiway serving Runway 18R-36L to allow aircraft to perform preflight engine checks and to enhance circulation.
- Taxiway B is realigned to a parallel configuration with Taxiway A with a separation distance of 144.5 feet, meeting ADG III separation standards. Realigning Taxiway B opens the possibility of expanding the aprons on the east landside area. It also allows for reconfiguring the intersection of Taxiway B with Taxiway A, creating 90-degree intersections and mitigating non-standard geometry.
- Fee simple or aviation easement acquisition of approximately 40.4 acres of property to protect the runway protection zones (RPZs) for each runway.
- The perimeter road is rerouted to the north and south of the parallel runway to avoid impacts to expanded runway/taxiway pavements.

### Airfield Alternative 3

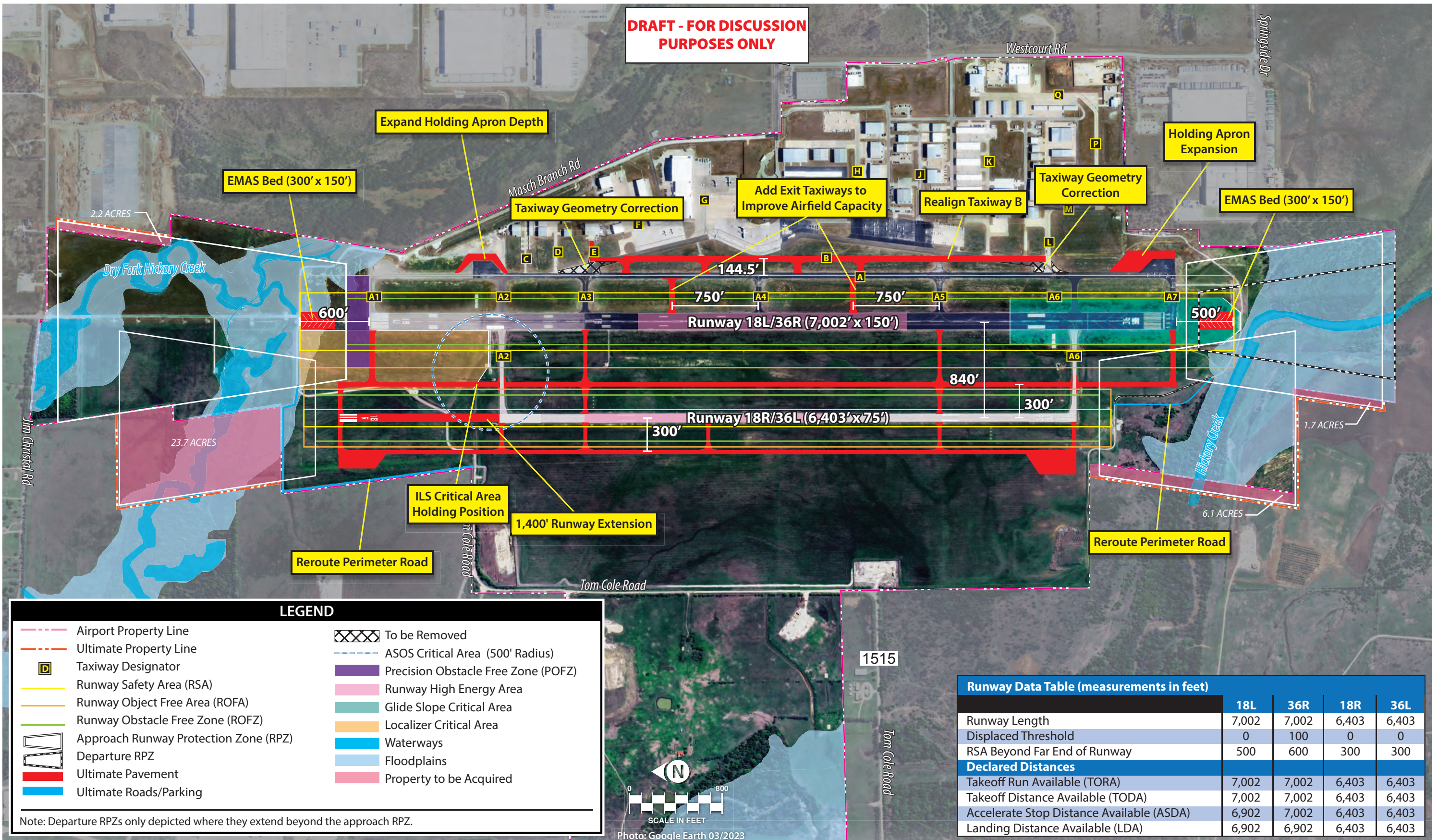
Airfield Alternative 3 is depicted on **Exhibit 4D** and considers the following:

