5.0 ALTERNATIVES ANALYSIS

This chapter serves to describe and evaluate the various development alternatives considered for EGE and to select a preferred development plan that accommodates the demand and facility requirements for airside, landside facilities, and the terminal building, as recommended in **Chapter 4**. Multiple options for alternatives were considered by County and Airport staff, and members of the Planning Advisory Committee (PAC) in arriving at the "preferred" alternatives. The preferred alternatives serve as the basis for the Airport Layout Plan (ALP) drawing set.

5.1 AIRPORT DEVELOPMENT GOALS

Realistic goals for development have been identified in this planning effort that reflects the role of EGE in the national and state aviation systems, and the community. Further, these goals were developed with consideration of both the short-term and long-term needs of the Airport and included the interests of airport users and the surrounding community. The goals include:

- Preparation of a logical development program for the Airport that provides a realistic vision to meet future aviation related demand.
- Analysis that provides financially feasible projects that also captures potential sustainability opportunities, and maximizes use of the limited space available while meeting current and future needs of the community.
- Continued adherence to federal and local design standards and compatible land use.

Recommendations and alternatives have been developed based on a proactive planning approach whereby long-term guidance has been presented to the County to assist them in facilitating logical and orderly development over the planning period. Further, it is understood that inclusion of the identified projects on the ALP do not indicate a commitment on the part of the FAA and State of Colorado to provide funding for any or all of the projects.

5.2 EVALUATION CRITERIA

To assist in evaluating the following airside, landside, and terminal building alternatives, several criteria were used. Where applicable, they fall generally with these broad categories:

- Operational – the ability to safely accommodate current and forecasted aircraft, passengers, and vehicles.
- Environmental – development that provides for minimal environmental disruption.
- Compatibility with future needs – projects are compatible with future, short and long-term, needs of the airport and the community.
- Sustainability – where applicable, development that supports airport sustainability initiatives.
- Cost – an estimate of costs to provide a basis for comparison of each alternative.

5.3 ALTERNATIVE CONSIDERATIONS

This chapter is organized into two main sections, and builds upon the conclusions in **Chapter 4**, *Facility Requirements*. The first section of this chapter provides analysis and a preferred alternative for those defined needs where the consideration of alternative methods or approaches would yield an optimum solution based upon stated objectives and evaluation criteria.

The second section of this chapter provides development concepts for those defined needs that can be met through the development of areas already established for that specific use. For those needs, the chapter provides phased development concepts and supporting narrative that outlines the expected timeframes for each phase based on projected aviation demand and/or full build out.

Table 5-1 summarizes those areas identified in **Chapter 4** that require additional levels of analysis. These areas will be discussed in the following sections.

TABLE 5-1 – SUMMARY OF RECOMMENDED FACILITY REQUIREMENTS

Facility	Improvements Recommended	Level of Analysis
Runway 7/25	High Speed Taxiway Exit	Phased
Taxiway A	Holding Bay/Bypass Taxiway for Runway 25	Alternatives
Taxiway B	Full Parallel Taxiway	Phased
Terminal	Expand curbside check-in Install dedicated loading dock Expansion of holdrooms Expand baggage claim Expand secured concessions Expand rental car counters and queuing Expand TSA Security Checkpoint (currently underway) Expand terminal storage space Install Passenger Boarding Bridges	Alternatives
Parking and Roadways	Improved parking and roadway efficiency	Alternatives
General Aviation Facilities	Additional aircraft storage	Phased
Airport Support Facilities	Expand ARFF/SRE Building	Alternatives

5.3.1 HOLDING BAY/BYPASS TAXIWAY FOR RUNWAY 25

Holding bays and bypass taxiways provide capacity and flexibility related to runway use by permitting and enhancing ground maneuvering and bypass operations for departing aircraft. It is recommended in FAA Advisory Circular 150/5300-13A, *Airport Design,* that a holding bay may be

considered when runway operations reach 30 departures per hour.[64] While the capacity analysis completed in **Chapter 4** indicates capacity at EGE will be sufficient throughout the planning period, existing design peak hour traffic of 19 operations per hour, is forecast to increase to 20 operations per hour through 2030. Due to current runway usage, alternatives for a holding bay or bypass taxiway were only developed for the end of Runway 25. The following summarize these alternatives.

5.3.1.1 Alternative 1 – Holding Bay

Alternative 1, depicted in **Figure 5-1**, provides a holding bay which provides two aircraft holding positions, capable of accommodating Boeing 757-200 sized aircraft. The holding bay allows for each parking area to be independent from the other, allowing aircraft to bypass others on both entrance and exit from the holding bay.[65] The proposed holding bay incorporates the FAA recommended layout that was introduced with the most recent update to Advisory Circular 150/5300-13A, released September 2012.[66]

The key advantage for a holding bay includes greater taxiway efficiency and capacity for multiple aircraft holding positions. The configuration of the holding bay provides flexibility in accommodating aircraft movement. By providing a holding bay, aircraft preparing for departure upon nearing the threshold of Runway 25 are able to be staged offset from the taxiway, keeping the taxiway clear for trailing aircraft to continue taxiing. This increases the possibility for reducing delay in taxi time and subsequently increasing airfield capacity. At least three aircraft queuing positions are available, with two positions located in the holding bay and one at the hold line position for Taxiway A1. All aircraft will have the full runway length available for departure under this alternative.

With consideration to environmental and sustainability advantages, reducing aircraft taxi time has the potential to reduce environmental impacts through a decrease in aircraft emissions and fuel burn. In a similar way, aircraft holding bays provide several other sustainable advantages. Reduced delay provides a social benefit by decreasing the total amount of travel time for passengers and time spent confined inside the aircraft. There is a cost savings for aircraft operators in the possible reduction of taxi time and the resulting fuel burn.

The main disadvantage for the holding bay alternative is cost. The requirement to provide independent holding bay positions, with clearly marked entrance and exit location and islands separating the positions, creates much larger paved surface area as compared to the bypass taxiway proposed in Alternative 2. This additional surface area increases the pavement required for snow removal. Relocation of the MALSR building is also required and access to the glycol recovery tanks must be maintained through manhole access.

[64] Federal Aviation Administration. (2012). Airport Design (AC 150/5300-13 A). Chapter 4. Taxiway and Taxilane Design. Section 412. p. 150
[65] Federal Aviation Administration. (2012). Airport Design (AC 150/5300-13 A). Chapter 4. Taxiway and Taxilane Design. Section 412 (a). p. 150
[66] Federal Aviation Administration. (2012). Airport Design (AC 150/5300-13 A). Chapter 4. Taxiway and Taxilane Design. Section 412(b). p. 150

Other disadvantages from an environmental standpoint include a greater increase in temporary construction impacts compared to Alternative 2. Required earthwork to construct the holding bay creates water quality impacts for Alkali Creek. The increase in material use is also greater than that in Alternative 2.

