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2022 Airport Master Plan
Tooele Valley Airport / TVY

RS&H

Tooele Valley Airport Identification and Evaluation of Development Alternatives

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Prepared by RS&H, Inc. at the direction of
Salt Lake City Department of Airports

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CHAPTER 4

IDENTIFICATION AND EVALUATION OF DEVELOPMENT ALTERNATIVES

4.1 INTRODUCTION

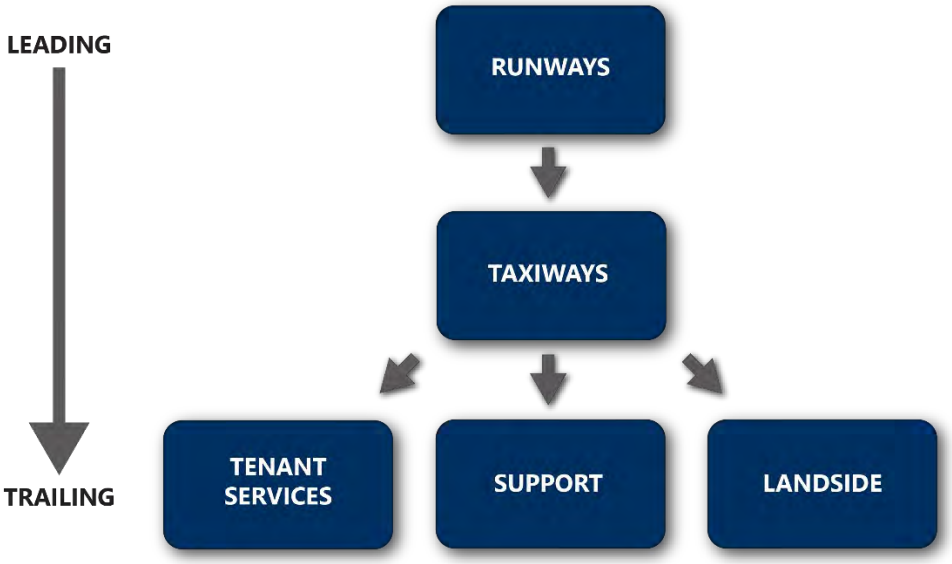
This chapter identifies and evaluates facility development alternatives for Tooele Valley Airport based on the facility requirements determined in **Chapter 3, Facility Requirements**. The primary purpose behind identifying and evaluating various alternative development options is to ensure airport facilities are capable of meeting projected activity demand levels, make efficient and effective use of available airport land, and meet FAA airfield design standards. Every potential alternative in this chapter has been thoroughly analyzed, refined, and vetted through the stakeholder involvement process to define a plan reflective of user needs, community values, SLCDA preferences, and the unique operational nature of the airport.

Analysis of development alternatives begins by defining a vision for airport land use patterns. This vision was vetted through a public process described within **Appendix X, Stakeholder Visioning**. Within that land use vision, alternative development options meeting projected facility demand are analyzed and aligned with existing and future land use patterns. This sets the stage for an airport development plan that extends beyond the planning period identified in this study and enables long-term strategic development. For the purposes of this study, planning activity level (PAL) 3 facility needs will inform the development of an Airport Layout Plan able to guide development throughout the planning period.

This chapter also explains the process by which alternatives development concepts were analyzed and evaluated. One critical component to crafting development alternatives is defining leading planning elements and trailing planning elements. Leading elements are primary facilities that require significant amounts of land and/or capital investment to implement, and whose placement and configuration must take precedence when formulating alternatives. At Tooele Valley Airport, these facilities include airfield elements such as runways and taxiways. Trailing elements are those whose placement and configuration are influenced by, and dependent on, the decisions made for primary facilities. Trailing elements at the airport include aircraft storage facilities, the landside/roadway system, and aviation support facilities. Defining the division between leading and trailing elements allows the initial focus of analysis to be on determining solutions for those high cost, and more permanently affixed leading elements. The placement and decisions surrounding the leading elements typically influence the location and layout of the trailing elements. **Figure 4-1** shows the relationship between leading and trailing elements at TVY.

The following sections lead the reader through the process of alternative concept development. This process will be narrated in detail, including evaluation criteria, initial design charrette concepts, and review of those concepts against established goals and criteria. The process then moves into the refinement and identification of the favored alternative options through stakeholder input, and the resulting preferred development alternative. The identification and evaluation of alternatives is an iterative process and the information presented in this chapter is a summary to present key criteria and factors leading to the selection of the preferred airport development plan.

FIGURE 4-1
AIRPORT PLANNING ELEMENTS



Source: RS&H Analysis, 2022

4.2 ALTERNATIVES ANALYSIS PROCESS

The following section identifies and describes the steps involved in the alternatives development process. Using this process, design charrettes were held to brainstorm ultimate land use pattern visions and various options for future airport development through PAL 3.

4.2.1 Steps in the Alternatives Analysis Process

The airport alternatives development approach was organized into the following steps:

1. Gather information related to airport users/community vision for airport development (Visioning)
2. Describe and evaluate existing airport land use patterns (Inventory and Facility Requirements)
3. Define evaluation criteria
4. Delineate constraining factors such as environmental conditions
5. Craft an ultimate on-airport land use pattern vision
6. Create alternative development options in-line with on-airport land use pattern vision as well as off-airport land use regulations
7. Analyze preferred options against planning, engineering, operational, and financial criteria
8. Select preferred development future

Prior to beginning the master plan, stakeholder advisory groups were established. These stakeholders represented a diverse array of community representatives acting as partners and valuable resources throughout the alternatives development and evaluation process. All alternatives within the chapter have been presented and refined through the public involvement process.

4.3 ALTERNATIVES EVALUATION CRITERIA

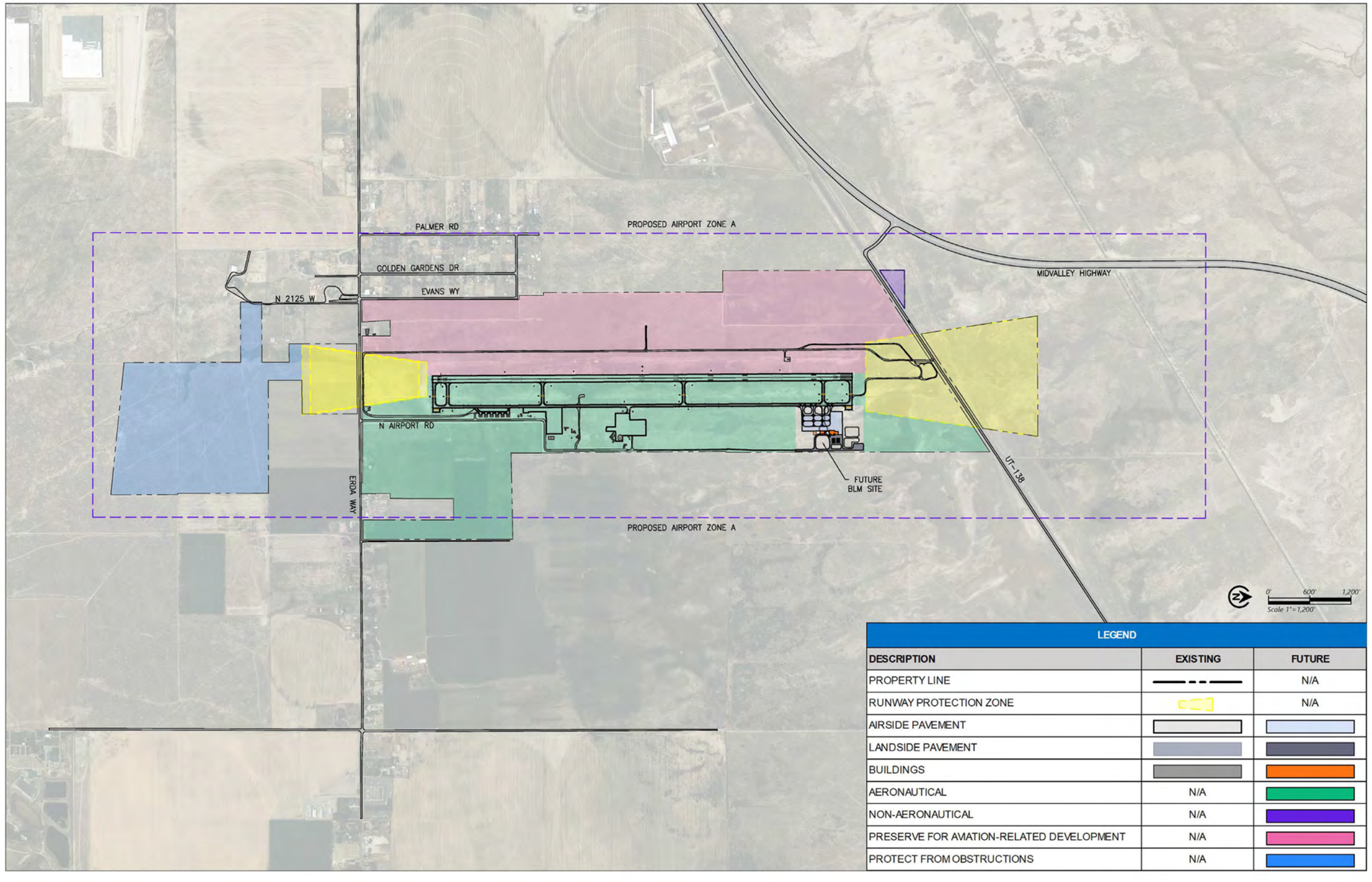
Throughout the alternative development process, evaluation was performed based on guidance provided from a combination of SLCDA visioning goals and general airport planning criteria. At a high level, each concept was evaluated against the following criteria:

- Operational and public safety
- Operational efficiency
- Ability to meet FAA airfield design standards
- Effectiveness to service target users
- Resolution of current issues
- Long-term facility requirements are met
- Appropriate level of service is provided
- Ease of implementation
- Realistic cost to implement (capital investment and operating)
- Flexibility and future expansion potential
- Supports sustainable development principles

4.4 LAND USE VISION

Tooele Valley Airport is largely undeveloped. Bounded by Erda Road on the south and State Route 138 (UT-138) on the north, there are large areas of land adjacent to the runway and taxiways that can accommodate aeronautical development far beyond forecast demand over the 20-year planning period. It is recommended that SLCDA preserve most of the airport land for aeronautical and aviation-related development and protect airspace from obstructions off the extended runway centerline by keeping property clear of any development. **Figure 4-2** shows the preferred land use vision as vetted through airport leadership and the stakeholder engagement process.

FIGURE 4-2
TVY LAND USE VISION



LEGEND		
DESCRIPTION	**EXISTING**	**FUTURE**
PROPERTY LINE		N/A
RUNWAY PROTECTION ZONE		N/A
AIRSIDE PAVEMENT		
LANDSIDE PAVEMENT		
BUILDINGS		
AERONAUTICAL	N/A	
NON-AERONAUTICAL	N/A	
PRESERVE FOR AVIATION-RELATED DEVELOPMENT	N/A	
PROTECT FROM OBSTRUCTIONS	N/A	

Source: RS&H Analysis, 2023

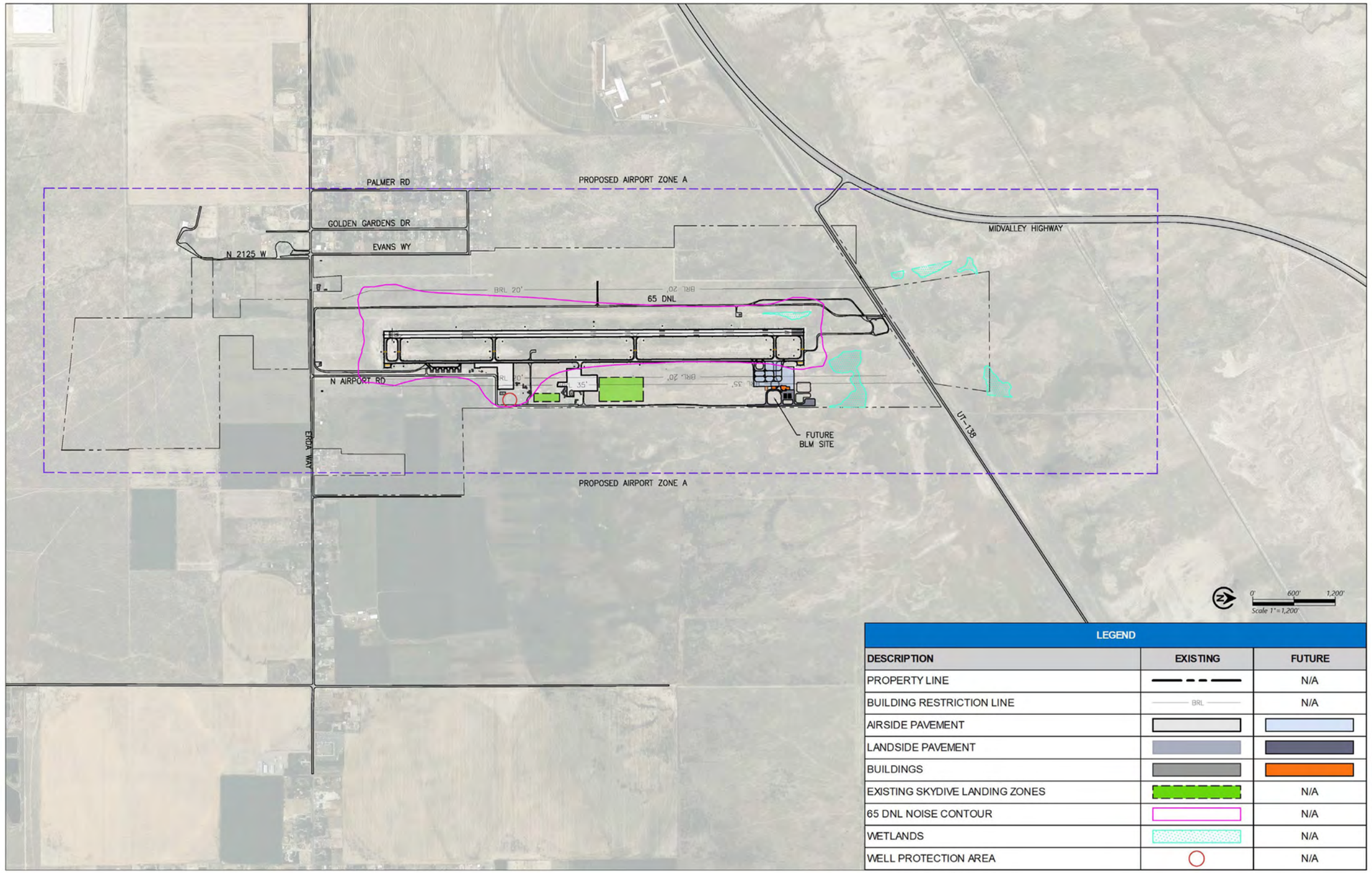
4.4.1 Constraining Factors

Development at any public airport needs to be responsive to regulations, environmental factors, and pervasive conditions such as ongoing development. Constraining factors for development at TVY warranting consideration include:

- Bureau of Land Management site development
- 14 CFR Part 77 (Part 77) imaginary surfaces and supporting building restriction lines (BRLs)
- US Army Corps of Engineer (USACE) determined wetlands
- Aircraft noise contours (as modeled using FAA Aviation Environmental Design Tool (AEDT))
- Existing TVY water well protection zone

This section describes those constraining factors as shown in **Figure 4-3**.