- Installing engineered material arresting system (EMAS) beds on both ends of the runway. EMAS is a crushable concrete material that decelerates aircraft during an excursion incident without damaging the landing gear of the aircraft. The implementation of EMAS reduces the RSA/ROFA beyond the end of the runway requirement from 1,000 feet to 600 feet. The EMAS bed shown in the alternative is 300 feet long, 150 feet wide, and is set back 300 feet north of the runway end and 200 south of the runway end. The Runway 36R threshold would remain displaced by 100 feet to meet the 600-foot of RSA prior to the landing threshold requirement. The reduced RSA/ROFA requirement increases the Runway 18L ASDA and LDA to 6,902 feet and the 36R ASDA to 7,002 feet and the LDA to 6,902 feet. This alternative gets more utility out of the existing runway pavement while also not requiring filling/grading any additional RSA, rerouting the Dry Fork Hickory Creek, or altering approach lighting systems or navigational aids.
- Two new exit taxiways serving Runway 18L-36R are added within the middle 1/3<sup>rd</sup> of the runway to allow landing aircraft to exit the runway more quickly, reducing runway occupancy times. The exits are spaced at a minimum of 750 feet separation (minimum spacing requirement to be considered as a capacity enhancement).
- Runway 18R-36L is extended 1,400 feet to the north for a full length of 6,403 feet. At this length, the parallel runway meets the FAA recommended length to accommodate the existing and future critical aircraft at useful loads of between 80 and 90 percent. Improving the utility of the parallel runway builds redundancy into the airfield if Runway 18L-36R is closed for maintenance or emergency situations.
- Additional taxiways to be located between the parallel runways and on the west side of Runway 18R-36L. These taxiways will enhance airfield circulation and support landside development of the west side of airport property. The taxiways are at a 300-foot separation distance from













Runway 18R-36L, meeting RDC C-II-4000 design standards. This separation allows the parallel runway opportunity to grow into a higher design standard in the future without needing to relocate the taxiways. The increased separation from what is proposed in the previous two alternatives also allows for better alignment of aircraft at holding position markings, giving pilots greater visibility of aircraft traffic. A disadvantage of the 300-foot separation distance is that the mid-field parallel taxiway extends through the glide slope critical area, which would require a separate instrument landing system (ILS) critical area holding position marking located north of the intersection of the parallel taxiway with Taxiway A2. Taxiways A1, A3, A5, and A7 are extended west to provide additional access points to the parallel runway and to aid in circulation of aircraft across the airfield.

- The Taxiway A taxiway object free area (TOFA) width is planned to increase from 124 feet (ADG II) to 171 feet (ADG III) which will restrict the use of the existing holding bay located adjacent to Taxiway A2. Expanding the depth of the holding bay will allow it to be used by aircraft without impacting the TOFA. This alternative also considers expanding the south holding apron on Taxiway A to provide increased capacity for queuing aircraft. Two new holding aprons are planned along the west parallel taxiway serving Runway 18R-36L to allow aircraft to perform preflight engine checks and to enhance circulation.
- Taxiway B is realigned to a parallel configuration with Taxiway A with a separation distance of 144.5 feet, meeting ADG III separation standards. Realigning Taxiway B opens the possibility of expanding the aprons on the east landside area. It also allows for reconfiguring the intersection of Taxiway B with Taxiway A, creating 90-degree intersections and mitigating non-standard geometry.
- Fee simple or aviation easement acquisition of approximately 33.7 acres of property to protect the runway protection zones (RPZs) for each runway.
- The perimeter road is rerouted to the north and south of the parallel runway to avoid impacts to expanded runway/taxiway pavements.

## LANDSIDE ALTERNATIVES

Generally, landside issues are related to the facilities necessary or designed for the safe and efficient parking and storage of aircraft, movement of pilots and passengers to and from aircraft, airport support facilities, and overall revenue support functions. To maximize airport efficiency, it is important to locate facilities together that are intended to serve similar functions. The best approach to landside facility planning is to consider the development like that of a community for which land use planning is the guide. For general aviation airports, land use in the landside areas should generally be dictated by aviation activity levels. In the case of DTO, all landside facilities are currently concentrated on the east side of the airfield. The proposed development of the Loop 288 extension along the west boundary of the airport will bring west landside development opportunities and the ability to further segregate disparate airport users.

## LANDSIDE CONSIDERATIONS

Landside planning considerations are summarized in **Table 4B**. Generally, the considerations reflect the needs of a growing general aviation airport that has strong hangar demand and growing itinerant traffic that demands greater apron capacity. Greater Jet A fuel storage capacity is needed, and an additional unleaded aviation fuel (100UL) tank may be added once 100UL fuel is more widely available and demanded by users. Consideration is also given to reserving space for advanced air mobility (AAM), a new entrant to the aviation industry, as well as for potential air cargo facilities.

**TABLE 4B | Landside Planning Considerations**

#	Landside Component	Existing Capacity	Consideration
1	Aircraft Storage Hangars	736,720 sf of existing capacity	Increase total capacity by 571,680 sf.
2	Aircraft Parking Apron	60,175 sy of apron/parking	Increase total capacity by 44,725 sy.
3	Fuel Storage Capacity	36,340 gallons (Jet A); 37,340 gallons (100LL)	Increase Jet A storage by 69,849 gallons. Add a dedicated unleaded aviation fuel (100UL) tank.
4	Advanced Air Mobility (AAM)	None	Reserve space for future vertiport and support facility development.
5	Air Cargo	None	Reserve space for the potential development of an air cargo handling facility and dedicated apron and truck loading and staging areas.
sf = square feet sy = square yards			

*Source: Coffman Associates analysis*

The following section describes a series of landside alternatives as they relate to the identified considerations. Variations of future hangar and apron developments are presented to help visualize what future facility developments could look like.