The cost to construct this alternative is approximately $6,400,000.

5.3.1.2 Alternative 2 – Bypass Taxiway

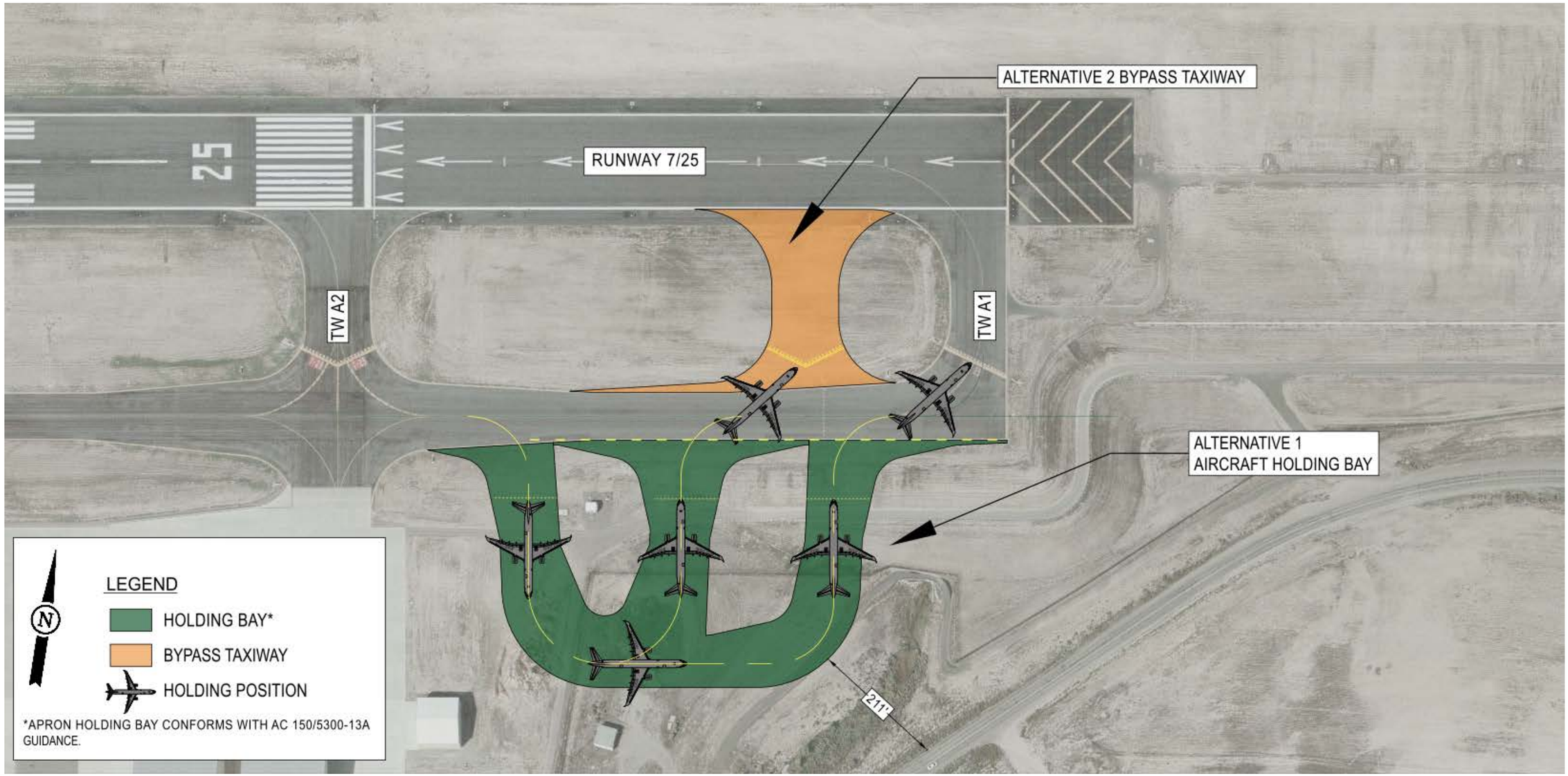
Alternative 2, depicted in **Figure 5-1,** provides a bypass taxiway allowing aircraft to depart on Runway 25 at a location 320 feet west of the existing threshold. This secondary departure location allows for aircraft to depart when Taxiway A1 is blocked by aircraft which are not ready for departure.

Providing a bypass taxiway has several advantages. As compared to Alternative 1, the bypass taxiway costs significantly less since it requires less pavement area, the MALSR building does not require relocation, and existing access to the glycol recovery tanks is maintained. Additionally, this alternative has less impervious surface than that proposed in Alternative 1. This alternative has a sustainable benefit in that there is reduced material use and has lower construction costs compared to Alternative 1.

However, a bypass taxiway comes with several disadvantages as well. As compared to Alternative 1, a bypass taxiway does not provide as much capacity for holding aircraft, as it only provides for a single aircraft queuing position. If an aircraft of any size (Aircraft Design Group I through IV) is positioned at the holdline for the bypass taxiway it blocks trailing aircraft from continuing to the runway end. Aircraft that require full length runway departures cannot use the bypass taxiway as it is located approximately 320 feet from the departure threshold of Runway 25.

Compared to Alternative 1, there is less opportunity for emission reduction and increased aircraft fuel burn. The cost to construct this alternative is approximately $1,100,000.

FIGURE 5-1 – HOLDING BAY & BYPASS TAXIWAY ALTERNATIVES



Source: Jviation, Inc

5.3.1.3 Preferred Alternative

The preferred Holding Bay/Bypass Taxiway Alternative as determined by County and Airport Staff as well as the PAC is Alternative 1 – Holding Bay.