FIGURE 4-3
CONSTRAINING FACTORS

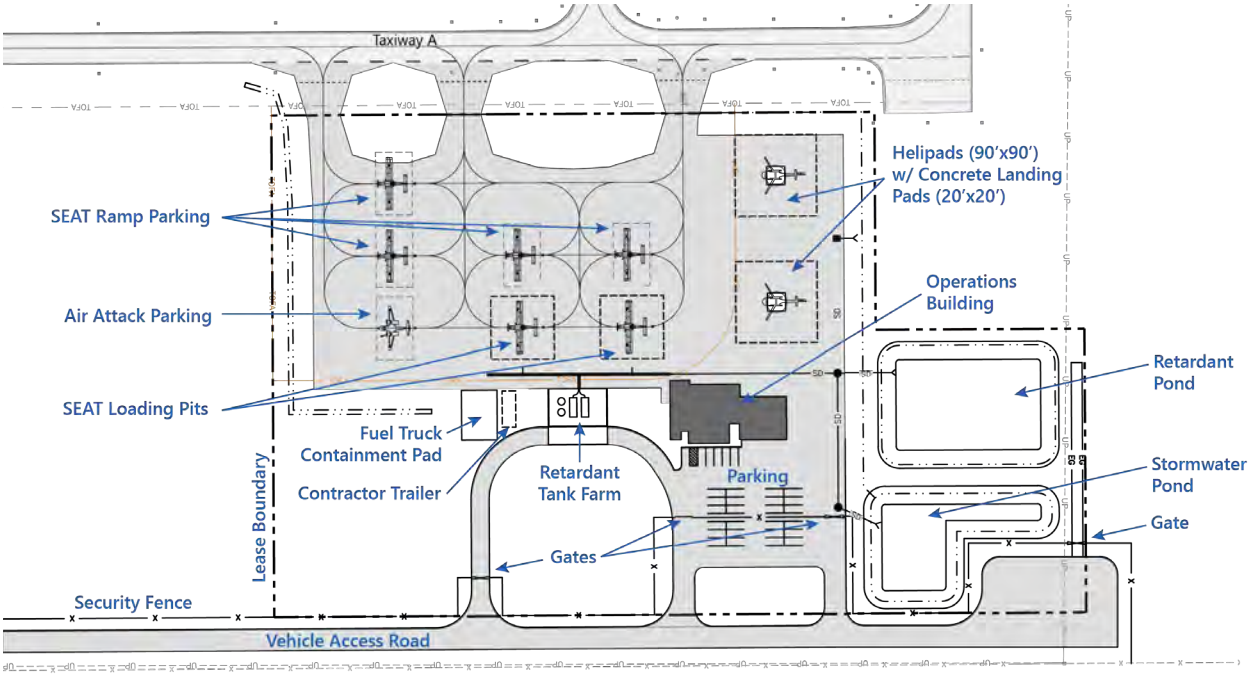


Source: RS&H Analysis, 2023

4.4.1.1 Bureau of Land Management Development

During this master planning study, the Bureau of Land Management (BLM) leased land and is designing a new facility at the north end of the TVY airfield. Preliminary design drawings were reviewed and integrated into alternatives planning as "existing" facilities to preserve the space and account for the land use. **Figure 4-4** shows preliminary site design plans which are accounted for in the alternatives planning process.

FIGURE 4-4
BUREAU OF LAND MANAGEMENT PRELIMINARY SITE PLAN



Source: Bureau of Land Management; Prepared by RS&H, 2023

4.4.1.2 14 CFR Part 77 Imaginary Surfaces

Federally regulated Part 77 imaginary surfaces are defined to promote the safe and efficient use of airspace by identifying potential obstructions to air navigation prior to their construction. Building Restriction Lines (BRLs) protect Part 77 surfaces by defining the height at which a penetration to the imaginary surface would constitute an obstruction. It is important to consider any object height which will be present within the BRL area, even if temporary, and particularly the tails of aircraft parked near or within any protected surface areas. Part 77 approach surfaces are dependent upon the type of approach (visual or instrument) serving the runway, ultimately limiting locations and heights of obstacles within the approach surface area. Any obstruction within these protected surfaces, whether permanent or temporary, is subject to the FAA Form 7460 obstruction evaluation process. Proposed alternative concepts will take caution not to plan development that may impact these protected surfaces.

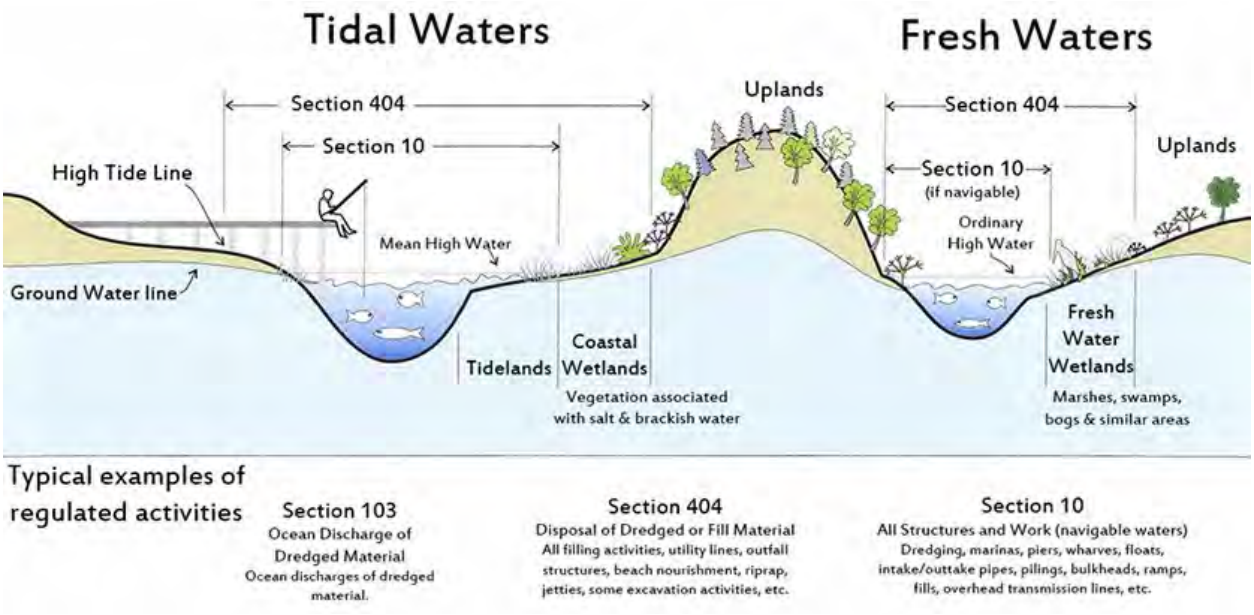
4.4.1.3 Jurisdictional Wetlands

Wetlands are protected by the Environmental Protection Agency (EPA) of the federal government under the Clean Water Act of 1972 (CWA) and the National Environmental Policy Act of 1969 (NEPA). The CWA serves to protect wetlands from pollutants and adverse impacts to surface water quality. NEPA serves as a

tool to inform and involve the public in any development decisions which carry significant impact to the natural environment, such as waters and wetlands.

The SLCDA completed an ASACE-accepted wetlands determination as part of the master plan process to identify wetland locations on airport property. **Figure 4-5** shows a synopsis of typical regulated activities under USACE jurisdiction. This process established UASCE jurisdictional determined wetlands within the TVY property boundary as identified on **Figure 4-3**. All projects funded by federal grants which take place in determined wetlands would need to undergo the NEPA process and permits authorizing proposed development alterations under Section 404 of the CWA.

FIGURE 4-5
USACE REGULATORY JURISDICTION



Source: Retrieved September 9, 2022 from https://www.nwp.usace.army.mil/Missions/Regulatory/Jurisdiction

4.4.1.4 Aircraft Noise Contours

As part of the master plan, an evaluation of baseline (calendar year 2020) and forecast (calendar year 2040) aircraft noise contours was performed using the FAA AEDT. Flight track data obtained from Envirosuite for the period of April 2020 through October 2021 was used to develop the existing fleet mix and day/night and modeled flight tracks. Radar data was scaled to the operational counts for 2020 and 2040 from aviation demand forecast data (**Chapter 2, Aviation Forecasts**). **Appendix X** provides the analysis and conclusions of the evaluation and 65 DNL noise contours are shown on **Figure 4-3**.

4.4.1.5 Water Well Protection Area

Additionally, TVY currently relies on a well system to provide limited water to select airport facilities. A buffer is established around the well to protect infrastructure and water supply (shown in **Figure 4-3**).

4.4.2 Preferred Aeronautical Land Use Sub Area Plan

Aeronautical land at TVY supports the following four primary existing and future uses:

- Aircraft parking and storage
- Future fixed base operator and fuel storage
- Bureau of Land Management firefighting
- Skydiving facilities and landing zones

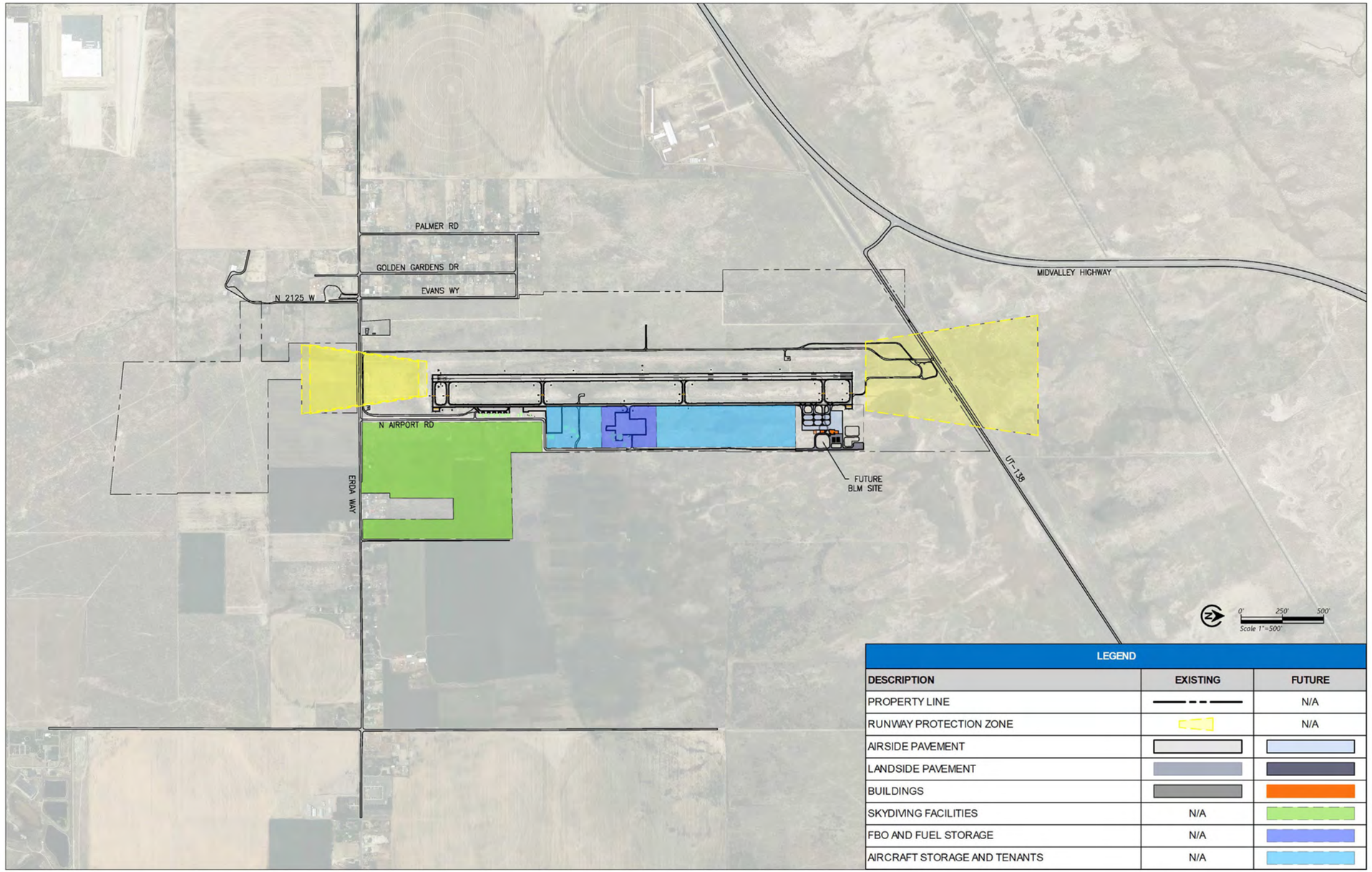
The BLM lease is set at the north end of the airfield. No master plan alternatives are proposed that impact these facilities. Rather, the ability for BLM facilities to expand in place will be considered during alternatives evaluation.

Skydiving facilities exist in the central portion of the airfield with landing zones flanking the buildings and apron area. Maximizing land adjacent to the airfield for facilities serving aircraft operations is desirable over large areas of empty land cleared for safe landing of parachuters. Opportunities at the south end of the airfield exist to allow separation of skydiving operations from other aeronautical uses with a larger clear area away from the airfield for parachute landings, while remaining conveniently adjacent to skydive facilities.

Accommodating development of a future fixed base operator at TVY is important not only to serving projected market demand at the airport, but equally as important, serving its role in meeting demand within the SLCDA system of airports. Establishment of water and sewer utilities at TVY will enable the airport to better serve its role in supporting these types of regional operations as quality development is better enabled through access to utilities. FBO facilities can be locationally flexible to work within existing development but, ideally, they are positioned well to promote efficiency to help attract private investment in developing, managing, and maintaining the facilities. TVY can accommodate development of an FBO in the center of the airfield (east side of runway), which is the most optimal location to provide high quality service to users. The sub area land use plan shows the general area where an FBO with supporting fuel storage facilities, tie-down apron, and large hangars should be located.

The remaining areas of land are preserved for development of aircraft parking/storage facilities based on market demand. Locating based aircraft storage adjacent to FBO's and fueling facilities is preferred by hangar owners and FBO's alike as they support each other's needs.