Six alternatives have been prepared: three for the east side, where existing landside facilities are already present, and three for the west side, which is largely undeveloped. The alternatives provide potential development plans aimed at meeting the needs of general aviation through the long-term planning period and beyond.

**The alternatives presented are not the only reasonable options for development.** In some cases, a portion of one alternative could be intermixed with another, and some development concepts could be replaced with others. The overall intent of this exercise is to outline basic development concepts to spur collaboration for a final recommended plan. The final recommended plan only serves as a guide for the airport to aid the City of Denton in the strategic planning of airport property. Airport operators often change their plans to meet the needs of specific users. **The goal in analyzing landside development alternatives is to focus future development so airport property can be maximized and aviation activity can be protected.**

## EAST LANDSIDE ALTERNATIVES

The east side is nearing a built-out condition with most undeveloped areas already under development for new hangar facilities. The three alternatives to follow are each similar in that they present concepts for filling in undeveloped areas with new hangars. Each alternative will also consider redevelopment of



certain areas on the east side to include the removal/relocation of some existing hangar facilities to meet the growing demand for new, larger conventional/executive style hangars. Impacted hangar units are planned to be relocated or replaced by new hangars on the west side. An area of focus for the alternatives is the segregation of uses. In this case, the future potential of west side development allows for the east side to be focused on larger facilities to support aircraft needing to operate on the longer primary runway, whereas west side development can be focused on facilities supporting smaller aircraft that are able to utilize the shorter parallel runway.

### **East Landside Alternative 1**

East Landside Alternative 1 is depicted on **Exhibit 4E** and considers the following:

- Hangar development in this alternative is focused on filling in developable property with hangar sizes and types that can accommodate larger and more sophisticated aircraft. In total, this alternative presents a net increase of 347,000 square feet (sf) of hangar capacity.
- The north portion of the east side, consisting of hangars along Taxilanes C and D, is proposed to be redeveloped to include a 24,000 square yard (sy) apron and three hangars sized to support FBO/specialty aviation service operator (SASO) types of activities.
- A 40,000-sf air cargo handling facility and associated 16,000 sy apron is proposed at the south end of the east side. This site has direct accessibility to the airfield, and the perimeter road would be improved to accommodate truck traffic to Westcourt Road.
- With the realignment of Taxiway B, the main terminal apron can be extended to provide an additional 21,350 sy for aircraft parking/circulation, particularly for larger business jets. This alternative presents a net apron increase of 70,550 sy.
- Vehicle parking is planned in the terminal area and where appropriate to accompany new hangar developments.
- Fuel storage facilities are planned to be expanded in their current locations, as needed.

### **East Landside Alternative 2**

East Landside Alternative 2 is depicted on **Exhibit 4F** and considers the following:

- Alternative 2 also considers a variety of hangar types/sizes to fill in developable property. Redevelopment is focused on the north portion (Taxilanes C and D) and south portion (between Taxilanes L and P). In total, this alternative presents a net increase of 475,000 sf of hangar capacity.
- The north portion of the east side, consisting of hangars along Taxilanes C and D, is proposed to be redeveloped to include a 24,000 sy apron with two taxilanes to support four new FBO/SASO hangars.
- Like Alternative 1, the main terminal apron is extended to provide an additional 21,350 sy for aircraft parking/circulation, particularly for larger business jets. This alternative presents a net apron increase of 64,500 sy.

- Vehicle parking is planned in the terminal area and where appropriate to accompany new hangar developments.
- Fuel storage facilities are planned to be expanded in their current locations, as needed.

### East Landside Alternative 3

East Landside Alternative 3 is depicted on **Exhibit 4G** and considers the following:

- Alternative 3 focuses on redevelopment of the north portion (Taxilanes C and D), the south portion (between Taxilanes L and P), and along Taxilane K, with the purpose of allowing development of larger conventional style hangars. In total, this alternative presents a net increase of 458,550 sf of hangar capacity.
- The north portion of the east side, consisting of hangars along Taxilanes C and D, is proposed to be redeveloped to include an extended taxilane from Taxiway A to support several new FBO/SASO style hangars.
- Taxiway B is eliminated in this alternative to create a larger main terminal apron with an additional 66,125 sy of pavement. Taxiway A becomes an apron edge taxiway with a no-taxi island created to eliminate direct access from Taxiway A4. This alternative presents a net apron increase of 84,325 sy.
- Vehicle parking is planned in the terminal area and where appropriate to accompany new hangar developments.
- Fuel storage facilities are planned to be expanded in their current locations, as needed.