The primary goal for these development alternatives is improving airfield capacity. Preference for the Holding Bay is given due to its increased operational benefits when compared to Alternative 2. Additionally, the aircraft holding bay has less of a potential to impact aircraft taxi time than that of the bypass taxiway, resulting in greater potential improvement to airfield capacity. Detailed cost analysis and project phasing will be discussed in **Chapter 7**, *Financial Implementation.*

TABLE 5-2 – HOLDING BAY /BYPASS TAXIWAY COMPARISON MATRIX

	Operational Efficiency	Environmental	Sustainability	Financial
Alternative 1: Holding Bay	**Advantages** • Additional flexibility for Air Traffic Control sequencing • May reduce departure delays for trailing aircraft • Full runway length available for takeoff • Potential for future aircraft deicing use • Allows for up to three aircraft queuing positions **Disadvantages** • Impacts perimeter road • Increased pavement area required for snow removal • Requires relocation of airfield structures • Impacts the location of the Glycol Recovery tanks	**Advantages** • Reduced aircraft emissions • Reduced fuel consumption **Disadvantages** • Increase in temporary construction impacts • Water quality impacts to Alkali Creek	**Advantages** • Reduced delay (social) • Reduction in cost associated with reduced taxi time and fuel burn (economic) • Potential increase in airfield capacity (environmental, social, and economic) **Disadvantages** • Increase in material use (environmental)	• Significantly higher construction cost to fully implement as shown in green in Figure 5-1 • $6,400,000
Alternative 2: Bypass Taxiway	**Advantages** • Less pavement area required for snow removal • Does not require the relocation of airfield structures • Does not impact the glycol recovery tanks **Disadvantages** • Does not reduce delay in taxi time for trailing aircraft • Only allows for single aircraft queuing • Aircraft requiring full runway length for departure are unable to use bypass taxiway	**Advantages** • Less impervious surface **Disadvantages** • Less efficient in reducing aircraft emissions • Less efficient in reducing fuel consumption	**Advantages** • Less use of material • Less construction cost (economic) **Disadvantages** • Less of a reduction in aircraft delay, as compared to Alternative 1 (social)	• Significantly lower construction cost as shown in orange in Figure 5-1 • $1,100,000

Source: Jviation, Inc.

5.3.2 COMMERCIAL TERMINAL EXPANSION

There are a number of Commercial Terminal needs identified in **Section 4.10** of **Chapter 4**, *Facility Requirements*. These areas and their corresponding levels of service are summarized in **Table 5-3**. Two main conceptual themes were developed, each of which present alternative concepts that fully meet the near-term and long range needs. The two concepts presented differ in the way the building is expanded and the landside elements, especially the terminal curb frontage, loop road, and parking areas, are integrated into the plan.

TABLE 5-3 – TERMINAL LEVEL OF SERVICE

Functional Area	Current Level of Service	No Action Level of Service		Desired Level of Service
		2020	2030	
Curbside Check-In	E	E	F	C
Baggage Claim	E	E	F	C
Non-secured Concessions	B	C	D	C
TSA Security Screening (currently underway)	A	C	D	C
Secured Concessions	D	D	E	C
Circulation	D	D	E	C
Holdrooms	D	E	F	C
Ancillary Space	D	D	D	C
A – Excellent level of service **B – High Level of Service** **C – Good Level of Service**	D – Adequate level of Service E – Inadequate level of service F – Unacceptable level of service			

Source: Jviation, Inc.

Each concept features a second level boarding concourse. This upper level would feature gates and loading bridges along with an increase in space to facilitate expansion of the holdrooms, circulation, and secured concessions.

The evaluation of these service areas take into consideration the significant seasonal fluctuations that occur between summer and winter. During the winter months and the associated ski season, the airport experiences peak operational levels. Conversely, the remainder of the year the airport operates well below peak period operations. To ensure the terminal functions meet passenger demands, an evaluation was conducted corresponding with peak operational periods. The goal for the Terminal and all functional areas is to provide for a Level of Service of C, with an understanding that during peak operational periods this level may temporarily fall to D. Using this baseline, several areas were found that do not adequately meet existing and future forecasted demand. To address these areas, expansion of the Terminal is necessary. The following sections discuss two proposed Terminal alternatives to address the needs both in the 2020 and 2030 planning periods and are summarized in **Table 5-6**.

5.3.2.1 Alternative 1 – Horizontal Expansion

This alternative, depicted in **Figure 5-2**, proposes a horizontal expansion of the Terminal to meet passenger demand forecast in the 10-year (2020) and 20-year (2030) time frame. Expansion would occur around the existing layout of the Terminal and expands both the secured and non-secured areas. This alternative also accommodates a second level holdroom, which would include the use of passenger boarding bridges. This second level would provide a wider and more open holdroom space than that which currently exists. Architectural elements can be incorporated which improve day lighting serving to eliminate the constrained and closed feeling that presently exists in the secured areas of the terminal.

There are several advantages of this horizontal expansion alternative. The main advantage is that expansion is not dependant on the reconfiguration of the existing roadway system, as compared to Alternative 2 which requires complete reconfiguration. Expansion of the Terminal serves to relieve existing capacity constraints in the terminal functional areas, and increases level of service like to the levels described in **Table 5-4**.

TABLE 5-4 – HORIZONTAL EXPANSION LEVEL OF SERVICE

Functional Area	Level of Service		
	Current	2020	2030
Curbside Check-In	E	C	C
Baggage Claim	E	C	C
Non-Secured Concessions	C	C	C
TSA Security Screening	C	C	C
Secured Concessions	D	B	B
Circulation	D	C	C
Holdrooms	D	C	C
Ancillary Space	D	B	B
A – Excellent level of service B – High Level of Service C – Good Level of Service	D – Adequate level of Service E – Inadequate level of service F – Unacceptable level of service		

Source: Jviation, Inc.

The addition of passenger boarding bridges increase level of service by protecting passengers from the elements and noise found on an active apron area. Passenger movement is also better controlled with improved security due to the use of enclosed loading bridges.

This alternative has the potential to provide an additional 10,000 square feet of holdroom for increases in passenger levels beyond that of the 2030 planning period. Phased construction of the landside baggage claim, curbside check in, outbound baggage, and west expansion of the holdroom are all accommodated with this alternative.

Expansion of the Terminal around the existing footprint reduces the overall footprint of the building at full build out, compared to that which is proposed in Alternative 2. Future building expansion can utilize sustainable building elements and the use of loading bridges coupled with expanded holdroom areas serve to provide better levels of service for passengers.

With the introduction of a second level holdroom, some existing building space is then able to be retrofitted for other required uses and facilitate the expansion of ancillary space for expansion of storage, maintenance, and building mechanical functions.