FIGURE 4-6
PREFERRED AERONAUTICAL LAND USE SUB AREA PLAN



Source: RS&H Analysis, 2023

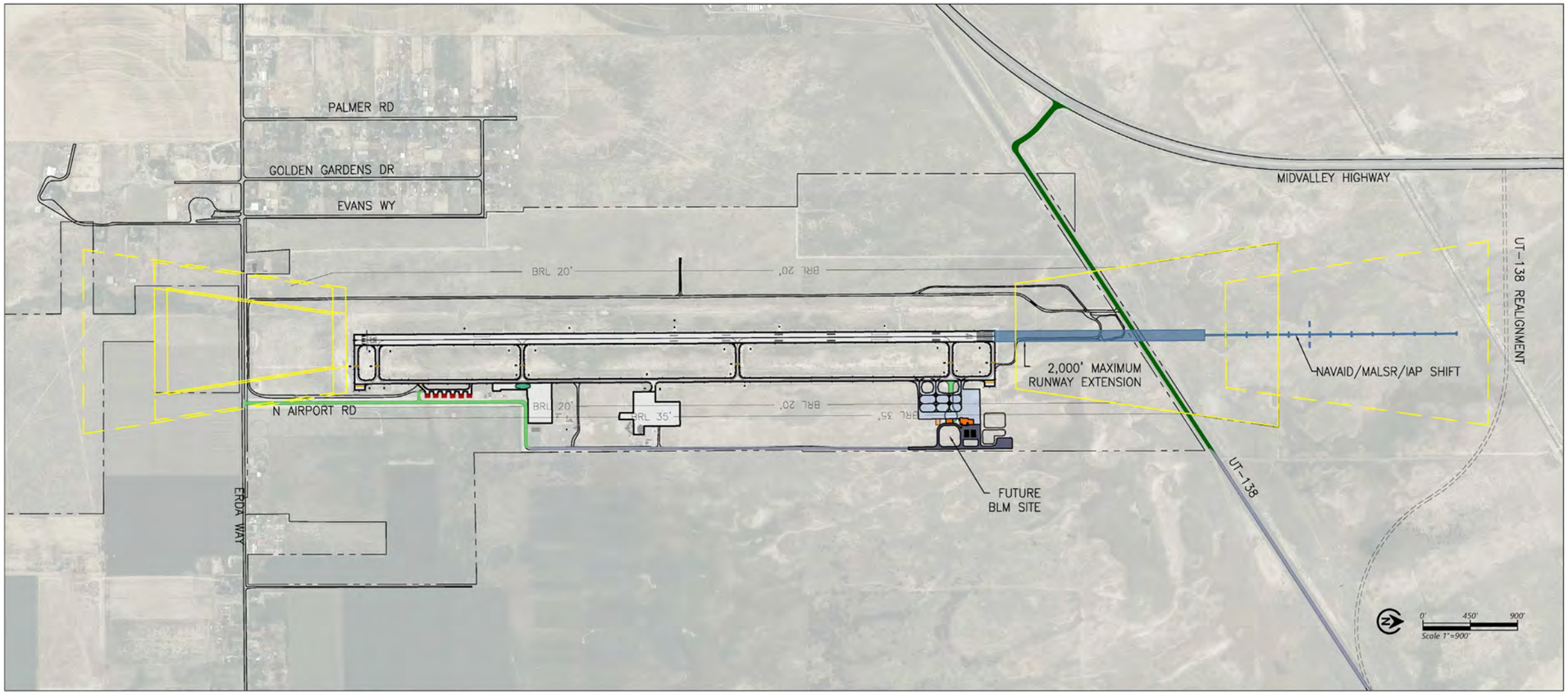
4.5 AIRFIELD DEVELOPMENT PLAN

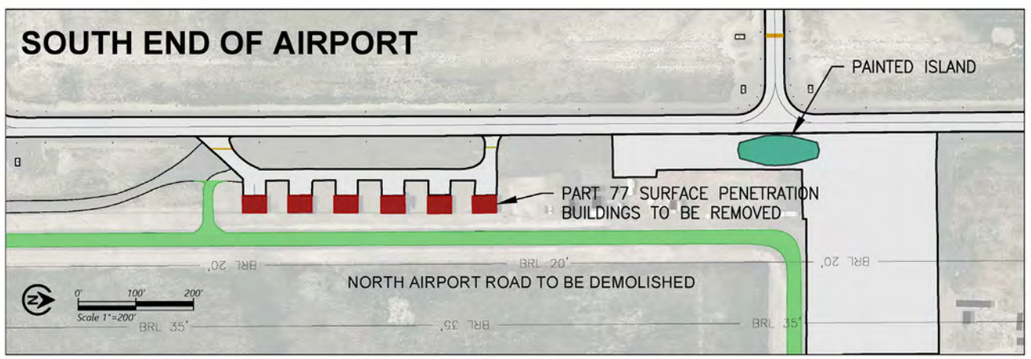
The TVY airfield is the leading planning element because the runway and taxiway configuration and infrastructure are the least flexible at the airport, being highly dictated by terrain, predominant meteorological conditions, aircraft performance requirements, the airport's fleet mix, and FAA design standards, guidance, and best practices. The existing TVY runway design is adequate to serve forecasted demand over the planning period and, although some business jets may be weight/range limited at times, the runway length can safely accommodate performance demands of the existing fleet mix, which varies from small piston aircraft to small business jets. The focus of airfield development plan is correction of FAA design standard deficiencies and SLCDA preparation for facility demands beyond the planning period.

Figure 4-7 shows the recommended actions for correcting airfield-related issues and preparation for future needs. These improvements include:

- Replacing and removing six hangars penetrating the Part 77 transitional surface
- Correcting a direct apron-to-runway access point at Taxiway A3
- Acquiring land to enable a future runway extension up to 2,000 feet
- Realigning UT-138 to avoid a future runway extension RPZ

FIGURE 4-7
TVY AIRFIELD ALTERNATIVES





LEGEND			
DESCRIPTION	**EXISTING**	**FUTURE**	**ULTIMATE**
PROPERTY LINE		N/A	N/A
BUILDING RESTRICTION LINE	BRL	N/A	N/A
RUNWAY PROTECTION ZONE		N/A	
AIRSIDE PAVEMENT			
LANDSIDE PAVEMENT			
PAVEMENT TO BE REMOVED	N/A		
BUILDINGS			N/A
BUILDINGS TO BE REMOVED	N/A		N/A

Source: RS&H Analysis, 2023

Replacing the six hangars currently penetrating the Part 77 transitional surface (identified by height above ground level value as the 20-foot Building Restriction Line) is critical to protecting safe and efficient air navigation. Proposed replacement locations for these hangars are identified in alternatives later within this chapter.

All facility development alternatives within this chapter address the direct runway access from apron by implementing a painted island according to AC 150/5300-13B standards.

The future critical aircraft at TVY is the Cessna Citation X+, which requires up to 8,283 feet of runway to accommodate unrestricted operations. While this aircraft does not currently operate at a level that enables AIP supported funding for a runway extension to meet these performance needs, it is sensible to develop a plan that allows for this beyond the 20-year planning period. Therefore, **Figure 4-8** shows land preservation and acquisition requirements to allow for an up to 2,000' runway extension with associated navigational aids, RPZ, and safety areas, beyond the planning period. The figure also demonstrates the impact to UT-138 and a potential realignment path to meet the Midvalley Highway. Alternatives to extend the Runway at the south end were not considered as rising terrain south of the airport and early airspace analysis deemed a southern extension impractical, if not impossible.

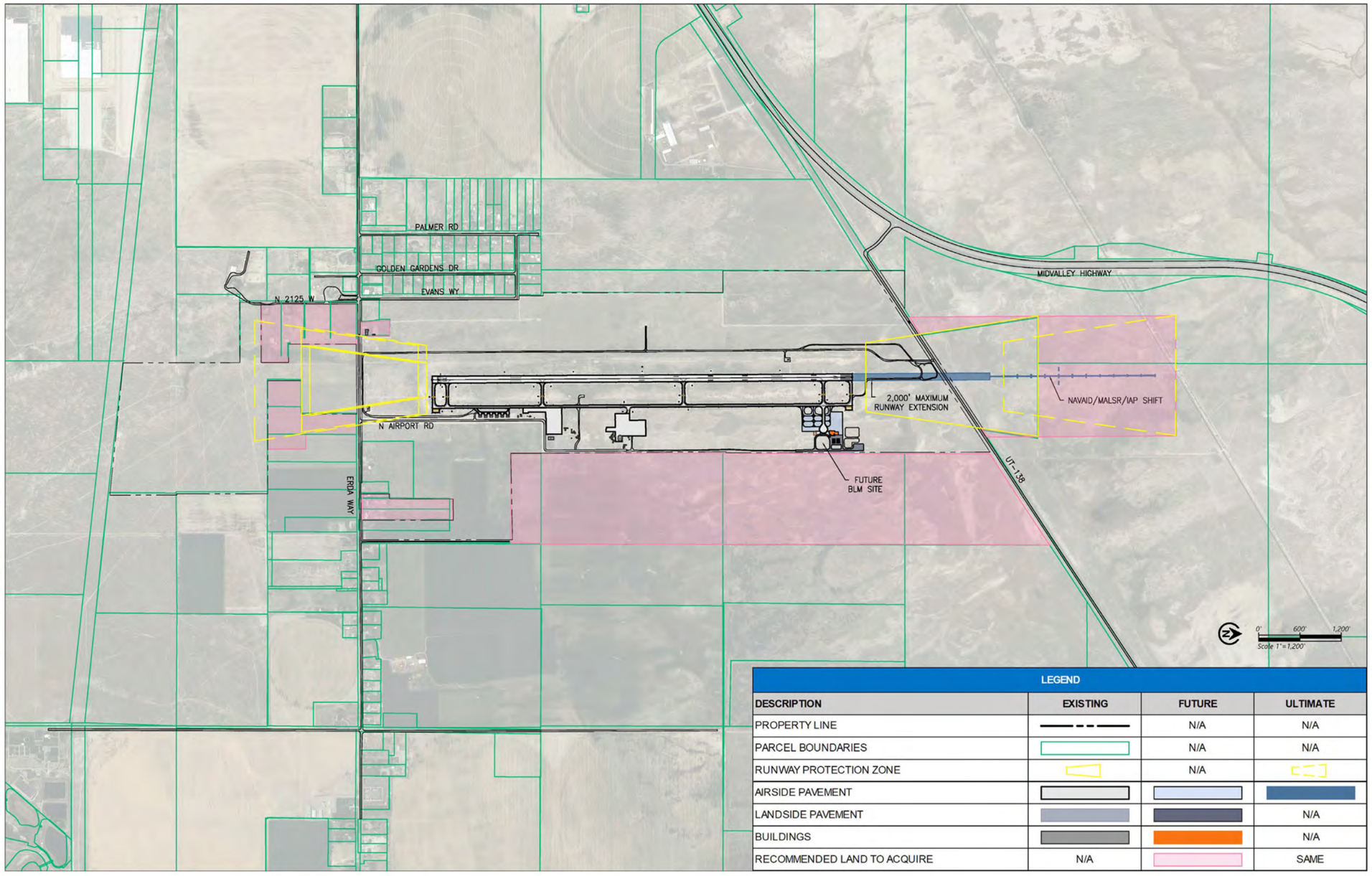
4.6 RECOMMENDED LAND FOR ACQUISITION OR EASEMENT

There are many areas of land surrounding the airport not currently owned by SLCDA which would be beneficial in protecting the utility of the airport and avoiding development of incompatible uses. These areas of land are shown in **Figure 4-8**. Parcels identified in the graphic include the following:

- Parcels 01-419-0-0042, 01-452-0-0011, 01-452-0-0001, and 01-409-0-0001 – Walters Ranch LLC
- Parcels 01-434-0-0005 (partial) and 01-409-0-0007 (partial) – Six Mile Ranch
- Parcel 01-419-0-0021 – 1710 W Erda Way
- Parcel 01-419-0-0008 – 1690 W Erda Way
- Parcels 15-049-0-0208, 15-049-0-0210, and 15-049-0-0204 (partial) – Walters
- Parcel 01-453-0-0001 – 2070 W Erda Way *(existing avigation easement)*
- Parcel 14-011-0-0004 – 3966 N 2125 West
- Parcel 14-011-0-0003 – 3908 N 2125 West
- Parcel 14-011-0-0002 – 3854 N 2125 West
- Parcel 14-011-0-0001 – 3808 N 2125 West

Land south of the airport would serve to protect the approach and departure surfaces from obstructions to airspace as well as enabling protection of a potential larger future RPZ should a below ¾ mile visibility instrument approach be developed for Runway 17. Acquiring land east of the airport enables development of future aeronautical and/or non-aeronautical facilities that are compatible with airport operations. Acquiring land north of the airport allows for an ultimate runway extension up to 2,000 feet with protections for future safety areas, RPZs, and navigation equipment such as a relocation of the existing instrument landing system and approach lighting system.

FIGURE 4-8
RECOMMENDED LAND FOR ACQUISITION OR EASEMENT



Source: Tooele County GIS Parcel Data; 2021 Airport Overlay Zone Study; RS&H Analysis, 2022

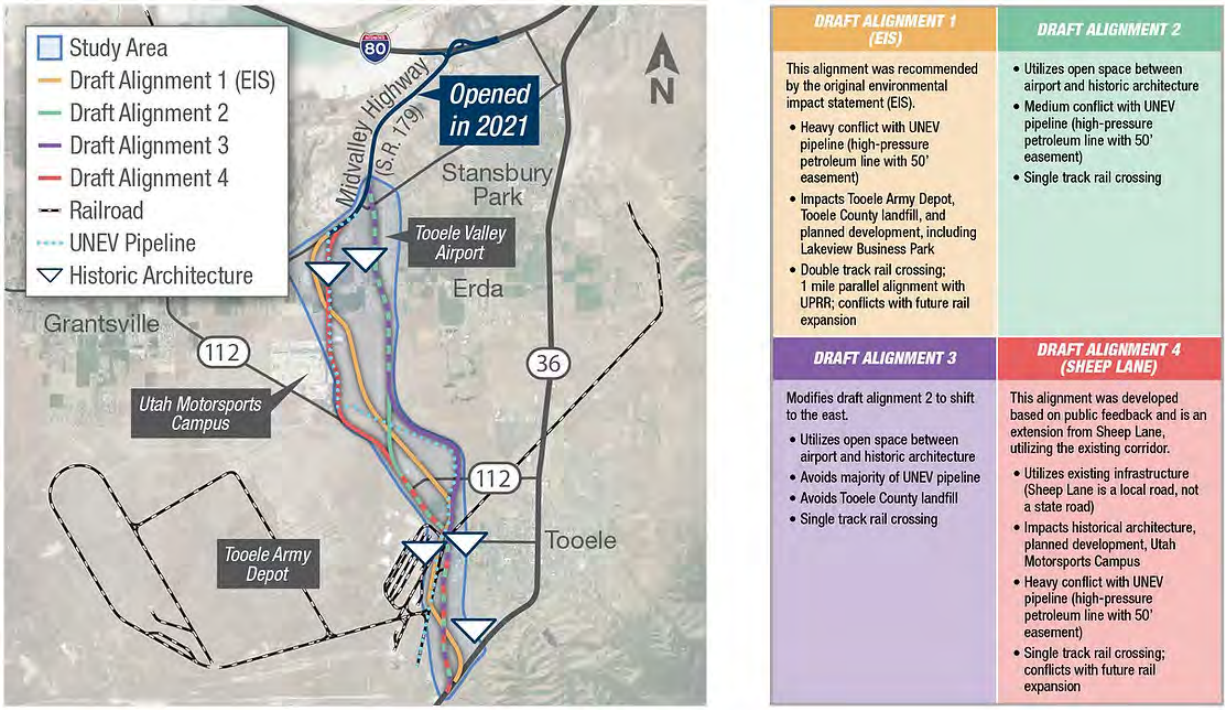
4.7 LANDSIDE ACCESS ALTERNATIVES

Safe and efficient regional access, primarily via roadways for TVY, is key to airport development. The connectivity of on-airport roadways to regional systems is also important when organizing access and airport land use.