## WEST LANDSIDE ALTERNATIVES

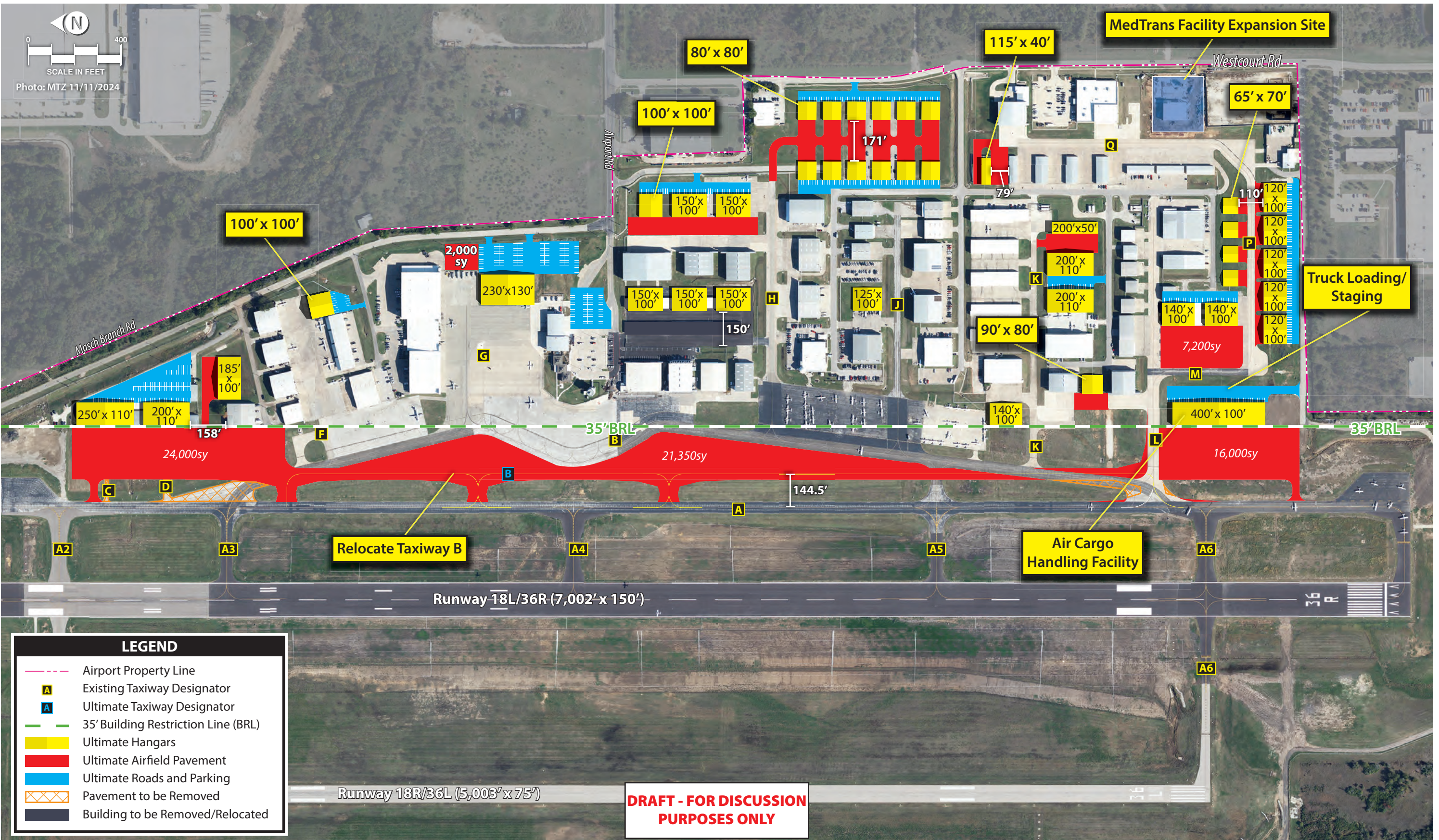
The west landside area, aside from natural gas well sites, is entirely undeveloped. Access is limited and utilities are not presently available for large scale development. However, with the east side reaching a built-out condition, focus must turn to the west side if the airport is to continue to grow. Each west landside alternative reflects proposed TxDOT plans for the extension of Loop 288, which will provide new access opportunities for the west side. To engage development on the west side, the City of Denton will likely need to invest in utility expansion and access roadways to these areas. The three alternatives to follow present conceptual layouts for new landside facility development as well as areas reserved for potential AAM facilities and non-aeronautical development.

### West Landside Alternative 1

West Landside Alternative 1 is depicted on **Exhibit 4H** and considers the following:

- Assumes parallel taxiways are set to a C-II-4000 separation distance of 300 feet from Runway 18R-36L. This pushes new landside development further back from the runway but protects against needing to relocate the parallel taxiways at some point in the future if higher design standards are achieved on the parallel runway.