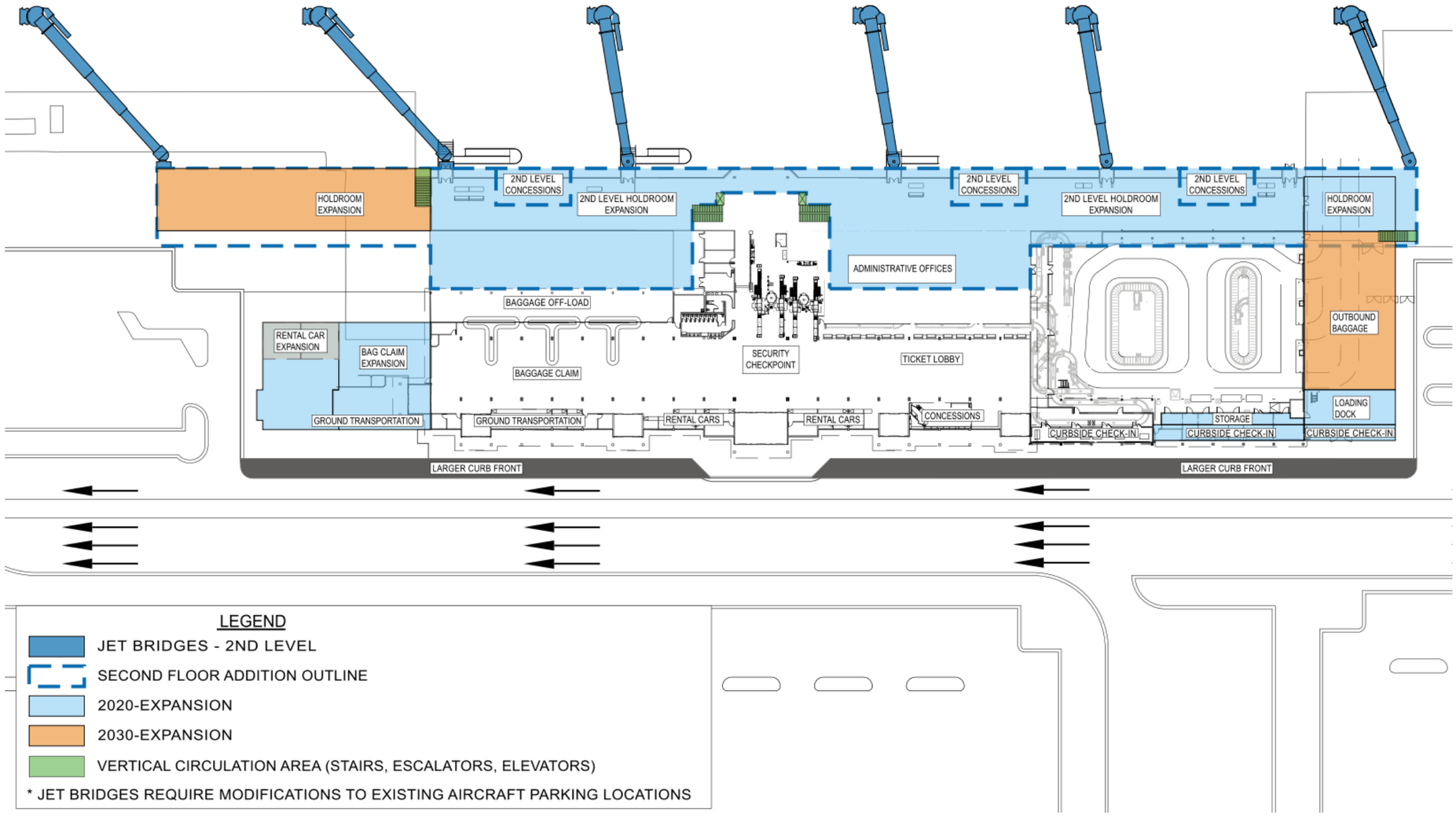
However, this alternative is not without several disadvantages. Currently there are five gates which serve two aircraft parking positions each, for a total of 10 positions. By introducing passenger boarding bridges these gates now only serve a single aircraft position. The geometric requirements of jet bridges require a shift in existing aircraft parking and results in a decrease in the number of aircraft that could simultaneously utilize the boarding gates. However, there is still room for up to 10 aircraft parking positions which can only be served through apron level boarding.

Exiting an aircraft into the mountain air with the surrounding scenery is also eliminated by the introduction of passenger boarding bridges. This has been identified in user and terminal surveys as unique trait of the airport. This could be potentially mitigated through the incorporation of glass loading bridges at an increased construction cost.

Finally, construction of a second level holdroom with jet bridges increases the overall project cost. This increase is a result of constructing a second level onto an area that was not originally designed for a second level structure. This construction requires higher initial investment as there is very little opportunity to phase this expansion.

The cost for this alternative is approximately $20,000,000 for 2020 expansion requirements and $9,500,000 for 2030 expansion requirements.

FIGURE 5-2 – HORIZONTAL EXPANSION



Source: Jviation, Inc.

5.3.2.2 Alternative 2 – "T" Expansion

This alternative, as depicted in **Figure 5-3** and **Figure 5-4**, proposes a larger expansion of the Terminal, compared to that proposed in Alternative 1. Additional development occurs through a south expansion of the central Terminal, changing the building footprint from an "H" to a "T" configuration. Much like Alternative 1, this expansion accommodates a second level addition for passenger boarding bridges. TSA Security screening could be relocated to the proposed second level allowing for passengers to clear screening and transition to the holdroom on a single level.

The key advantage of this "T" expansion is that it allows for a much greater efficiency than that proposed in Alternative 1. Incorporating a split curb Terminal area allows for much greater curb front for curbside check-in and passenger pick-up, while maintaining close proximity to the center of the Terminal building, as compared to Alternative 1. Existing curbside check-in would be expanded to the west with additional check-in kiosks located near the center of the terminal on portions of the curb front between the roadway circulation loops. Additionally, expansion area is given for ground transportation and rental cars, located in an area separated from the baggage claim area, and could help eliminate congestion in the baggage claim area during peak operational periods. There is a greater increase in space dedicated for the expansion of both non-secured and secured concession, an area identified as lacking in passenger surveys and interviews. Relocation of the holdroom to the second level allows for repurposing of the existing holdroom floor space. This includes relocating the airport administrative offices from the ARFF facility to the terminal and expansion of existing tenant administrative spaces. Finally, relocation of TSA screening to a second level has the potential to further increase capacity beyond that provided in the 2012 expansion.

Exiting from the Secured Holdroom would occur at level one. This would separate inbound travelers from outbound, helping to improve circulation and further reducing the existing pinch point. **Table 5-5** on the following page provides a full summary of the increase in level of service proposed in Alternative 2.

Passenger boarding bridges increase the level of service by protecting passengers from the elements and noise found on an active apron area. Passenger movement is also better controlled with improved security due to the use of enclosed loading bridges.

TABLE 5-5 – "T" EXPANSION LEVEL OF SERVICE

Functional Area	Level of Service		
	Current	2020	2030
Curbside Check-In	E	C	B
Baggage Claim	E	C	C
Non-Secured Concessions	C	A	B
TSA Security Screening	C	B	B
Secured Concessions	D	B	B
Circulation	D	B	B
Holdrooms	D	A	B
Ancillary Space	D	B	B
A – Excellent level of service B – High Level of Service C – Good Level of Service	D – Adequate level of Service E – Inadequate level of service F – Unacceptable level of service		

Source: Jviation, Inc.