4.7.1 Regional Access

Tooele Valley Airport is accessed via the N Airport Rd entrance on Erda Road at the south end of the airport. However, the regional highway connection to the population center (Salt Lake City metropolitan area) is the Midvalley Highway at the north end of the airfield. At the time of this writing, the state is conducting an Environmental Assessment for alignments of a southern extension to the Midvalley Highway from the area where it connects with State Route 138. Draft alignments of this extension (see **Figure 4-9**) show the highway routing through the western property boundary of TVY (Draft Alignments 2 and 3). Precise alignments were not available at the time of this study; however, high-level analysis of Draft Alignment 2 and Draft Alignment 3 show the potential of routing the extension through the existing and potential future RPZ. These comments have been passed along through the EA public process as concerns to SLCDA because they would hinder the airport's ability to meet FAA airport design criteria and potentially reduce the utility of a public facility that has received significant financial investment from federal, state, and local entities. The schedule shows this EA concluding in the first half of 2023.

FIGURE 4-9
MIDVALLEY HIGHWAY EXTENSION ROUTES STUDIED IN ENVIRONMENTAL ASSESSMENT



Source: https://udot.utah.gov/midvalley, Retrieved December 21, 2022

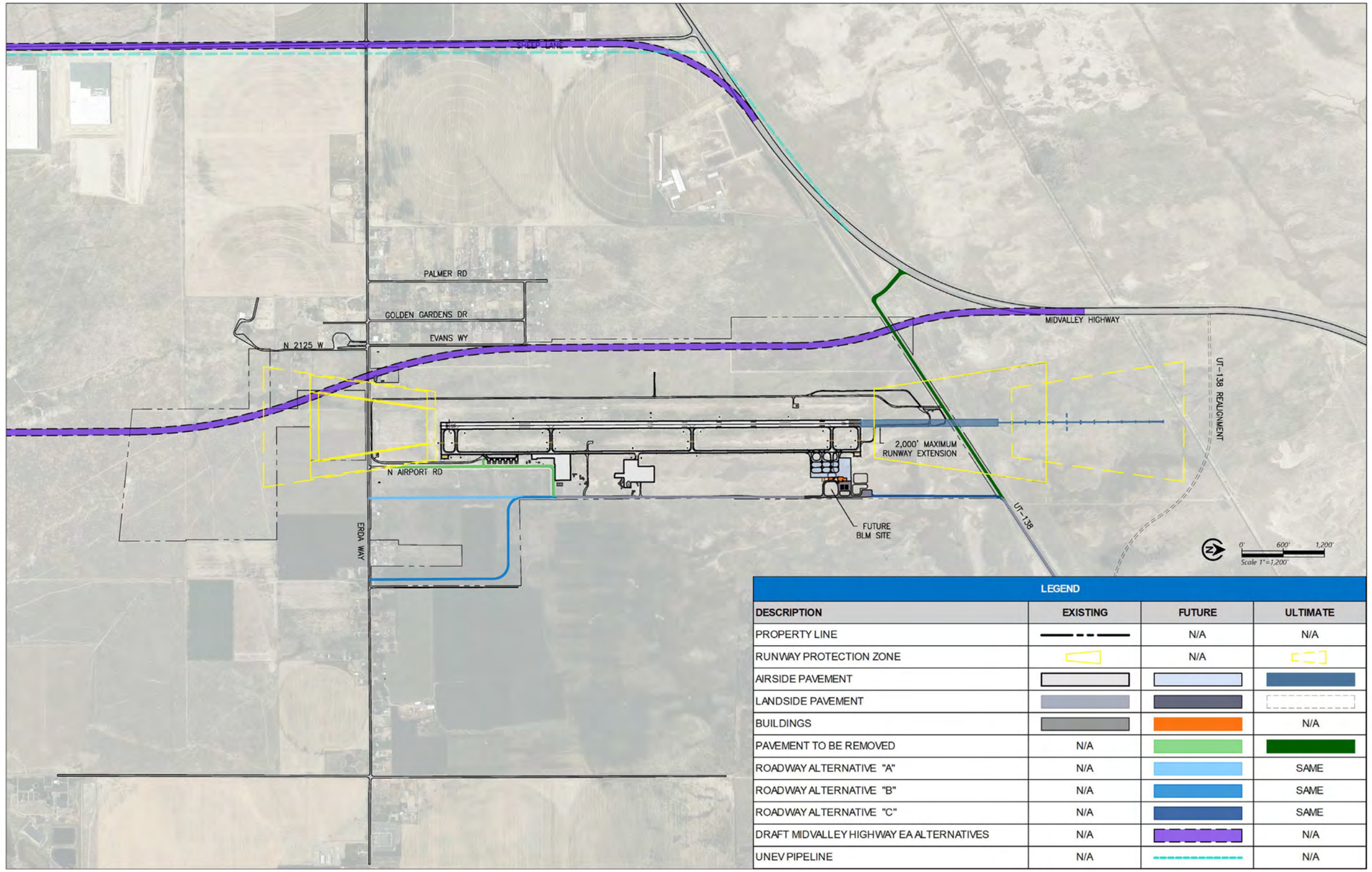
4.7.2 On-Airport Access

Since the original construction of N Airport Rd, SLCDA has acquired property to the east including several parcels along Erda Way toward 1200 W. **Figure 4-10** shows three potential on-airport roadway alignments that could improve the access and availability of aeronautical land at TVY. These include:

- **A** – Establish a new N Airport Rd/Erda Way intersection to align N Airport Rd with the easternmost segment of N Airport Rd.
- **B** – Establish a new N Airport Rd/Erda Way intersection at the easternmost land owned along Erda Way to create a new N Airport Rd entry that follows property lines to meet existing N Airport Rd
- **C** – Create a northern airport entry which aligns with the easternmost segment of N Airport Rd and meets the dead-end road at the new BLM site

In addition to simply implementing one of the three roadway solutions, either roadway realignment on the south end of the airport can be complemented with a northern airport connection of N Airport Rd to UT-138.

FIGURE 4-10
TVY REGIONAL AND ON-AIRPORT ACCESS ALTERNATIVES



Source: Midvalley Highway EA draft alignments approximated from https://udot.utah.gov/midvalley, Retrieved December 21, 2022; RS&H Analysis, 2022

4.7.3 Landside Alternatives Evaluation

The existing entry alignment of N Airport Rd at Erda Way is inadequate to meet aeronautical land uses at TVY. This section of N Airport Rd sits within the 20-foot BRL meaning that no land west of the road can be used effectively for most aeronautical purposes. For this reason, a "no action" alternative was not proposed. The roadway alternatives evaluated include the possibility of implementing a combination of roadway improvements. Therefore, each improvement was evaluated individually, and two combinations of alternatives, A-C and B-C were evaluated.

Alternative A provides safe access in alignment with the existing northern segment of N Airport Rd and provides adequate space for development of aeronautical uses adjacent to the airfield. By comparison, Alternative B provides more land with access to the airfield, creating more flexibility for future development. The south end of the airport is programmed for skydiving operations under the aeronautical sub area land use vision (see **Figure 4-6**). Road Alternative B provides more land to support skydive landings without requiring parachuters to cross the street when returning to skydive facilities. Alternative A would be marginally less expensive to implement than Alternative B. Both options would be safe, operationally efficient, easy to implement, and effectively serve public access needs.

Roadway Alternative C creates a new connection to N Airport Rd from UT-138. There are wetlands identified at the north end of the airport which would need to be avoided or mitigated to create this section of roadway within airport property.

Individually, Alternatives A and B are both good options at the south end of the airport, however Alternative B has the advantage of better serving skydiving operations. Combining south and north end road solutions creates significant benefits by allowing access at both ends of the airport, albeit with the challenge of addressing wetland impacts. For these reasons, Alternative B is the minimum recommended solution to address access needs at the south end of TVY, with the option of including Alternative C as an additional enhancement by establishing a north airport access point.

TABLE 4-1
ON-AIRPORT ACCESS LANDSIDE ALTERNATIVES

Evaluation Criteria	Alternatives				
	A	B	C	A-C	B-C
Safety					
Operational Efficiency					
Effectively Serves Target User					
Resolves Current Issues					
Meets Long-Term Facility Needs					
Appropriate Level of Service					
Ease of Implementation					
Cost to Implement					
Flexible/Future Expansion					
Supports Sustainability Principles					

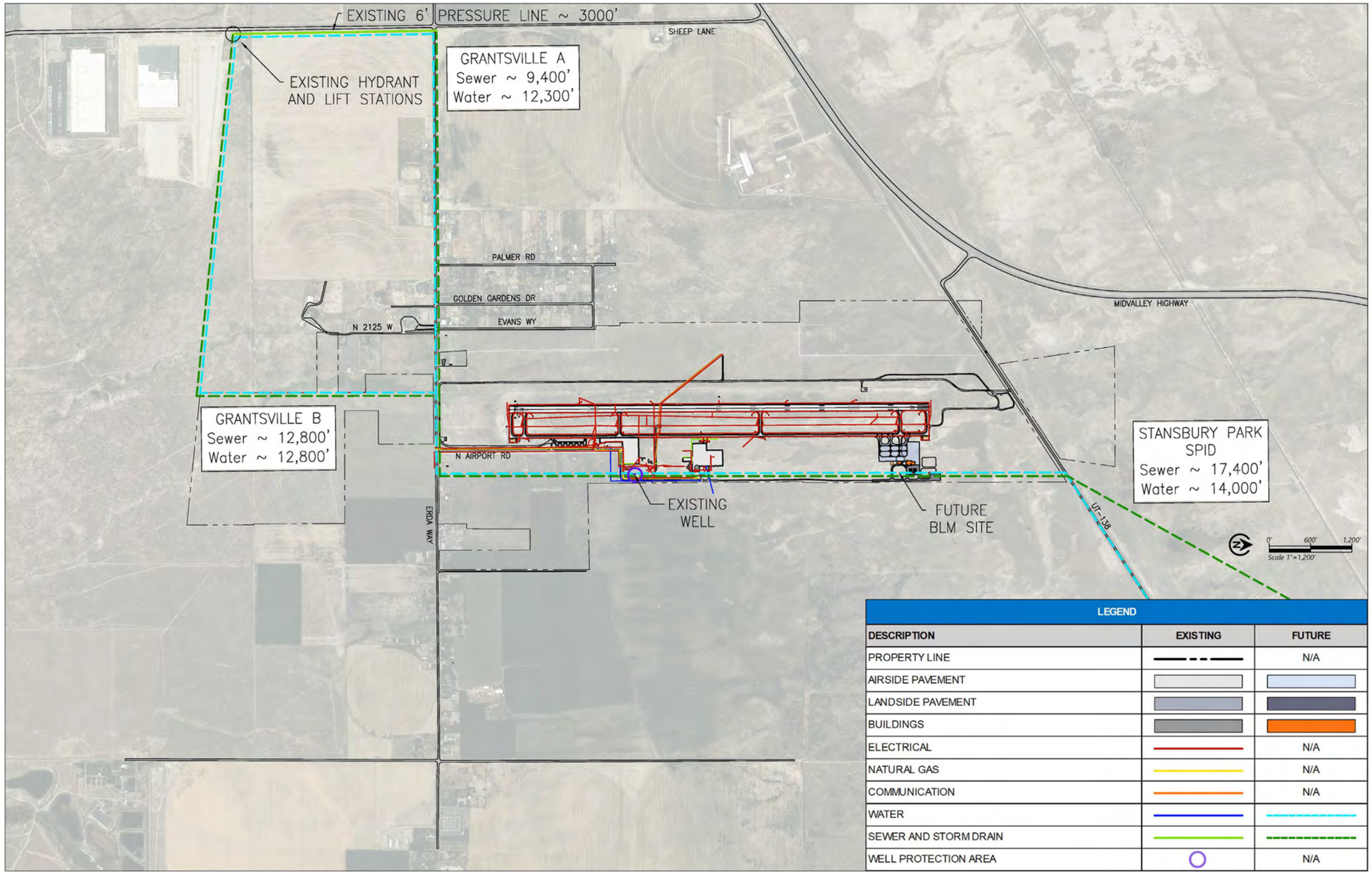
Legend | **Good** | **Fair** | **Poor**

Source: RS&H Analysis, 2022

4.8 UTILITY ALTERNATIVES

As part of development activities at TVY, SLCDA is actively seeking to provide utility services including water and sewer, for any new facilities. To organize and coordinate the development of these utility services, RS&H retained Bowen, Collins & Associates (BC&A) to prepare a utility master plan (see **Appendix X**). **Appendix X, TVY Utility Master Plan** provides a utility development plan consistent with the proposed future conditions at the airport as established within this master plan. **Figure 4-11** shows three potential utility routing alternatives to provide sewer and water to TVY.

FIGURE 4-11
TVY UTILITY ROUTE ALTERNATIVES



Source: SLCDA Records, RS&H Analysis, 2023

4.9 TENANT/USER FACILITY DEVELOPMENT

The tenant/user facility development analysis focuses on size and campus layout for future fixed base operator facilities including a modest general aviation terminal building and supporting taxiways, tie-down apron, hangars, fuel storage, and landside facilities.

4.9.1 Fixed Base Operator (FBO) and Supporting Facilities

Arranging fixed base operator facilities is largely a function of how management would seek to provide a high level of customer service safely and efficiently.

ACRP Report 113, *Guidebook on General Aviation Facility Planning*, provides general guidance and considerations when defining locations and orienting supporting facilities for fixed-base operators. These considerations include:

- Maximum visibility of facility/airfield for arriving customers and FBO operators
- Safe and efficient access from primary roadways
- Adequate apron for based/transient aircraft
- Adequate vehicle parking
- Flexibility for future expansion plans (FBO, hangars, fuel storage, or otherwise)
- Safe and efficient access to fuel storage (at safe distance from adjacent facilities)
- Utility access

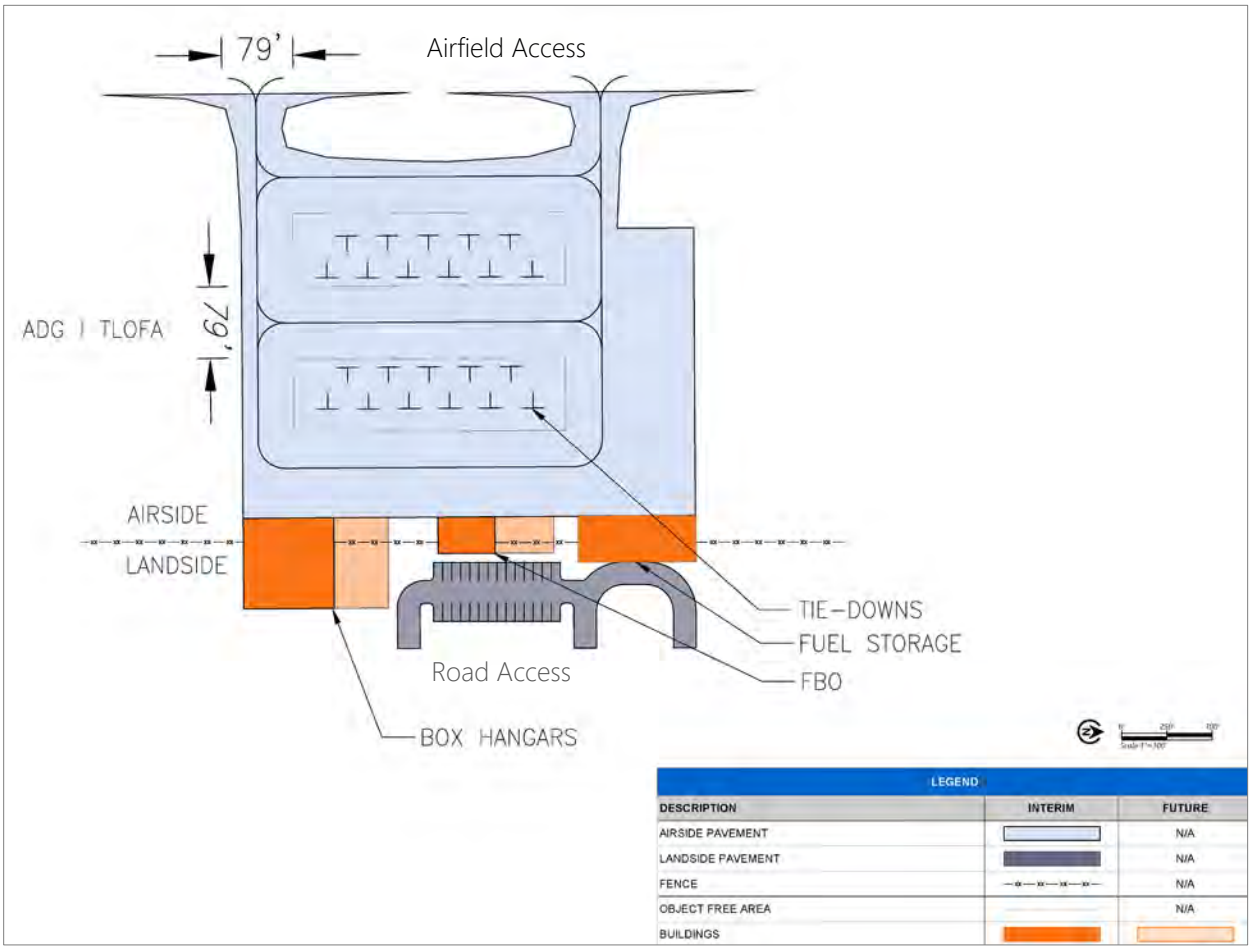
Section 4.4.2 established the preferred location for the FBO as the center of the airfield in the location where skydiving facilities currently exist. This location aligns well with the previously listed siting criteria.