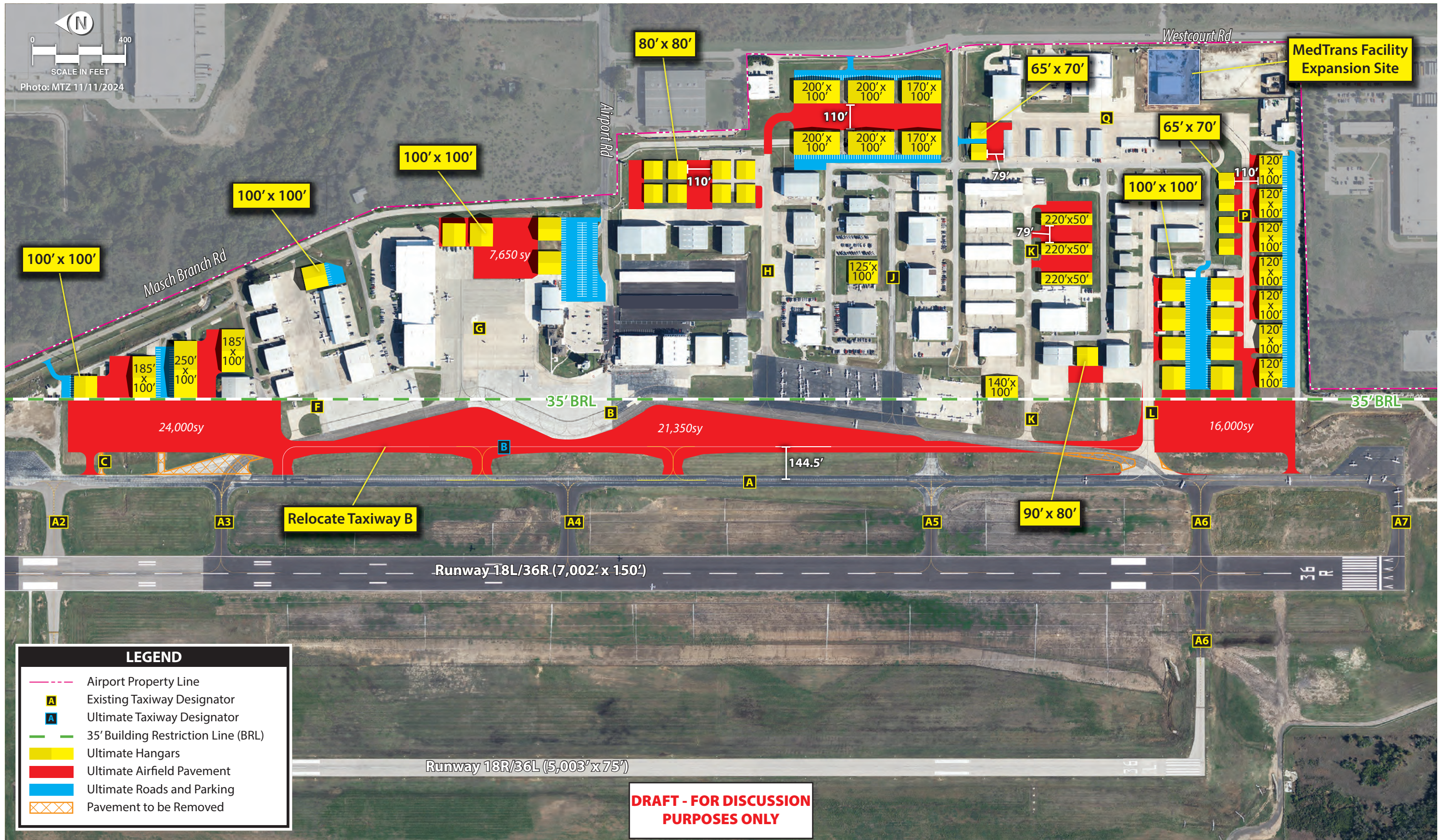


**LEGEND**

- Airport Property Line
- A Existing Taxiway Designator
- A Ultimate Taxiway Designator
- 35' Building Restriction Line (BRL)
- Ultimate Hangars
- Ultimate Airfield Pavement
- Ultimate Roads and Parking
- Pavement to be Removed
- Building to be Removed/Relocated