Expansion of the baggage claim and outbound baggage facilities has the potential to be phased and occur as actual passenger demand warrants. The increase in concession area allows for expansion that mirrors passenger growth or through proposed private development opportunities. Similar to Alternative 1, there is space for additional west expansion of the holdroom to accommodate passenger growth beyond the 2030 planning period. Terminal expansion facilitates the expansion of ancillary space to be used for future storage, maintenance, and other building mechanical functions.

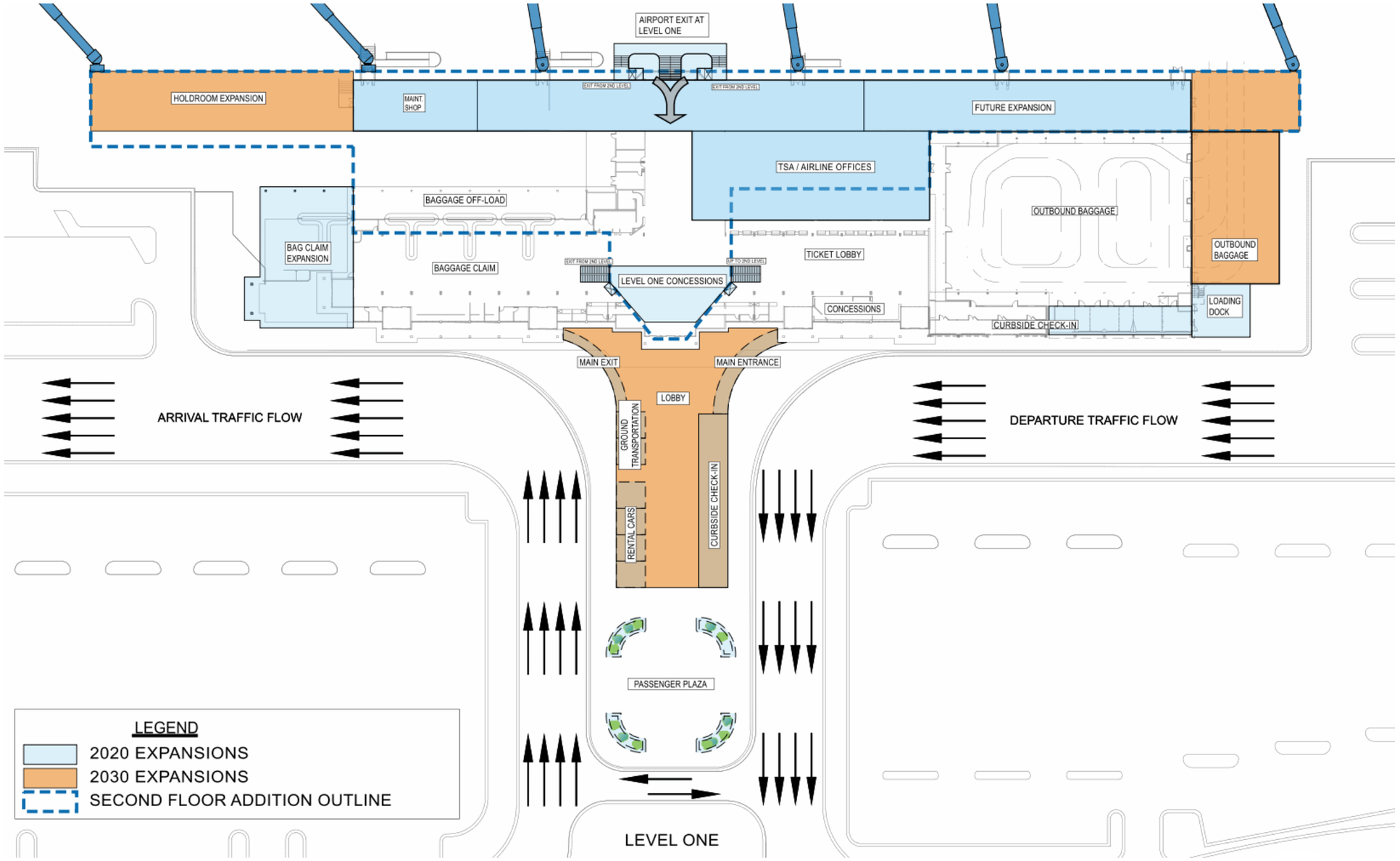
Future building expansion can utilize sustainable building elements and the use of loading bridges, coupled with expanded holdroom areas serve to provide better levels of service for passengers.

This "T" expansion alternative also has disadvantages. The main disadvantage, when compared to Alternative 1, is the increased cost and phasing complexity required for reconfiguration of the roadway and parking system to enable the south expansion. Additionally, the use of passenger boarding bridges introduces the same aircraft parking issues as outlined in Alternative 1.

Finally, the "T" expansion creates a larger building and construction footprint than that in Alternative 1. This expansion creates a secondary impact in that roadway circulation and parking must also be reconfigured.