A recent study to develop minimum standards for operating at TVY was performed and includes the following lease requirement recommendations for a full service FBO (summarized):

- Land – Minimum 5.0 acres of land
- Aircraft Apron/Paved Tie-Downs – Minimum 200 percent of hangar square footage commensurate with total number of aircraft handled
- Hangar – One single structure with minimum 10,000 square feet
  - Minimum 100-foot door
  - Minimum 21-foot high
- Terminal (customer service building) – Minimum 4,000 square feet
- Fuel Storage – Above-ground facility with minimum 10,000-gallon AvGas tank and 20,000-gallon Jet-A tank

Figure 4-12 demonstrates an efficient layout for an FBO area at general aviation reliever airports. Apron entry and exit taxilanes at TVY need to be designed to accommodate ADG-II aircraft to meet critical aircraft design requirements (110′ TLOFA).

FIGURE 4-12
COMMON FBO, FUEL STORAGE, AND APRON SITE LAYOUT



Source: RS&H Analysis, 2022

4.10 AIRCRAFT STORAGE AND PARKING ALTERNATIVES

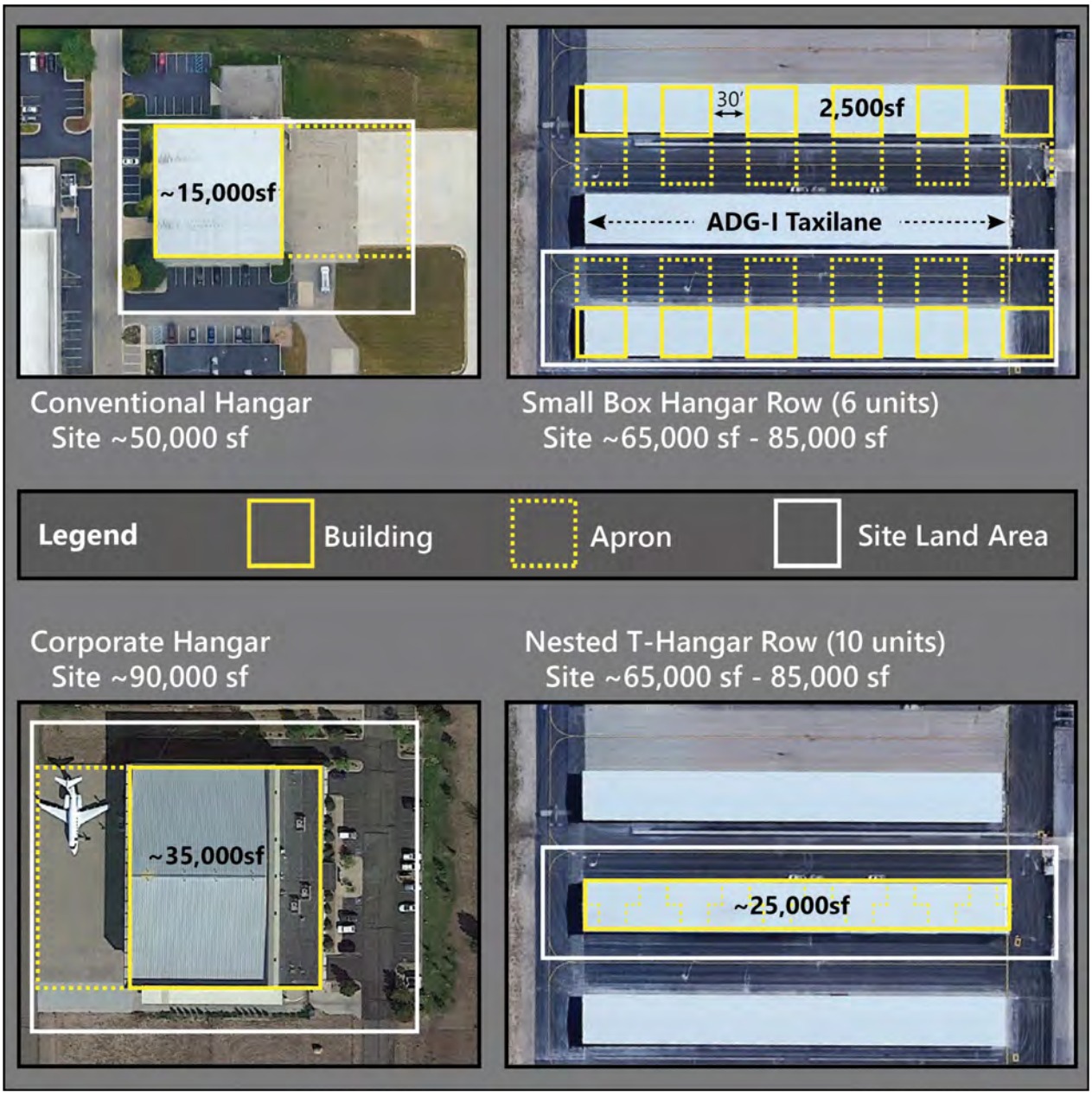
The configuration of aircraft storage and apron parking facilities relates strongly to the airfield layout and design aircraft served by the specific facilities. This analysis will consider three alternative aircraft parking and storage configurations that accommodate a variety of aircraft operating at TVY.

Chapter 3 Facility Requirements determined a need for the following over the planning period:

- 60 total tie-down spaces (~95,000 square feet)
- 26 total T-hangars (~40,000 square feet)
- 11 total box hangars (~ 35,000 square feet)

Figure 4-14 shows general site planning space requirements for different hangar types as well as how plans can be flexible to account for changing market conditions to support multiple future scenarios.

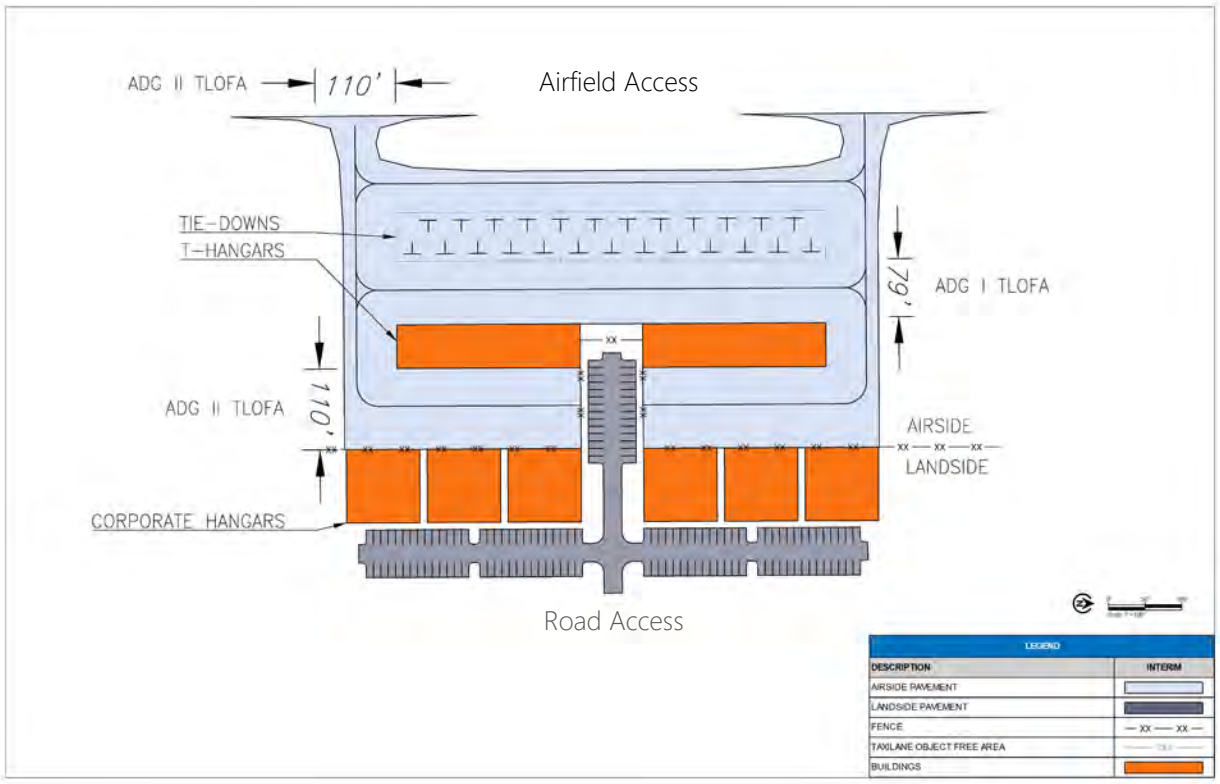
FIGURE 4-13
PLANNING FACTORS FOR LAND REQUIREMENTS BASED ON HANGAR TYPE



Source: RS&H Analysis, 2022

Figure 4-15, **Figure 4-16**, and **Figure 4-17** show aircraft storage and parking alternatives at TVY with supporting roadway, parking, and security fencing. Hangar area development configurations will be analyzed later in the chapter as part of comprehensive development alternatives capable of meeting short- and long-term growth.

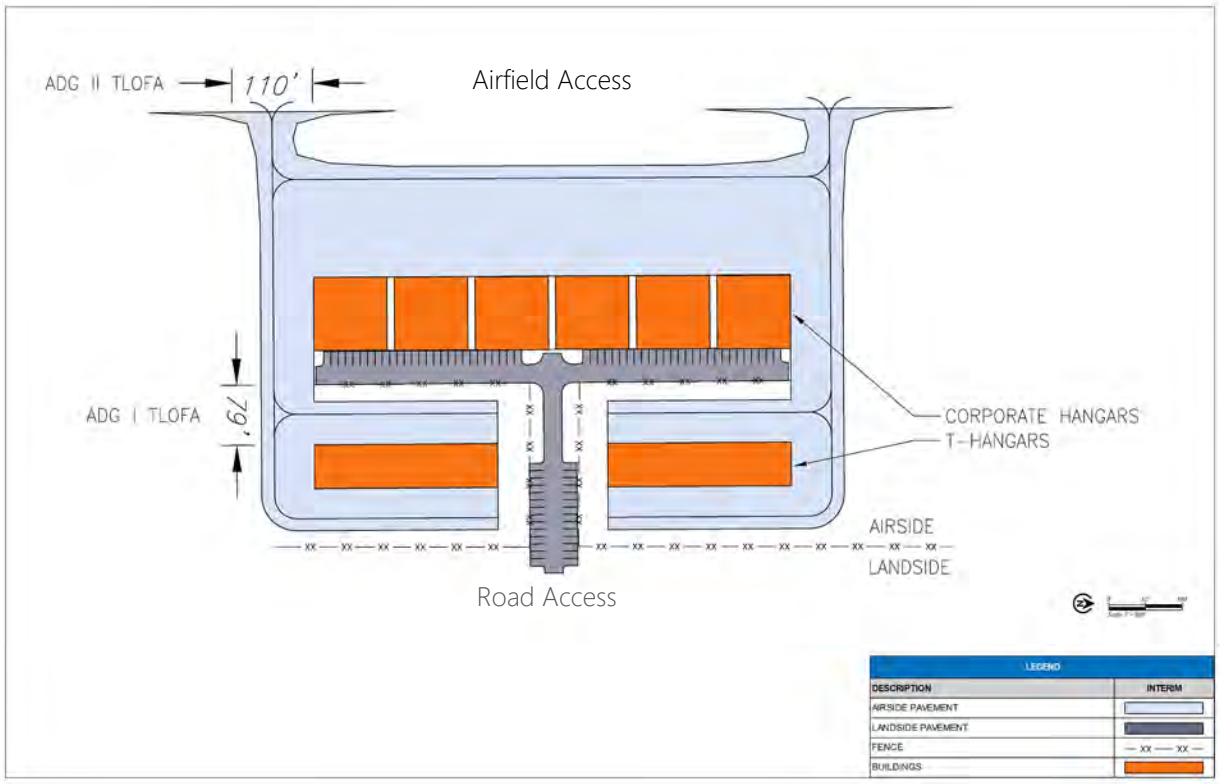
FIGURE 4-14
HANGAR AREA DEVELOPMENT CONFIGURATION ALTERNATIVE 1



Source: RS&H Analysis, 2022

Hangar area development configuration Alternative 1 works to optimize the number of storage and parking positions for a variety of market conditions within Part 77 transitional surface constraints by positioning tie-downs closest to the runway environment and gradually "stepping back" taller buildings further from the runway. ADG-II taxilanes provide access to/from parallel Taxiway A. Apron tie-downs are positioned between ADG-I/II taxilanes, followed by T-hangar rows, with large box hangars furthest from the runway but closest to supporting landside roads.