**DRAFT - FOR DISCUSSION  
PURPOSES ONLY**

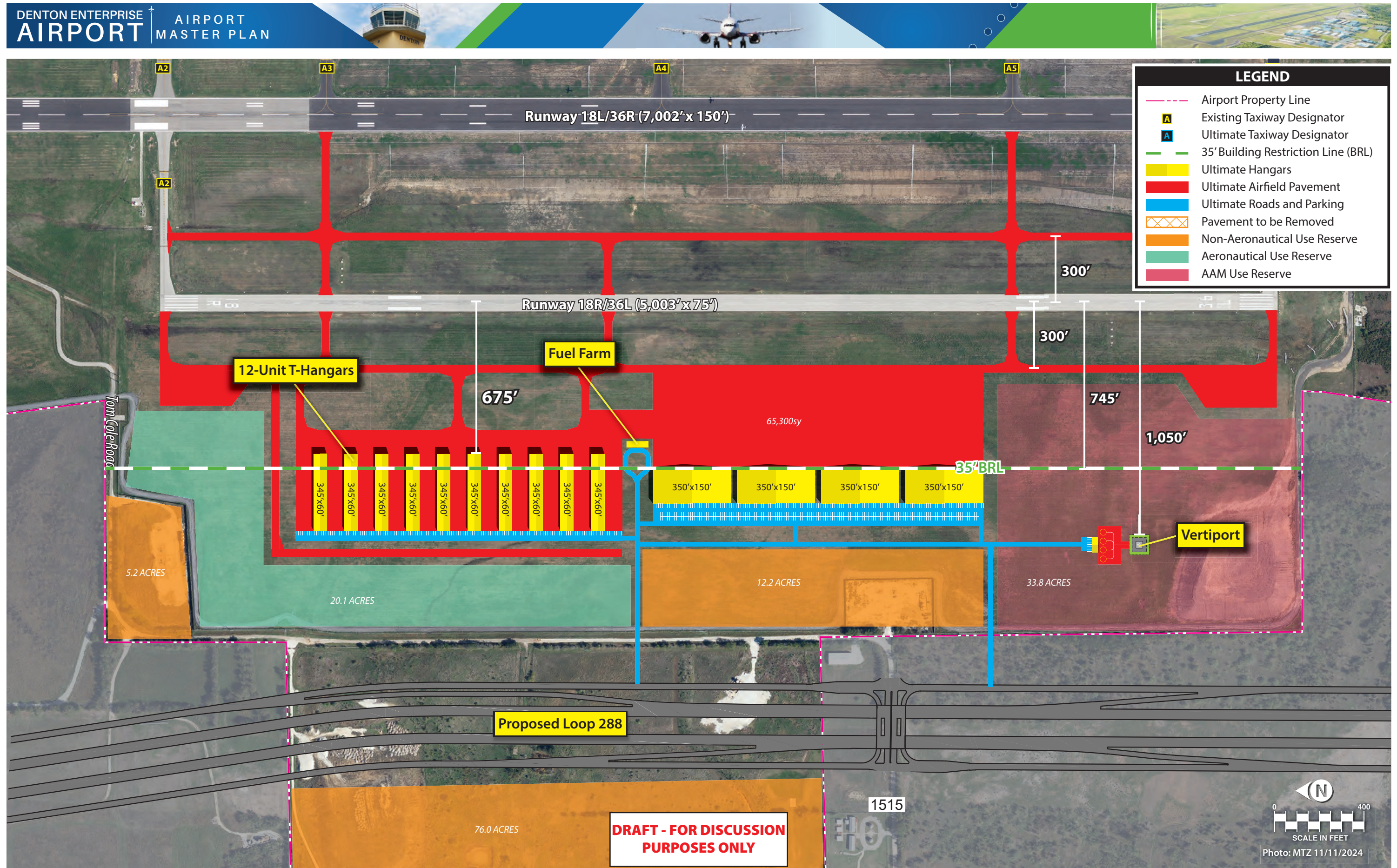
















- A 65,300 sy apron centrally located to support four large FBO/SASO hangars. Ten 12-unit T-hangars provide 120 individual storage units. In total, this alternative presents 417,000 sf of new hangar capacity.
- A taxilane extension to provide aeronautical access to 20.1 acres of property reserved for future development, which will include SASO and small hangar facilities.
- A centralized fuel farm consisting of Jet A, 100LL, and 100UL fuel tanks, including self-service.
- The south 33.8 acres is reserved for AAM development, including a vertiport, aircraft parking, a small terminal facility, and vehicle parking. The vertiport is separated from Runway 18R-36L by 1,050 feet, which exceeds the 700-foot minimum separation distance recommended in the FAA's draft Engineering Brief (EB) 105A, *Vertiport Design*. However, EB105A also notes that vertiports located between 700 and 2,499 feet from a runway centerline may still experience impacts by eVTOL wake turbulence. This location for a vertiport would also put eVTOL operations directly under the downwind leg of the traffic pattern for aircraft operating right hand traffic to Runway 18R and for left hand traffic to Runway 36L. The FAA cautions airports with significant amounts of visual flight rule (VFR) traffic, which is the case for DTO, that a vertiport located below the visual traffic pattern may experience additional delays as controllers sequence eVTOL arrivals and departures with aircraft in the visual traffic pattern.
- Due to the large electricity demands associated with AAM eVTOL aircraft, AAM reserve areas could also include solar farms to help provide on-site electricity generation, lessening off-airport energy demand.
- Reserving 93.4 acres for non-aeronautical uses. These areas, which include the existing natural gas well sites, could be developed with new commercial/industrial developments. The non-aeronautical reserve areas are those that are cut off from airfield access by vehicle roads or the proposed Loop 288.

## West Landside Alternative 2

West Landside Alternative 2 is depicted on **Exhibit 4J** and considers the following:

- Assumes parallel taxiways are set to a B-II-4000 separation distance of 240 feet from Runway 18R-36L. This separation meets current design standards and allows for deeper apron development between the taxiway and the 35-foot building restriction line (BRL). However, at this separation, the airport risks having to undergo a future project to relocate the taxiways out to a 300-foot separation if higher design standards are achieved on the parallel runway.
- A 77,000 sy apron centrally located to support three columns of large FBO/SASO style hangars; six columns of executive style hangars, totaling 36 individual hangars; and six 12-unit T-hangars to provide 72 individual storage units. In total, this alternative presents 489,600 sf of new hangar capacity.
- A 5,000 sf GA terminal is included to provide terminal services to tenants and visitors to the west side. An adjacent fuel farm, consisting of Jet A, 100LL, and 100UL fuel tanks, to support the FBO/SASO hangars and self-serve users.