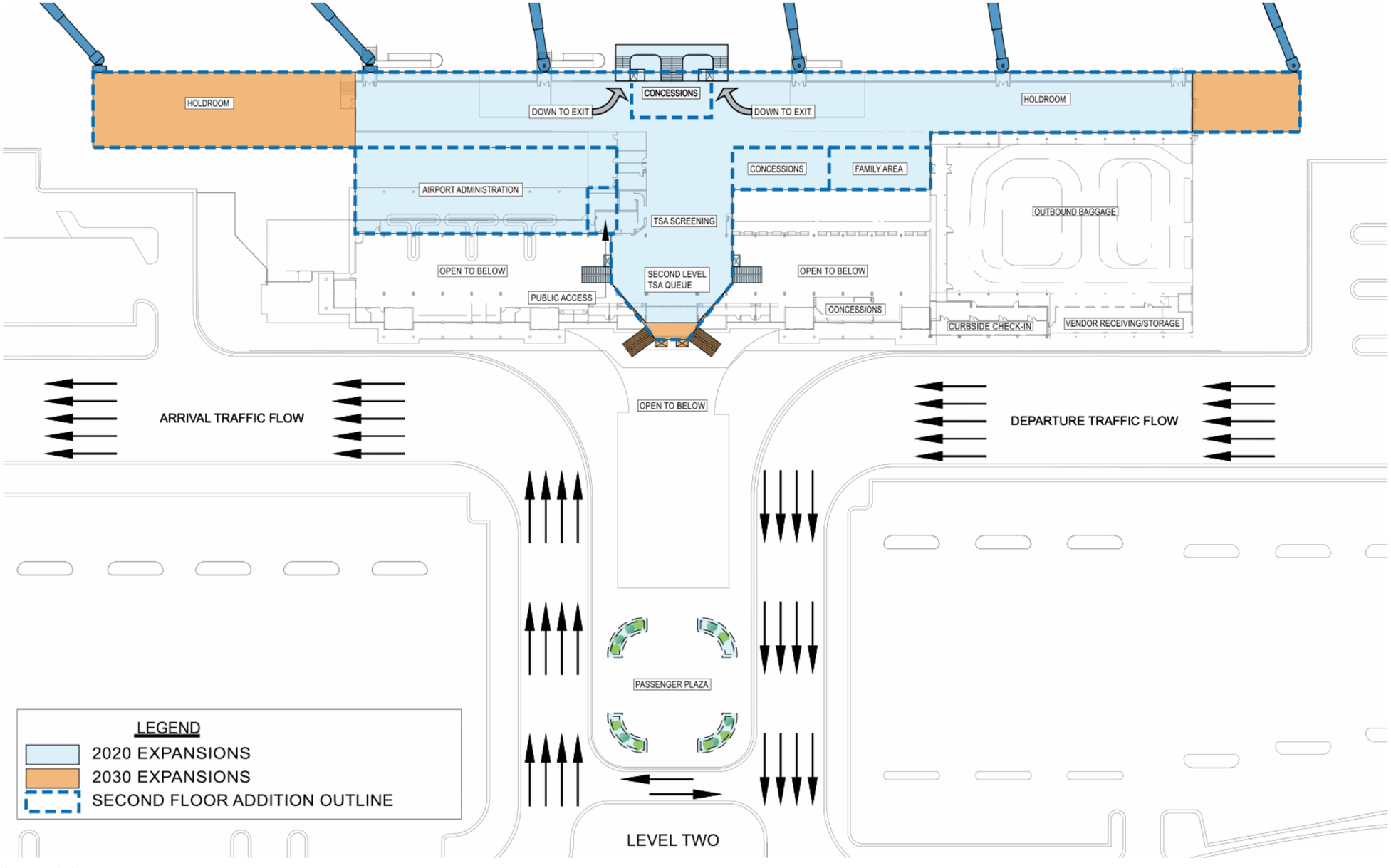
The cost for this alternative is approximately $27,000,000 for 2020 expansion requirements and $22,500,000 for 2030 expansion requirements. There is also an additional cost of $25,000,000 in roadway improvements required to accommodate the terminal expansion, as discussed in **Section 5.3.3**.

FIGURE 5-3 – "T" EXPANSION LEVEL ONE



Source: Jviation, Inc.

FIGURE 5-4 – "T" EXPANSION LEVEL TWO



Source: Jviation, Inc.

5.3.2.3 Preferred Alternative

The preferred Commercial Terminal Expansion Alternative as determined by County and Airport Staff as well as the PAC, is Alternative 2 – "T" Expansion. Alternatives for Access Roadway and Parking, outlined in **Section 5.3.3**, will focus on providing a reconfiguration that facilitates this expansion.

The "T" Expansion of the Commercial Terminal was chosen as the preferred alternative because it not only provides greater expansion area, but better improves upon key functional areas than that proposed in Alternative 1. Specifically, the additional curb front for curbside check in and passenger pick up, proposed in the alternative, serves to improve on an area that currently experiences congestion during peak operational periods. A south extension of the main Terminal area also allows for greater flexibility in available space for concessions, administrative offices, and tenant lease space compared to Alternative 1. Finally, this alternative better addresses the pinch point where TSA security, secured terminal concessions, and exit from the secured areas all converge. This provides not only a more efficient terminal, but an increase in passenger level of service. Detailed cost analysis and project phasing will be discussed in **Chapter 7**, *Financial Implementation.*

TABLE 5-6 – COMMERCIAL TERMINAL EXPANSION ALTERNATIVE COMPARISON MATRIX

	Terminal Program Requirements	Passenger Level of Service	Scalability	Sustainability	Financial
Alternative 1: Horizontal Expansion	**The Horizontal Expansion Alternative** provides the ability to meet program requirements through 2030. The concept also allows for the expansion to a second level boarding area and the optional use of jet bridges if desired.	**Advantages** • The Level of Service will improve with additional areas for all terminal functions • The Horizontal Expansion provides a single curb on the landside which is familiar to passengers • The arrangement of all functions is similar to the majority of single level terminals, allowing for easier wayfinding to most passengers **Disadvantages** • The Horizontal Expansion is limited by the length of the curb frontage and is subject to significant congestion from high demand from both arriving and departing passengers simultaneously during the peak periods	**Advantages** • The Horizontal Expansion is somewhat scalable in that each end can be extended and additional gates provided • If ground level passenger boarding is maintained, the airside and landside capacity will remain in balance • Second level boarding gates with passenger boarding bridges may offer additional concourse width and significantly more circulation and concession space **Disadvantages** • The Horizontal Expansion concept is limited by development on each side of the building beyond the planning period • It is more difficult to balance the airside and landside terminal functions since they are linked to the same linear element	**Advantages** • The Horizontal Expansion may have a smaller footprint to accommodate program requirements compared to the "I" Expansion depending on the size of each phase • May not require relocation of certain rental car facilities to a Greenfield site in order to implement • Potentially lower development cost than Alternative 2 in order to meet 2020 and 2030 program requirements **Disadvantages** • Level of Service may continue to decrease at peak periods especially if some terminal functions are out of balance • Energy and other operating cost saving opportunities are lower compared to the "T" concept	• $20,000,000 for 2020 • $9,500,000 for 2030
Alternative 2: "T" Expansion	**The "T" Expansion Alternative** provides the ability to meet program requirements through 2030. The concept also allows for the expansion to a second level boarding area and the optional use of jet bridges if desired.	**Advantages** • The Level of Service will improve with additional areas for all terminal functions • The "T" concept reduces congestion by providing for much longer curb frontage with additional expansion capability without horizontally extending the building envelope • Segregating arrival and departure traffic within separate traffic flows will reduce congestion and enhance the Level of Service and processing times **Disadvantages** • The implementation requires the concurrent reconfiguration of the terminal loop roadway and many parking lots, which may interrupt passenger experience • Depending on the transportation mode, walking distances may increase with the displacement of some close-in parking • Signage and wayfinding will be more complex leading to potential confusion both within the terminal and landside	**Advantages** • The "T" Expansion provides for additional flexibility in balancing the capacity of the various terminal elements • Ticketing and ground transportation can be located in the new terminal envelope and a second level could offer new concession or TSA processing areas • Opens a third side of the terminal that can be expanded in the future as needed for balancing. • Second level boarding advantages are similar to the Horizontal Expansion concept **Disadvantages** • Phasing opportunities of the initial construction program are limited because the new terminal shape will require a new roadway configuration prior to, or in conjunction with, the terminal expansion • A much larger expansion of the terminal is necessary to implement the "T" Expansion whereas the Horizontal Expansion could be scaled back if necessary to fit reduced funding scenarios.	**Advantages** • Once implemented, the "T" concept will offer greater flexibility to balance the building's functions within the existing footprint • May provide a greater overall increase in passenger level of service beyond the planning period • The new building envelope will offer increased energy efficiency opportunities and lower average operating costs • At non-peak times and/or seasons, the building addition can be offline, offering reduced operating costs **Disadvantages** • Some existing unpaved lots will need to be paved to meet existing demand, offsetting parking relocated for new addition. • Compared to the Horizontal Expansion, there may be increased 1st costs associated with the expansion, offset by the lower operating costs.	• $27,000,000 for 2020 • $22,500,000 for 2030 • Requires $25,000,000 in roadway improvements, as detailed in **Section 5.3.3.**

Source: Jviation, Inc.