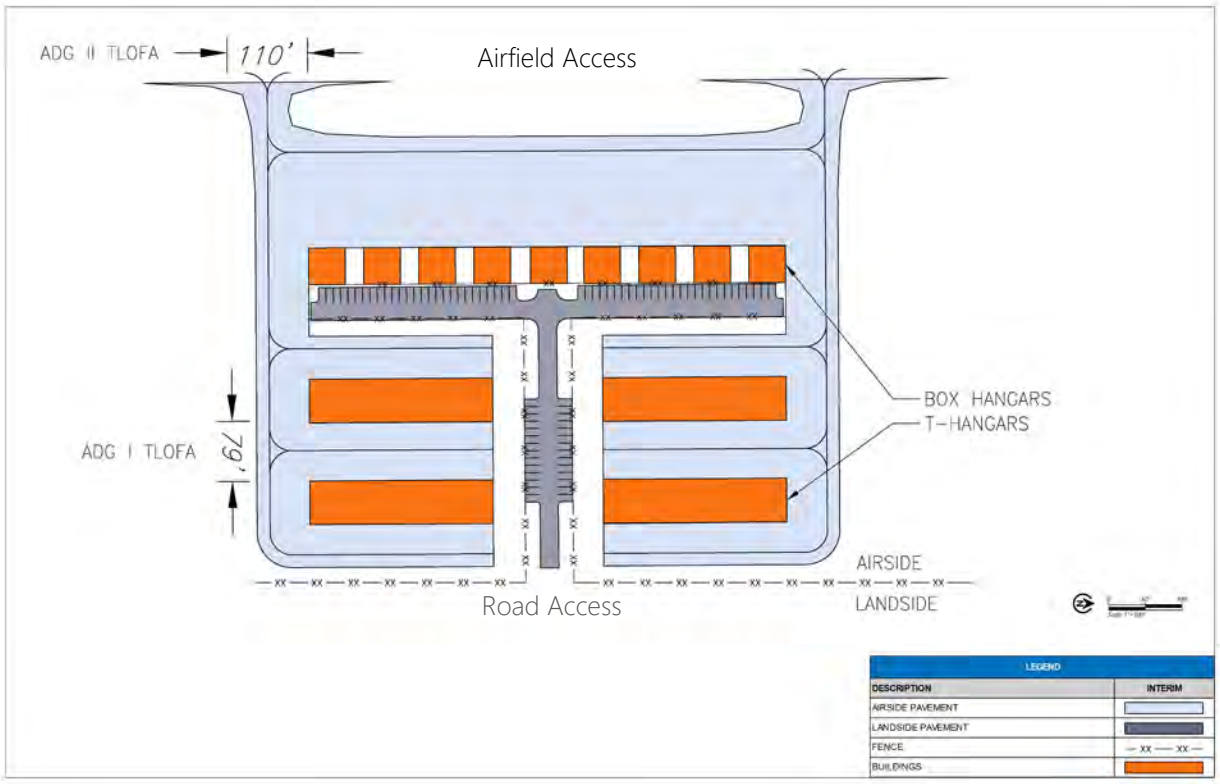
FIGURE 4-15
HANGAR AREA DEVELOPMENT CONFIGURATION ALTERNATIVE 2



Source: RS&H Analysis, 2022

Hangar area development configuration Alternative 2 prioritizes large hangar development closest to the airfield. The proximity of large box hangar development near the runway is limited by the Part 77 transitional surface which creates the possibility of constructing private aprons leading to the apron taxilane as part of the large hangar leaseholds. ADG-I taxilanes lead to rear T-hangars. Taxiway connectors accessing the area can be designed to meet ADG-II standards or limited to ADG-I if other feasible access points are available.

FIGURE 4-16
HANGAR AREA DEVELOPMENT CONFIGURATION ALTERNATIVE 3



Source: RS&H Analysis, 2022

Hangar area development configuration Alternative 3 places smaller box hangars closest to the runway and allows for private apron leaseholds adjacent to a parallel taxilane while meeting Part 77 transitional surface height limitations. With smaller box hangars closest to the runway, two rows of T-hangars can be placed within the existing available eastside TVY land boundaries. ADG-I taxilanes lead to rear T-hangars. Taxiway connectors accessing the area can be designed to meet ADG-II standards or limited to ADG-I if other feasible access points are available.

4.11 SKYDIVING FACILITY ALTERNATIVES

Skydiving is recognized by the FAA as an aeronautical activity and airports that receive FAA funding are obligated through grant assurances to accommodate these activities unless FAA determines compatibility issues creating an unsafe operating environment.

Due to the lack of guidance concerning parachute landing areas (PLA) for airports that can accommodate these "nontraditional" aeronautical activities, research was conducted to determine the recommended size and location of PLAs on airports and provide planning guidance. FAA determined that the experience of the parachutist and type of parachute used should be considered in developing the size of the PLA. DOT/FAA/AR-11/30, *Development of Criteria for Parachute Landing Areas on Airports* (October 2015) provides guidance on safe development for PLAs on airports. The United States Parachute Association (USPA), a nonprofit organization dedicated to supporting the sport of parachuting, publishes the Skydivers Information Manual which was referenced in the creation of the DOT/FAA/AR-11/30 report.

According to DOT/FAA/AR-11/30, PLAs must be hazard free. Potential hazards include telephone and power lines, towers, buildings, open bodies of water, clusters of trees covering more than 9,840 square feet (3,000 square meters), fencing, paved surfaces, aircraft tie-down areas, equipment necessary for aircraft operations or navigation (navaids, airfield lighting, and signage), excluding equipment necessary for skydiving operations. It is recommended that a PLA should be located no closer than 40 feet from a hazard.

The PLA size(s) are based on the type of activity taking place at the airport. **Table 4-2** shows recommended minimum PLA sizes and distances from hazards by activity type.

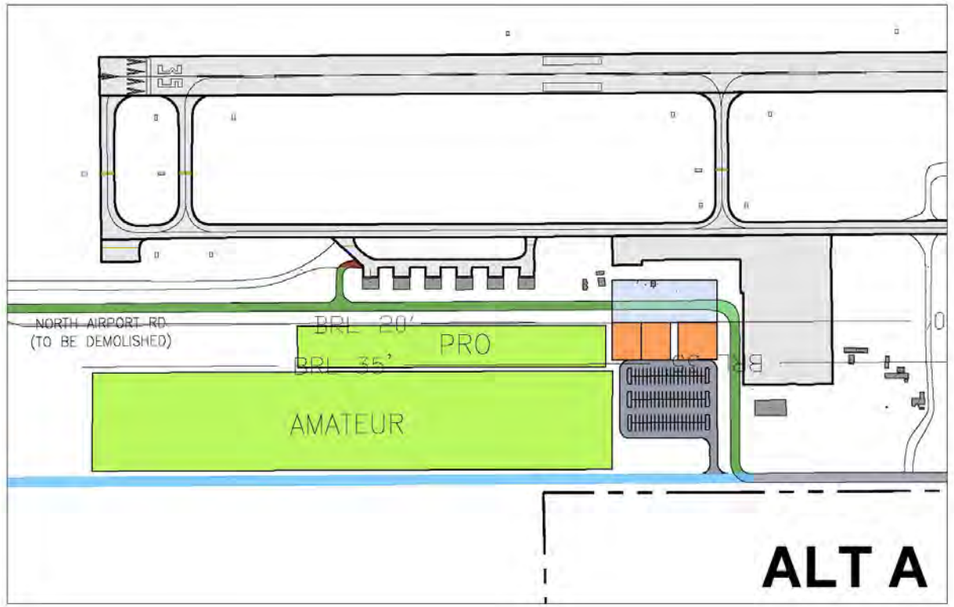
TABLE 4-2
PARACHUTE LANDING AREA MINIMUM RECOMMENDED SIZE AND DISTANCE FROM HAZARDS

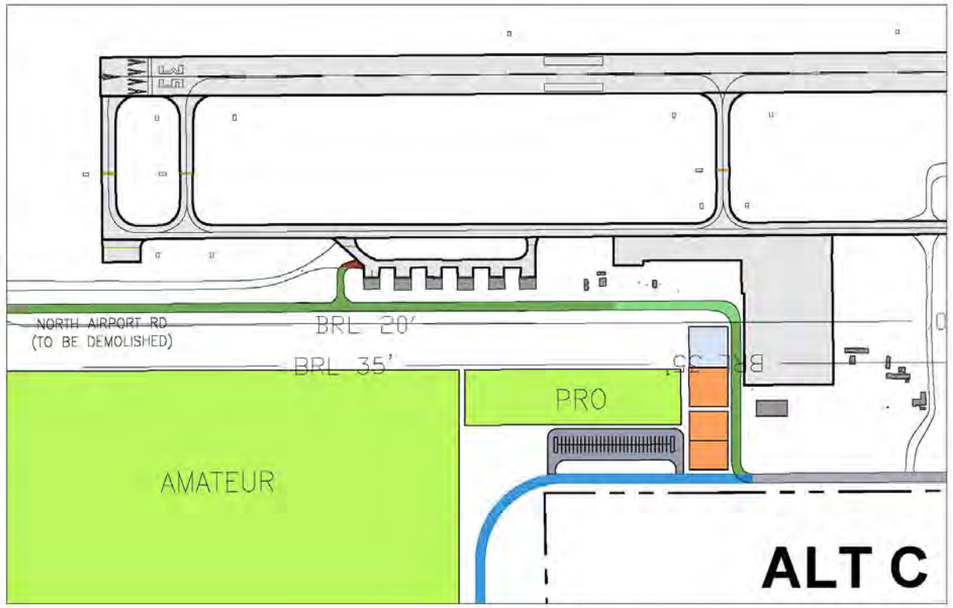
Parachute Activity	Minimum PLA Size – Ram-Air Canopies	Minimum PLA Size – Round Canopies	Radial Distance from Hazards
Student/Training	338,000 sf	N/A	40 ft
Tandem	84,500 sf	N/A	40 ft
All other activity	5,000 sf	338,000 sf	40 ft

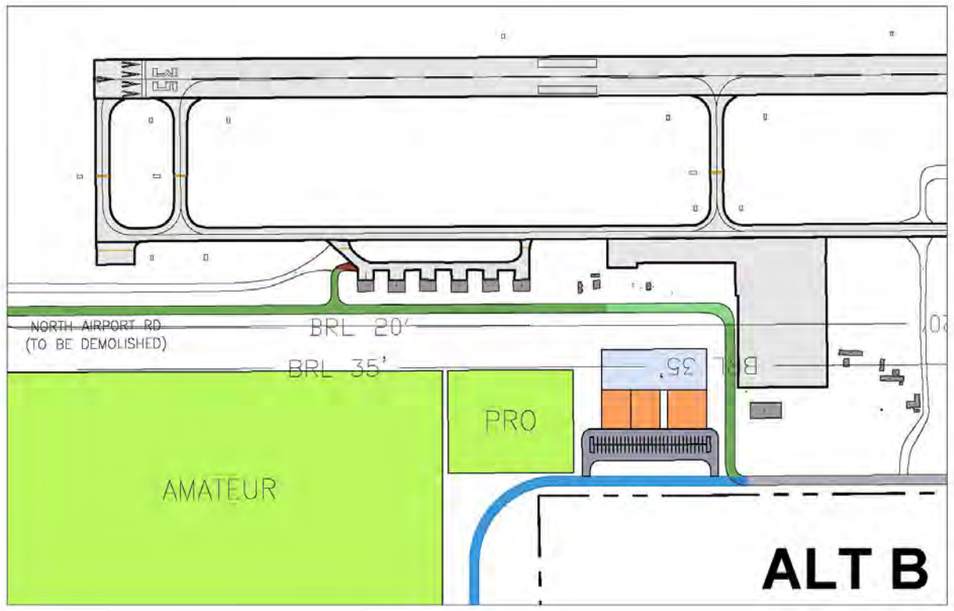
Note: USPA Parachute Landing Area (PLA) Guidance – Minimum Size/Distance from Hazards
Source: DOT/FAA/AR-11/30, *Development of Criteria for Parachute Landing Areas on Airports,* October 2015

Aside from parachute landing areas, skydiving facilities at TVY also include customer-facing buildings, vehicle parking, administrative buildings, packing and staging facilities, and an aircraft storage hangar. For TVY planning purposes, the customer service and administrative buildings are assumed to require approximately 10,000 square feet of open land area and 10,000 square feet to accommodate a storage/maintenance hangar. To meet peak demand days, approximately 50 vehicle parking spaces should be provided with additional land area preserved for future vehicle parking lot expansion. **Figure 4-18** shows three alternative layouts for skydiving facilities at the south end of the airport (preferred land use area for skydiving).

FIGURE 4-17
SKYDIVING FACILITY LAYOUT ALTERNATIVES







0' 150' 300'
Scale 1"=300'

LEGEND		
DESCRIPTION	**EXISTING**	**FUTURE**
PROPERTY LINE		N/A
BUILDING RESTRICTION LINE	BRL	N/A
AIRSIDE PAVEMENT		
LANDSIDE PAVEMENT		
PAVEMENT TO BE REMOVED	N/A	
BUILDINGS		
PROPOSED SKYDIVE LANDING ZONES	N/A	
ROADWAY ALTERNATIVE "A"	N/A	
ROADWAY ALTERNATIVE "B"	N/A	

Source: RS&H Analysis, 2022

4.11.1 Evaluation of Skydive Facilities Alternatives

Skydive Facilities Alternative A fronts the aircraft storage/maintenance hangar and customer-facing/administrative space to the 20-foot BRL. Depending on the hangar height, this may require further setback from the 20′ BRL. This concept creates additional space between where the existing N Airport Rd (to be removed) and a new roadway alignment, therefore allowing parachute landing areas to be placed immediately south of a skydive campus where skydivers can walk directly to the campus without crossing a road.

Skydive Facilities Alternative B positions aircraft storage/maintenance hangar and customer-facing/administrative space the same alignment as Alternative A but behind the 35-foot BRL to create additional space for private apron to load and unload skydivers. Vehicle parking is placed east of the buildings with entry/exit from N Airport Road. Parachute landing areas are immediately south of the campus allowing skydivers to walk directly back without crossing a road.

Skydive Facilities Alternative C orients the campus east-west with an aircraft storage/maintenance hangar fronting the 35′ BRL which allows construction of a private apron space to serve skydive loading and unloading operations. Customer-facing/administrative buildings are placed east of the adjacent storage/maintenance hangar with vehicle parking immediately to the south. This concept creates parachute landing area for professional skydivers immediately south of the hangar (west of parking) and close to the skydive facilities campus where they can walk directly back after landing without crossing a road. Alternative C is the preferred development because it accommodates skydive business operational flows, enables a positive customer experience, allows flexibility for future aeronautical expansion, and meets all safety design criteria. **Table 4-3** shows an evaluation of the skydiving facilities alternatives.