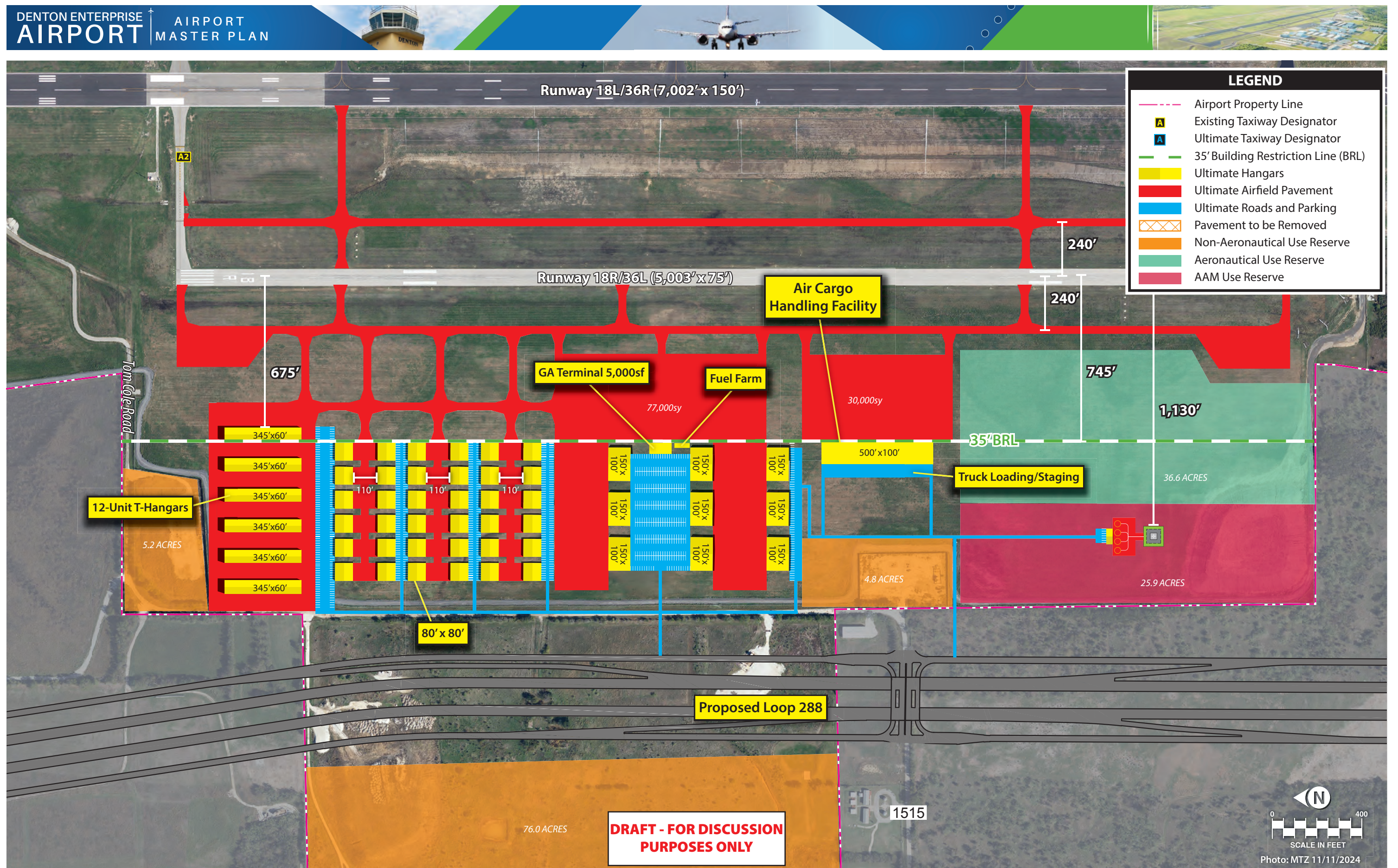
- The southwest 25.9 acres is reserved for AAM development. The vertiport is separated from Runway 18R-36L by 1,130 feet. Like Alternative 1, this separation exceeds the recommended 700-foot minimum separation distance from the runway, but would have similar wake turbulence concerns, as well as cause potential operational delays due to its location under the Runway 18R-36L traffic pattern. The remaining portion of the AAM site can be developed with a solar farm to support electric charging for eVTOL aircraft.
- A 50,000 sf air cargo handling facility with truck loading/staging area and dedicated 30,000 sy apron. The west side location for air cargo provides easy truck access to the proposed Loop 288.
- Reserving 36.6 acres along the parallel runway flightline for future aeronautical developments to include new hangars and FBO/SASO facilities.
- Reserving 86.0 acres for non-aeronautical uses. These areas, which include the existing natural gas well sites, could be developed with new commercial/industrial developments. The non-aeronautical reserve areas are those that are cut off from airfield access by vehicle roads or the proposed Loop 288.