5.3.3 Access Roadways and Parking

Alternatives for access roadways and parking were developed to support existing activity and proposed Commercial Terminal and landside expansion, and to more efficiently serve passenger levels forecast in the 20-year planning period.

The current roadway system meets the overall needs of passengers; however, there are areas where level of service issues exist during peak operational periods. Specifically, passenger pick-up and drop-off curb front experiences congestion during the primary departure and arrival periods during the busy winter ski season. It is not uncommon for up to three rows of cars to be stopped in front of the terminal, creating a pinch point and restriction to the flow of traffic. This results in a requirement for additional staffing for the specific purpose of traffic control during the peak operational period. It has also been identified through user surveys and tenant focus groups, that signage directing passengers to airport facilities are confusing and in need of improvement. This suggests that signage could be improved along the entire route from the I-70 interchanges to the Airport, as well as within the Airport itself. Signage beyond the Airport would be the responsibility of CDOT or other local jurisdictions as applicable.

While existing public parking meets existing demand, there are areas where reconfiguration could maximize available space and increase parking efficiency. Both expansion alternatives also serve to expand public parking to accommodate the growth forecasted for the 2020 and 2030 planning period. As identified in **Section 4.3.3,** the current long-term and overflow parking lots are unpaved, which results in an inefficient parking layout and reduced use as passengers typically prefer paved parking options. Being a resort oriented airport, space requirements for rental car parking and commercial ground transportation were considered especially important for future capacity and convenience improvements.

A comparison of the advantages and disadvantages associated with the alternatives discussed in the following sections are summarized in **Table 5-6**. Finally, the alternatives discussed in the following sections assume that the "T" expansion for the Commercial Terminal is the preferred alternative. It is important to note, however that these roadway improvements facilitate the "T" expansion; they have the ability to be implemented with the existing Terminal footprint, taking advantage of the associated benefits.

5.3.3.1 Alternative 1 –Split Roadway Circulation with Single Rental Car Parking Lot

Alternative 1, depicted in **Figure 5-5**, proposes to split roadway circulation and parking into two functional areas. These areas correspond with the arrival and departure functions of the Commercial Terminal. It should be noted that this alternative also works with the existing layout of the Commercial Terminal, allowing for parking and roadway reconfiguration to be phased prior to the start of the Terminal expansion.

Advantages with this alternative include the benefits of grouping related vehicle functions in separate traffic patterns. In its current configuration, traffic for both departures and arrivals utilize the same roadway system. Vehicles that are picking up passengers on the west end of the Terminal must first pass vehicles dropping off passengers at curbside check in, on the east end of the terminal. When the Terminal curb front reaches capacity vehicles begin to stack into the adjacent lanes, creating constraints that restrict the flow of traffic. This results in delays for vehicles utilizing the roadway. Splitting the roadway helps to reduce the impacts if one functional area experiences congestion.

The key difference between the two alternatives is the placement of the rental car facilities. Similar between the concepts is the removal of the rental car servicing facility near the Terminal. A consolidated facility located outside of the main loop road frees up additional close-in parking. However, Alternative 1 features a single lot for both ready and return lots on the east side of the "T" expansion of the Terminal. The west side remains available for public short-term and long-term parking.

The key advantage to this arrangement is that all rental car facilities are located in the same general area even though the servicing function is conducted across Cooley Mesa Road. The other key advantage is that close-in parking is available for public parking in private vehicles for the meeter-greeters and resident travelers.

This alternative provides greater expansion capabilities beyond 2030 than that in Alternative 2, as there is room for future expansion of the west public parking lot or other future development. All development is located on previously disturbed land and has less paved surface than what is proposed in Alternative 2.

The primary disadvantage, when compared to Alternative 2, is the reduced efficiencies that arise from the proposed single rental car ready and return parking lot, to be located adjacent to the east end of the Commercial Terminal. This requires all rental car users to utilize the departure passenger roadway system. The result is an increased amount of vehicles on this portion of the roadway, which has the potential to impact roadway efficiency. Additionally, arriving passengers must collect their bags from baggage claim, located on the west end of the Terminal and then travel across the Terminal building to access the rental car parking lot. There is only a single access point for the passenger arrival roadway system, compared to two in Alternative 2. This has the potential to create constraints to traffic flow.

At the final 2030 build out, there is abundant capacity for rental car operations, although less total area when compared to Alternative 2. Due to constraints from the Terminal to the east and the ARFF building to the west, the Commercial Ground Transportation Pick Up lot will likely remain at its current size or be relocated in the future. The Commercial Ground Transportation Pick Up lot area already reaches capacity during maximum peak hour periods.