TABLE 4-3
SKYDIVING FACILITIES ALTERNATIVES EVALUATION

Evaluation Criteria	Alternatives		
	A	B	C
Safety			
Operational Efficiency			
Meets FAA Design Standards			
Effectively Serves Target User			
Resolves Current Issues			
Meets Long-Term Facility Needs			
Appropriate Level of Service			
Ease of Implementation			
Cost to Implement			
Flexible/Future Expansion			
EONS Impact			
Supports Sustainability Principles			

Legend **Good** **Fair** **Poor**

Source: RS&H Analysis, 2023

4.12 AIRPORT SUPPORT FACILITY ALTERNATIVES

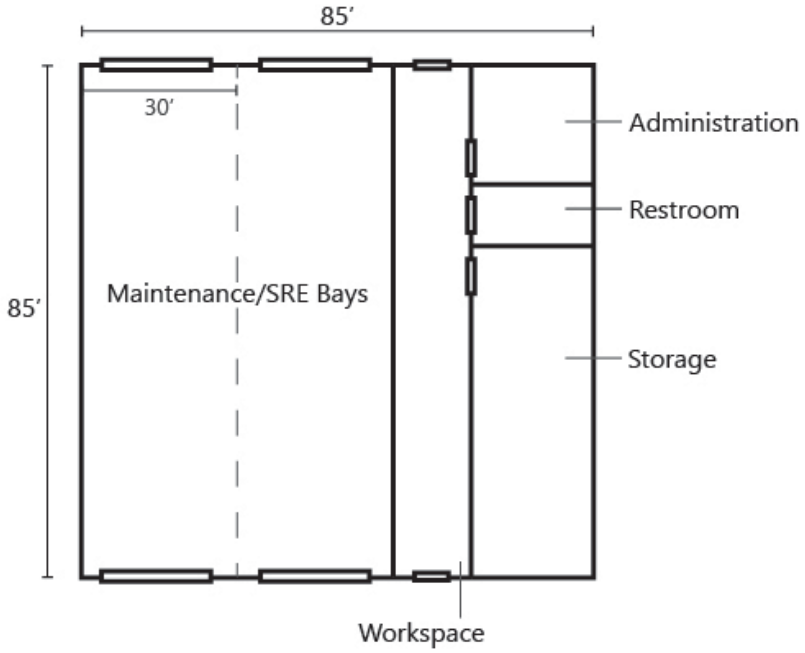
As noted in **Chapter 1 Inventory**, there is no snow removal equipment (SRE) or on-site support staff at TVY to clear the airfield during winter weather. When winter precipitation events occur, SLCDA maintenance must drive road-capable SRE over to TVY once it is certain the equipment is no longer needed at SLCIA. There is also no building to store snow removal equipment. Smaller airport ground equipment is stored in a small maintenance shed adjacent to the apron in a location better suited for aeronautical development.

Creating space for airport staff to perform administrative, operations, and maintenance functions at TVY is important for SLCDA to provide safe and efficient operations. Combining airport administration facilities with maintenance/SRE storage facilities is a cost effective and efficient way to ensure TVY can meet its role within the system and provide quality services to airport users and the community. These facilities, while critical to safe and efficient airport operations, are typically better located farther from the runway environment. It is important to create dedicated facilities to serve these roles, rather than repurpose hangars which are better used for aircraft storage and providing lease revenues. As utilities are implemented at TVY, and development materializes, a maintenance/SRE storage facility will be important to provide enhanced services for tenants.

ACRP Report 113, *Guidebook on General Aviation Facility Planning*, offers a starting point of reference for sizing and layout of airport administration, maintenance, and storage facilities. For a combined

administration/maintenance/storage facility at TVY, it is recommended that the building be designed in a linear fashion with drive-through style maintenance bays. At a minimum, the maintenance bays need to accommodate large, single-function SRE, typically up to 40-feet long and 20-feet wide. Sizing maintenance bays with 22- to 24-foot doors at 50-feet long by 30-feet wide can accommodate this style of equipment. Many airports are opting to purchase multi-function SRE which are longer and slightly wider, reaching upwards of 65-feet long by 24-feet wide. **Figure 4-19** shows general planning dimensions and internal facility layout for a combined administrative/maintenance/equipment storage facility capable of accommodating multi-function equipment. The building is 85-feet by 85-feet (7,225 square feet). In addition to the building footprint, pavement capable of meeting equipment turning radius limitations is necessary on both sides of the bays. This will vary by equipment manufacturer but generally planning for an additional 100-feet of pavement on each side will preserve adequate space.

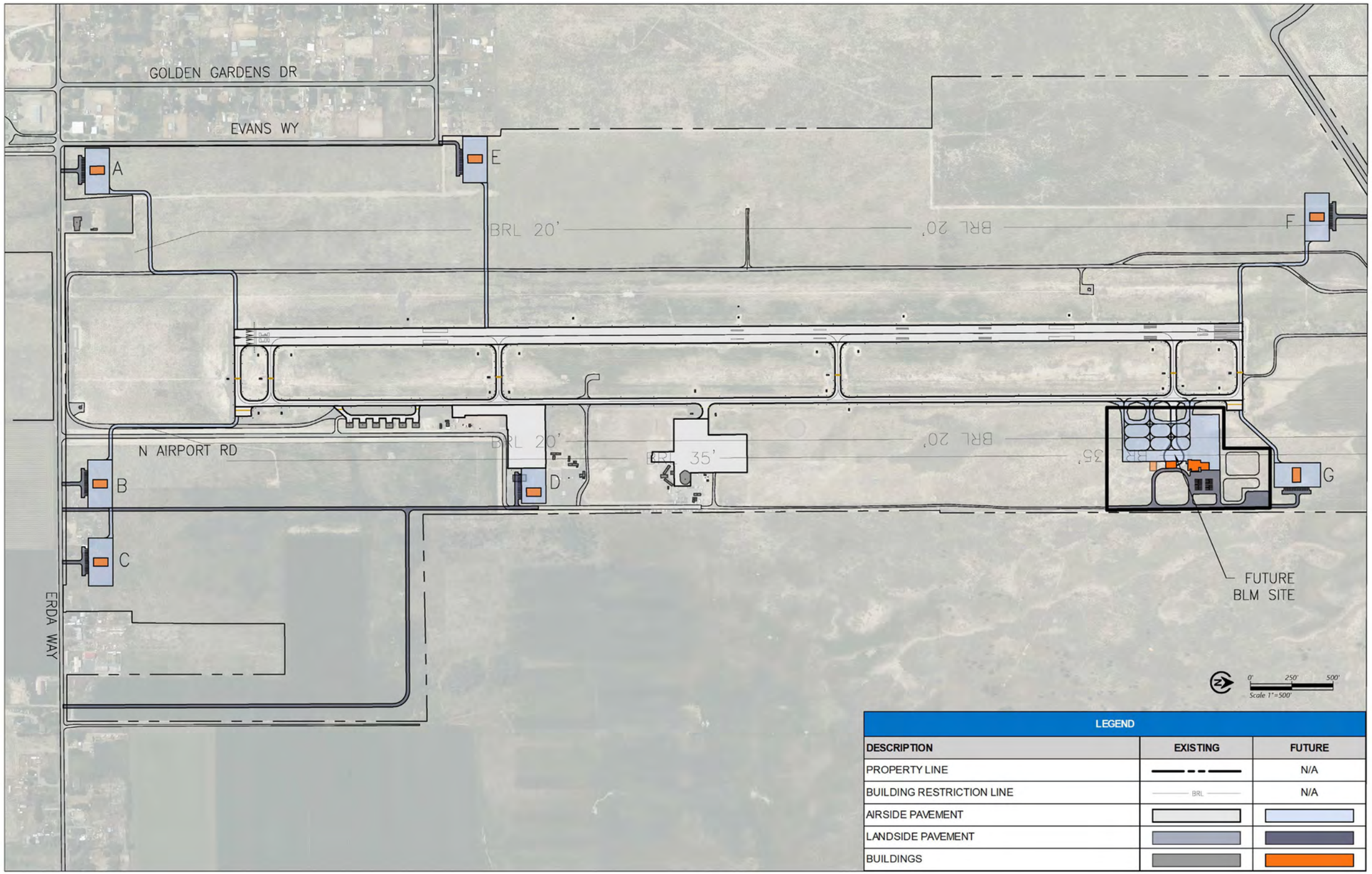
FIGURE 4-18
EXAMPLE LAYOUT FOR COMBINED AIRPORT SUPPORT FACILITY



Source RS&H Analysis, 2023

Figure 4-20 shows alternative locations for airport support facility development.

FIGURE 4-19
AIRPORT SUPPORT FACILITY ALTERNATIVES



Source: RS&H Analysis, 2023

4.12.1 Airport Support Facility Alternatives Evaluation

Alternative A and Alternative E were eliminated as possibilities during the landside regional access analysis (**Section 4.7.1**) because of land use conflicts created by a draft alignment of the Midvalley Highway extension in an ongoing Environmental Assessment. For this analysis, it was deemed that alternative locations were equally or more viable options and the two conflicting locations could be eliminated. All alternatives assume N Airport Rd is realigned.

Airport Support Facility Alternative B performs the best when evaluated against established criteria and is the preferred location for future support facilities. This site allows easy access for airport staff from both the landside and airside. The location also leaves more valuable land near the airfield open for aeronautical uses. Operationally the site is near the runway end which creates an efficient flow for snow removal operations. Additionally, the building lot provides an opportunity to create a formal entryway to the airport.

Alternatives F is also a viable location but may have access challenges in the future if the runway is extended north and UT-138 is removed. Alternative D is at a location better preserved for aeronautical development. Alternative G is feasible but infringes on the ability to expand the BLM site to the north. Alternative C is a good solution but may see conflicts from ultimate aeronautical development as it occurs at the south end of the airfield.

TABLE 4-4
SUPPORT FACILITY ALTERNATIVES EVALUATION

Evaluation Criteria	Alternatives						
	A	B	C	D	E	F	G
Safety							
Operational Efficiency							
Meets FAA Design Standards							
Effectively Serves Target User							
Resolves Current Issues							
Meets Long-Term Facility Needs							
Appropriate Level of Service							
Ease of Implementation							
Cost to Implement							
Flexible/Future Expansion							
EONS Impact							
Supports Sustainability Principles							

Legend Good | Fair | Poor

Source: RS&H Analysis, 2023
Note: Alternative A and Alternative E eliminated due to conflict with EA draft alignment of Midvalley Highway extension.

4.13 ELECTRIC VERTICAL TAKEOFF-LANDING PAD ALTERNATIVES

Utah Department of Transportation (UDOT) has taken a proactive approach to planning for the emerging Urban Air Mobility (UAM) market. In coordination with Utah Legislature, the UDOT Division of Aeronautics established the Utah Advanced Air Mobility (AAM) Working Group to research and publish the *Advanced Air Mobility Infrastructure and Regulatory Study* in coordination to analyze state infrastructure assets and anticipated needs to make AAM possible in Utah.

As it relates to electrical demand, the AAM study notes that Utah is a shared-grid system and therefore can draw additional power from other places as demand increases. However, substations would likely be necessary upgrades as electrical demand increases beyond the current capacity. This is a critical component for consideration of vertiport placement to ensure that the infrastructure can support the charging of vehicles and adjacent infrastructure. Additionally, collaboration with other electric vehicle (EV) efforts may be complementary to lower construction costs and minimize impacts to residents. Finally, innovative approaches focused on energy resilience, such as on-airport generation and micro-grids, could address the growing electricity demand especially at smaller airports serving rural areas.

The Working Group study also notes that reliable high-speed communications would be critical to allow monitoring and communications for AAM aircraft. The FAA's Remote ID rule stipulates that aircraft must broadcast their identity, position, speed, altitude, and safety messages (and disseminate real-time weather reporting, if possible).

In September 2022 FAA issued Engineering Brief 105, *Vertiport Design*, to provide guidance on planning for vertiports at airports including electric vertical takeoff and landing (eVTOL) aircraft pad location and design. Engineering Brief 105 notes clearly that, at the time of being published, FAA does not have adequate validated VTOL aircraft performance data and is therefore taking a "prescriptive and conservative approach" for recommendations made within the briefing.

The following table (adapted from Engineering Brief 105, Table 1-1) contains specifications for the assumed reference aircraft used to plan eVTOL pad space needs within this master plan.

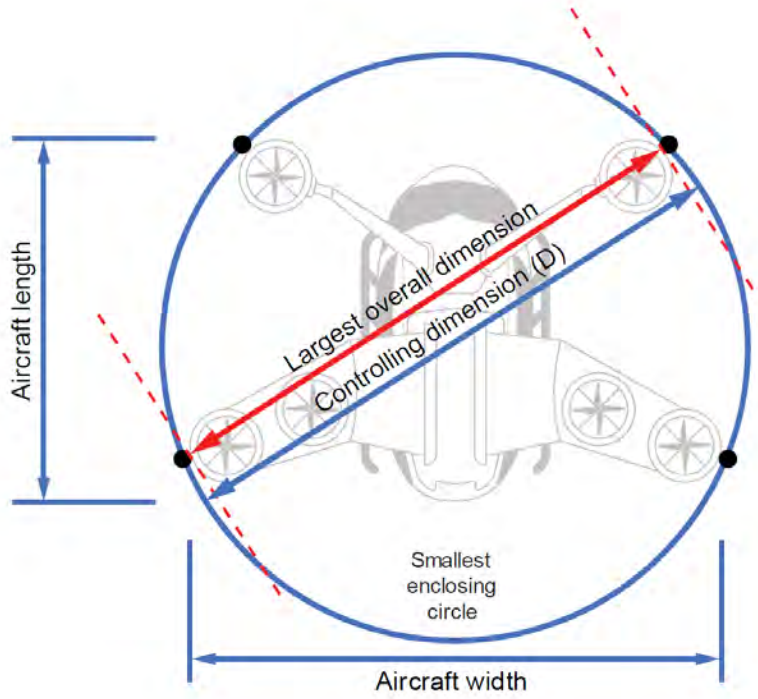
TABLE 4-5
EVTOL ENGINEERING BRIEF 105 REFERENCE AIRCRAFT

Design Characteristics	Criteria
Propulsion	Electric battery driven, Utilizing distributed electric propulsion
Propulsive Units	2 or more
Battery Systems	2 or more
Maximum Takeoff Weight (MTOW)	12,500 lbs. or less
Aircraft Length	50 feet or less
Aircraft Width	50 feet or less

Source: Engineering Brief 105, Table 1-1

The aircraft length and width are known as the "controlling dimension" (see **Figure 4-21**) which is defined as "the diameter of the smallest circle enclosing the VTOL aircraft projection on a horizontal plane, while the aircraft is in the takeoff or landing configuration, with rotors/propellers turning, if applicable."

FIGURE 4-20
EVTOL CONTROLLING DIMENSION



Source: Engineering Brief 105, September 21, 2022

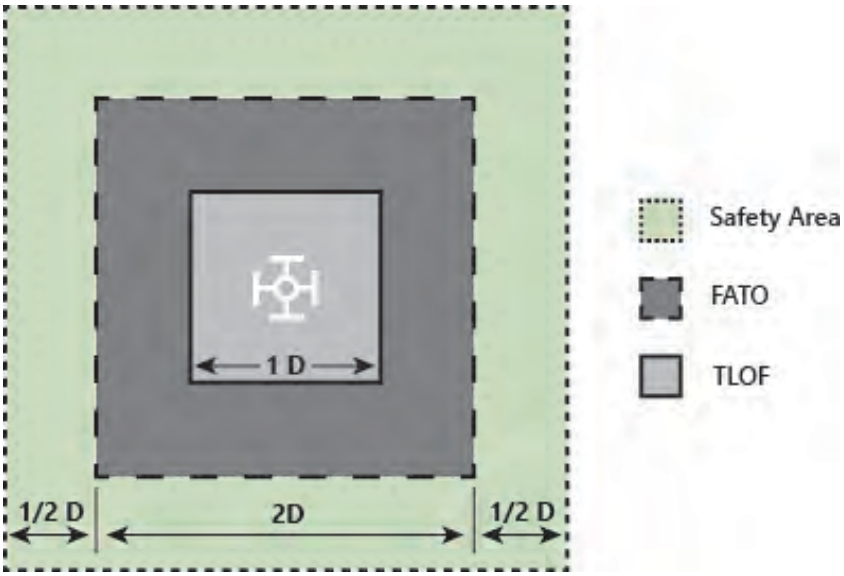
Vertiport design and geometry are determined the touchdown and liftoff (TLOF[1]) area, the final approach and takeoff area (FATO[2]), and the safety area[3]. **Figure 4-21** shows the relationship between the TLOF, FATO, and safety area for a vertiport.