### West Landside Alternative 3

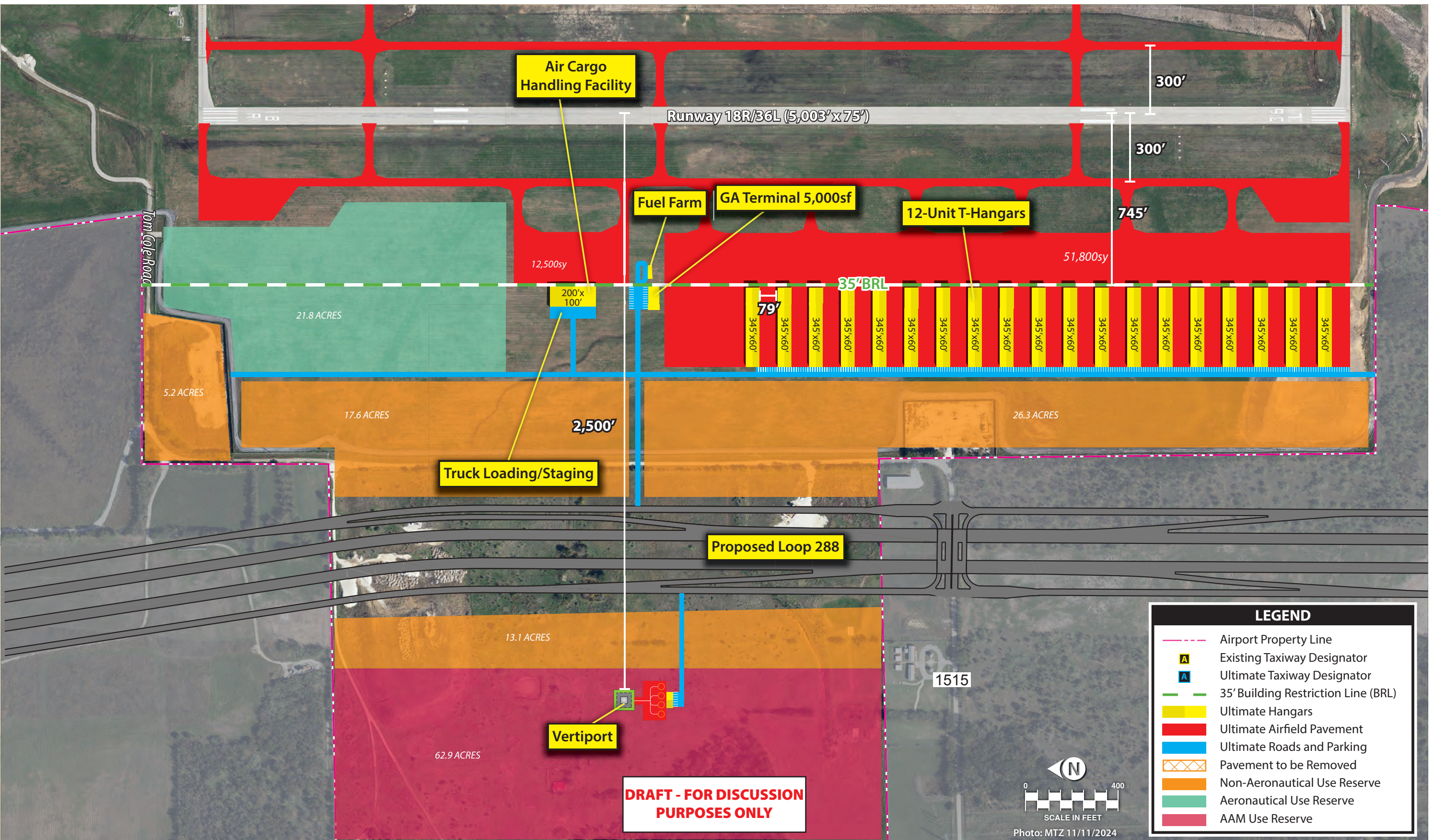
West Landside Alternative 3 is depicted on **Exhibit 4K** and considers the following:

- Assumes parallel taxiways are set to a C-II-4000 separation distance of 300 feet from Runway 18R-36L. This pushes new landside development further back from the runway, but protects against needing to relocate the parallel taxiways at some point in the future if higher design standards are achieved on the parallel runway.
- Hangar development focus in this alternative is entirely on small aircraft T-hangar facilities. A 51,800-sy apron to support 19 new 12-unit T-hangars, providing 228 individual storage units. In total, this alternative presents 393,300 sf of new hangar capacity.
- A 5,000 sf GA terminal is included to provide terminal services to tenants and visitors to the west side. An adjacent fuel farm, consisting of Jet A, 100LL, and 100UL fuel tanks, to support the FBO/SASO hangars and self-serve users.
- A 20,000-sf air cargo handling facility with truck loading/staging area and dedicated 12,500 sy apron. The west side location for air cargo provides easy truck access to the proposed Loop 288.
- Reserving 21.8 acres along the parallel runway flightline for future aeronautical developments, which will include new hangars, FBO/SASO facilities, and future air cargo facility expansion.
- 62.9 acres located west of proposed Loop 288 is reserved for AAM development. This location offers the ability to meet the minimum 2,500-foot separation from Runway 18R-36L, which is needed to provide independent flight paths and minimal disruption to runway operations. This site is also further out from the standard traffic pattern for Runway 18R-36L, which will potentially avoid controller sequencing issues with eVTOL and fixed-wing aircraft in the visual traffic pattern.











- Reserving 62.2 acres for non-aeronautical uses. These areas, which include the existing natural gas well sites, could be developed with new commercial/industrial developments. The non-aeronautical reserve areas are those that are cut off from airfield access by vehicle roads or the proposed Loop 288.

## SUMMARY

This chapter presents an analysis of various options that may be considered for specific airport elements. The need for alternatives is typically spurred by projections of aviation demand growth and/or by the need to resolve non-standard airport elements. Several development alternatives related to both the airside and the landside have been presented.

The next step in the master plan development process is to arrive at a recommended development concept. Participation of the PAC and the public will be important considerations. Additional consultation with the FAA and TxDOT may also be required. Once a consolidated development plan is identified, a 20-year capital improvement program will be presented that includes a prioritized list of projects tied to aviation demand and/or necessity. Finally, a financial analysis will be presented to identify potential funding sources and show airport management what local funds will be necessary to implement the plan.