[1] Touchdown and liftoff (TLOF) area is a load bearing, generally paved area centered in the FATO, on which the aircraft performs a touchdown or liftoff.

[2] Final approach and takeoff (FATO) area is The FATO is a defined, load-bearing area over which the aircraft completes the final phase of the approach, to a hover or a landing, and from which the aircraft initiates takeoff.

[3] The Safety Area is a defined area surrounding the FATO intended to reduce the risk of damage to aircraft accidentally diverging from the FATO.

FIGURE 4-21
EVTOL PAD DESIGN



Source: Engineering Brief 105, September 21, 2022
Note: "D" is equal to the diameter of the smallest circle enclosing the VTOL aircraft projection on a horizontal plane, while the aircraft is in the takeoff or landing configuration, with rotors/propellers turning, if applicable

In addition to sizing the vertiport and protected areas around it, Engineering Brief 105 offers guidance on recommended separation distances for vertiports from runways. **Table 4-6** shows the recommended minimum distance between a vertiport FATO center from the runway centerline for VFR operations. Recommendations for IFR operations are not provided.

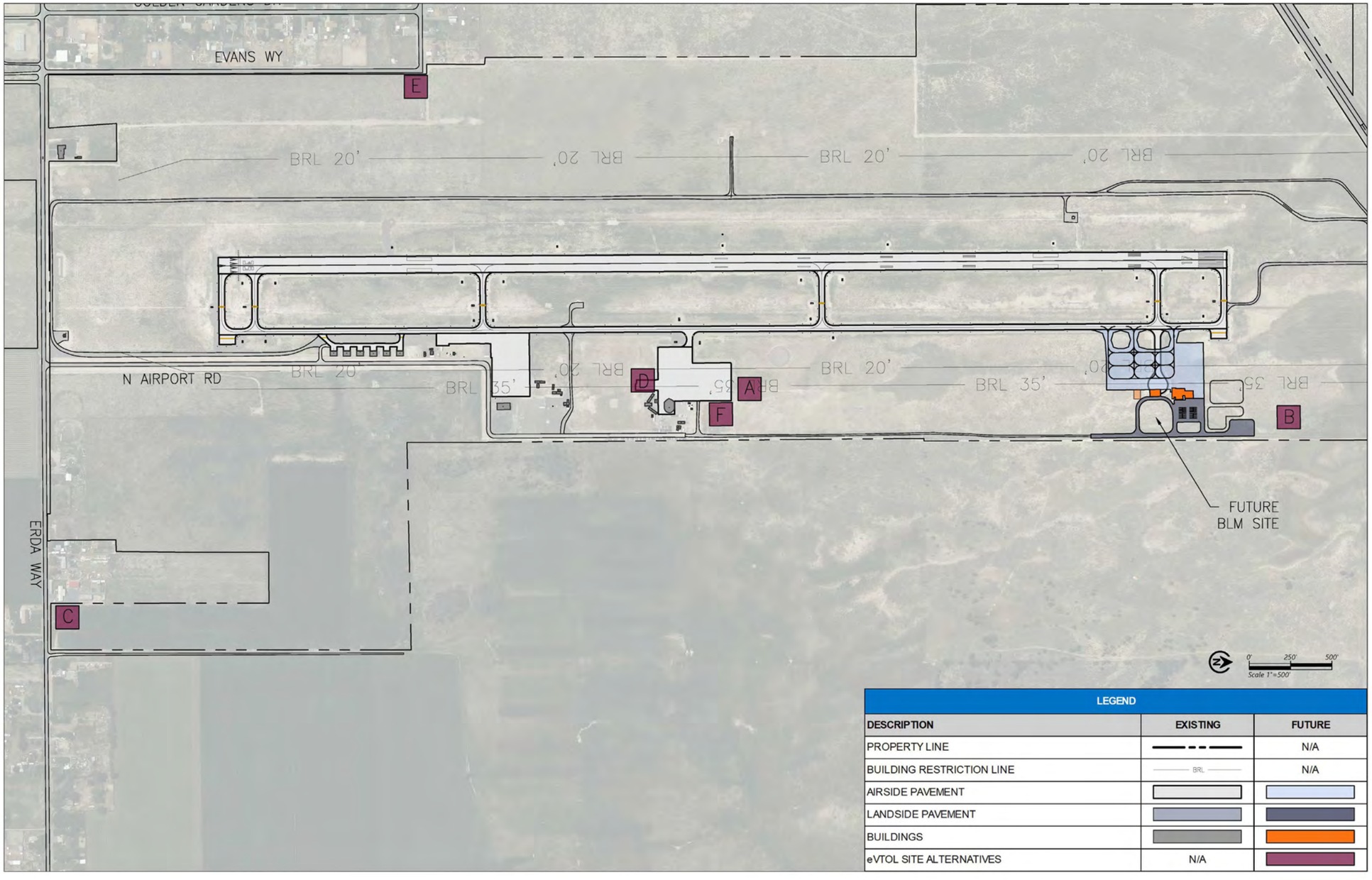
TABLE 4-6
RECOMMENDED MINIMUM DISTANCE BETWEEN VERTIPORT FATO CENTER TO RUNWAY CENTERLINE FOR VFR OPERATIONS

Reference VTOL Aircraft MTOW	Airplane Size	Distance from Vertiport FATO Center to Runway Centerline
12,500 lbs or less	Small Airplane (12,500 lbs or less)	300 feet
	Large Airplane (12,500-300,000 lbs)	500 feet
	Heavy Airplane (Over 300,000 lbs)	700 feet

Source: Engineering Brief 105, September 21, 2022

According to FAA guidance, an eVTOL pad at TVY should be located a minimum of 500 feet from the vertiport FATO center to the runway centerline. Under the established FAA location and design assumptions. **Figure 4-23** shows viable eVTOL pad site alternatives for TVY. Each option assumes a 22,500 square foot area of land is occupied and exceeds the 700-foot separation minimum.

FIGURE 4-22
EVTOL PAD LOCATION ALTERNATIVES



Source: RS&H Analysis, 2022

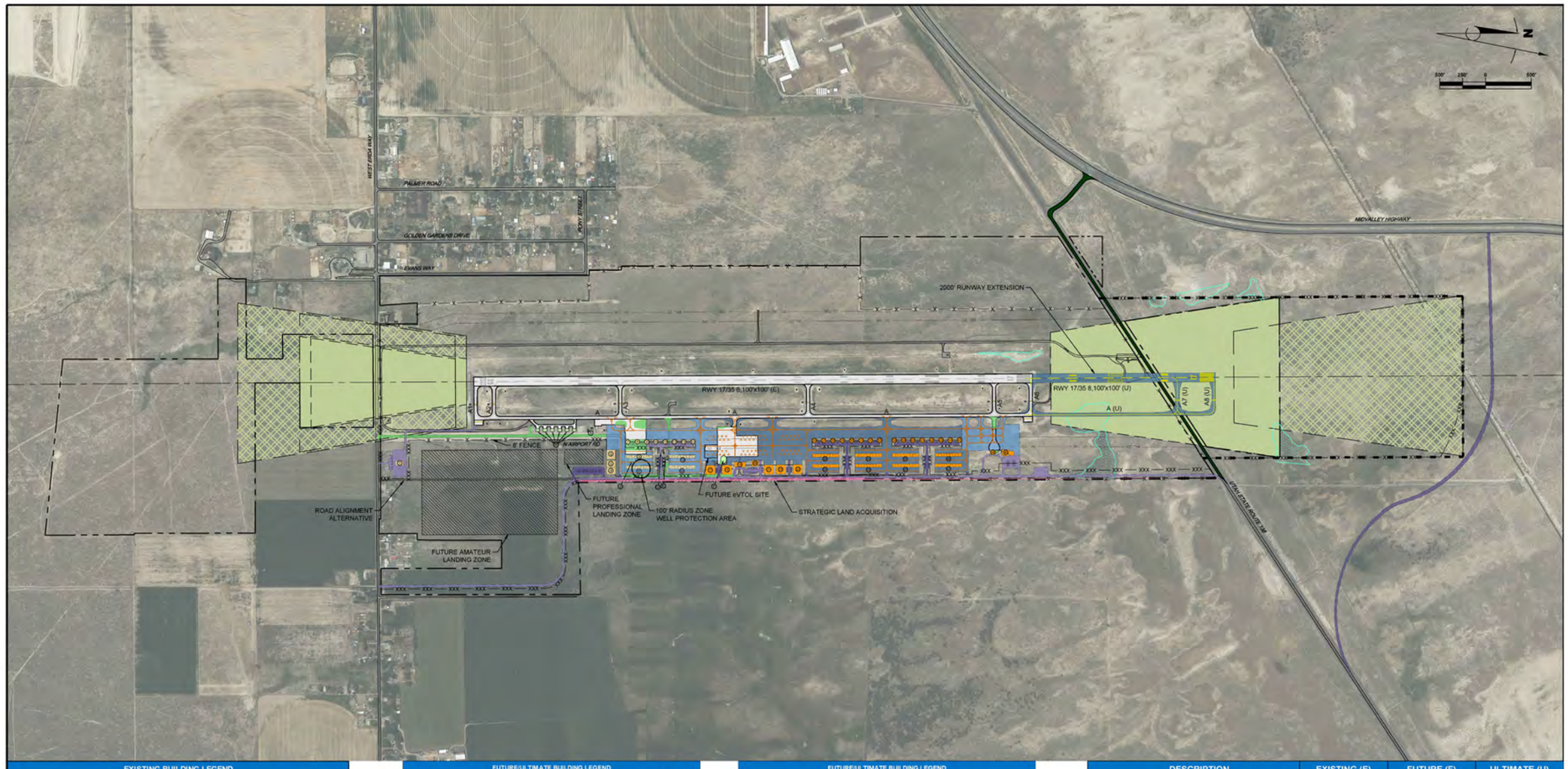
4.13.1 eVTOL Facility Alternatives Evaluation

Accommodating an eVTOL aircraft at TVY is a relatively low priority item, primarily because TVY is still working to provide water and stormwater utilities. However, it is prudent to plan for meeting the need for at least one eVTOL pad in a proper location under the known constraints. While, at this juncture, all proposed alternatives are presumably feasible solutions, Alternative D is in a location that fits well within the preferred land use plan. It is located near where FBO services are planned as well as existing utilities (electrical and telecom). With many variables still unclear surrounding the market development and implementation of eVTOL technology across the industry, Alternative D is the preferred eVTOL pad location.

4.14 COMPREHENSIVE PREFERRED ALTERNATIVE

The comprehensive preferred alternative for developing Tooele Valley Airport is a coordinated facilities plan which addresses needs up to and beyond the forecast demand facility requirements. **Figure 4-24** shows the preferred comprehensive plan for ultimate development of TVY. This plan optimizes use of available airport land for aeronautical purposes to capture growing market demand for user facilities that integrate into the overall SLCDA system of airports. This comprehensive development plan provides facilities that allow TVY to fulfill its general aviation reliever system role safely and efficiently while providing high quality coordinated facilities for airport users and supporting economic development within the local community.

FIGURE 4-23
COMPREHENSIVE ULTIMATE DEVELOPMENT PLAN



EXISTING BUILDING LEGEND		
BUILDING NO	BUILDING DESCRIPTION	ELEVATION HIGHEST POINT (MSL)
A	EXECUTIVE HANGARS	4331.0'
B	RESTROOMS	4322.3'
C	MAINTENANCE BUILDING	4,328.4'
D	ELECTRICAL VAULT	4315.3'
E	NONDIRECTIONAL RADIO BEACON	4315.9'
F	HANGAR	4324.8'

NOTE: ALL ELEVATIONS ARE EXPRESSED IN FEET ABOVE MEAN SEA LEVEL (MSL).

FUTURE/ULTIMATE BUILDING LEGEND		
BUILDING NO	BUILDING DESCRIPTION	ELEVATION HIGHEST POINT (MSL)
1	AIRPORT SERVICES (F)	4355'
2	SKYDIVE UTAH HANGAR (F)	4350'
3	SKYDIVE UTAH OPERATIONS (F)	4335'
4	SKYDIVE UTAH OPERATIONS (F)	4335'
5	NESTED T-HANGARS (F)	4333'
6	NESTED T-HANGARS (F)	4333'
7	BOX HANGAR (F)	4338'
8	BOX HANGAR (F)	4338'
9	BOX HANGAR (F)	4336'
10	BOX HANGAR (F)	4336'
11	BOX HANGAR (F)	4334'
12	BOX HANGAR (F)	4332'
13	BOX HANGAR (F)	4330'
14	BOX HANGAR (F)	4330'
15	NESTED T-HANGARS (F)	4327'
16	NESTED T-HANGARS (F)	4327'
17	CORPORATE HANGAR (U)	4340'
18	CORPORATE HANGAR (U)	4340'
19	FBO TANKS (U)	4340'
20	FBO TERMINAL (U)	4323'
21	CORPORATE HANGAR (U)	4336'
22	CORPORATE HANGAR (U)	4336'
23	CORPORATE HANGAR (U)	4336'
24	NESTED T-HANGARS (U)	4317'
25	NESTED T-HANGARS (U)	4317'

FUTURE/ULTIMATE BUILDING LEGEND		
BUILDING NO	BUILDING DESCRIPTION	ELEVATION HIGHEST POINT
26	BOX HANGAR (U)	4322'
27	BOX HANGAR (U)	4322'
28	BOX HANGAR (U)	4322'
29	BOX HANGAR (U)	4320'
30	BOX HANGAR (U)	4318'
31	BOX HANGAR (U)	4316'
32	BOX HANGAR (U)	4316'
33	BOX HANGAR (U)	4311'
34	NESTED T-HANGARS (U)	4313'
35	NESTED T-HANGARS (U)	4315'
36	NESTED T-HANGARS (U)	4311'
37	NESTED T-HANGARS (U)	4311'
38	BOX HANGAR (U)	4314'
39	BOX HANGAR (U)	4314'
40	BOX HANGAR (U)	4314'
41	BOX HANGAR (U)	4312'
42	BOX HANGAR (U)	4312'
43	BOX HANGAR (U)	4312'
44	BOX HANGAR (U)	4310'
45	BOX HANGAR (U)	4310'
46	NESTED T-HANGARS (U)	4307'
47	NESTED T-HANGARS (U)	4307'
48	BUREAU OF LAND MANAGEMENT RETARDANT TANK FARM (U)	4308'
49	BUREAU OF LAND MANAGEMENT OPERATIONS (U)	4303'

NOTE: FUTURE/ULTIMATE BUILDING ELEVATIONS ARE ESTIMATED.

DESCRIPTION	EXISTING (E)	FUTURE (F)	ULTIMATE (U)
PROPERTY LINE			
RUNWAY PROTECTION ZONE		N/A	
BUILDING RESTRICTION LINE		N/A	N/A
AIRFIELD PAVEMENT			
AIRFIELD PAVEMENT TO BE REMOVED	N/A		
BUILDINGS			
BUILDINGS TO BE REMOVED	N/A		N/A
ROADWAY/PARKING			
AIRCRAFT HOLDING POSITION		N/A	
PAVEMENT MARKING			
FENCE	— x — x — x —	— xx — xx — xx —	— xxx — xxx — xxx —
WETLANDS		N/A	N/A
STRATEGIC LAND ACQUISITION		N/A	N/A

Source RS&H Analysis, 2023