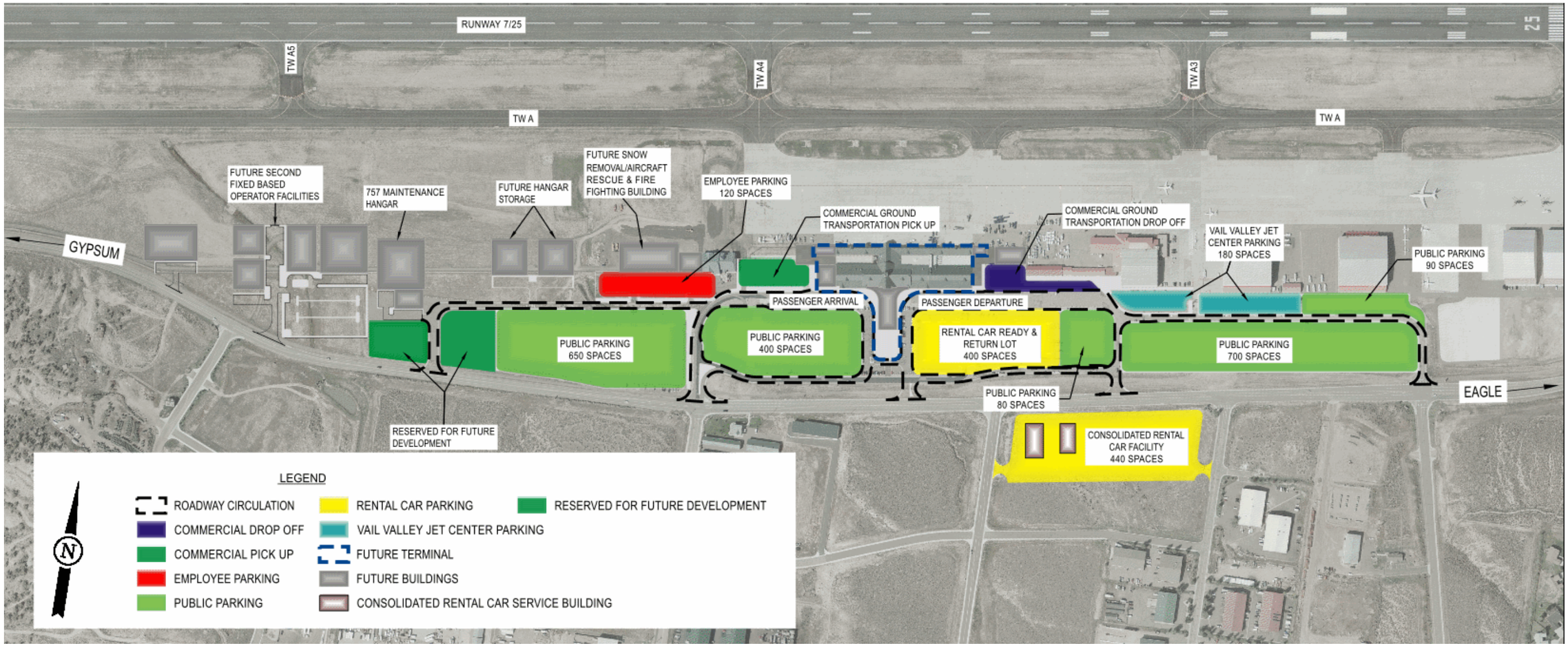
The location of the existing Commercial Ground Transportation Pick Up Lot also has the potential to have a negative impact on passenger level of service. Ground transportation counter space is proposed to be expanded into the future south expansion of the "T". This location will require passengers to travel a greater distance between check in and the existing parking lot. Inefficiencies in passenger flow are increased, as passengers will be required to cross back across the terminal from baggage claim to the ground transportation check in counters.

The consolidated rental car maintenance facility shared between the two concepts must be relocated from its existing location and requires land acquisition on the south side of Cooley Mesa Road. The location of the new facility requires rental car agencies to shuttle vehicles back and forth across Cooley Mesa Road. This has the potential to impact staffing and roadway capacity. Adding additional entrances/access roadways from the airport to Cooley Mesa Road also may impact traffic flow. The Town of Gypsum has reviewed this proposed roadway layout and comments received were incorporated into this configuration. Finally, the expansion of parking, along with the shift in access roadways will impact stormwater drainage and detention facilities.

From a sustainability standpoint, this alternative improves roadway efficiency, resulting in the potential reduction of emissions and fuel consumption. The reduction in fuel also has a potential to lower fuel costs. Finally, this alternative requires less construction material than Alternative 2.

The cost for this alternative, which includes land acquisition, is approximately $24,500,000 for 2020 expansion requirements and $1,900,000 for 2030 expansion requirements. However, there are many opportunities to phase the development and share development costs.

FIGURE 5-5 – ALTERNATIVE 1 - SPLIT ROADWAY CIRCULATION WITH A SINGLE RENTAL CAR PARKING LOT



Source: Jviation, Inc.

5.3.3.2 Alternative 2 – Split Circulation with Two Rental Car Parking Lots

Alternative 2, as depicted in **Figure 5-6**, also features a split to the roadway circulation and parking based on splitting the Commercial Terminal functioning areas. This alternative differs from what is proposed in Alternative 1 in that rental car parking is divided into two parking lot areas, corresponding with the associated arrival or departure areas of the Terminal. Rental car return would be located adjacent to the east end of the Terminal, corresponding with the passenger departure functions. The ready lot would be located adjacent to the west end of the Terminal and related passenger arrival functions. To better accommodate this concept, an additional access road for the passenger departure roadway system is proposed that has the potential to create greater efficiencies to this portion of the roadway, compared to the single access road proposed in Alternative 1.

The main advantage with this alternative, compared to that in Alternative 1, is the greater increase in roadway and parking efficiency. In its current configuration, traffic for both departures and arrivals utilize the same roadway system. Vehicles that are picking up passengers on the west end of the Terminal must first pass vehicles dropping off passengers at curbside check-in, on the east. When Terminal curb front reaches capacity the main roadway becomes constrained, restricting the flow of traffic. This results in delays for vehicles utilizing the roadway system. Separating the roadway serves to reduce the impacts when one functional area experiences congestion. Dividing the rental car lots into two areas also adds to the efficiency of the roadway system as rental car traffic is dispersed between both roadway systems. This also has the potential to improve Terminal efficiency, as arriving passengers are no longer required to travel across the flow of traffic upon exiting the baggage claim in order to reach their rental car. A second access point for the passenger arrival roadway also has the potential to increase the level of circulation above that proposed in Alternative 1, as there is less of an opportunity for congestion with multiple roadway entry points.

Configuring rental car parking into two lots also allows for a greater amount of rental car and ground transportation parking, compared to that proposed in Alternative 1. As a resort airport there is larger utilization of rental car and ground transportation services, creating a higher demand for facilities to support these functions.

Similar to Alternative 1, sustainable advantages include an improved roadway system, increasing efficiency and the potential to reduce emissions and fuel consumption. Reduced fuel consumption has the added benefit of potentially lowering costs for passengers. Sustainable building materials and construction practices can also be applied.

There are several disadvantages with this alternative. The closest public parking spaces are at least 340 feet from the main entrance of the Terminal, thus the average walking distance for public parking spaces is greater than Alternative 1. Also, the edge of the east public parking lot will be over 2,000 feet from the entrance of the Terminal and would require the use of a

passenger shuttle during the ski season.[67] Similar to Alternative 1, the Commercial Ground Transportation Pick Up lot expansion is constrained by the Terminal to the east and ARFF building to the west. Parking for this lot is maintained in an area that begins to approach capacity during peak operational periods.

Due to rental car parking being located on both sides of the Terminal, the west public parking lot must be expanded beyond the size proposed in Alternative 1 to ensure public parking demand is met through the 2030 planning period. This limits the land available for future development as compared to that in Alternative 1. The split rental car lots may lead to passenger confusion due to the presence of the terminal expansion bisecting the roadway functions.

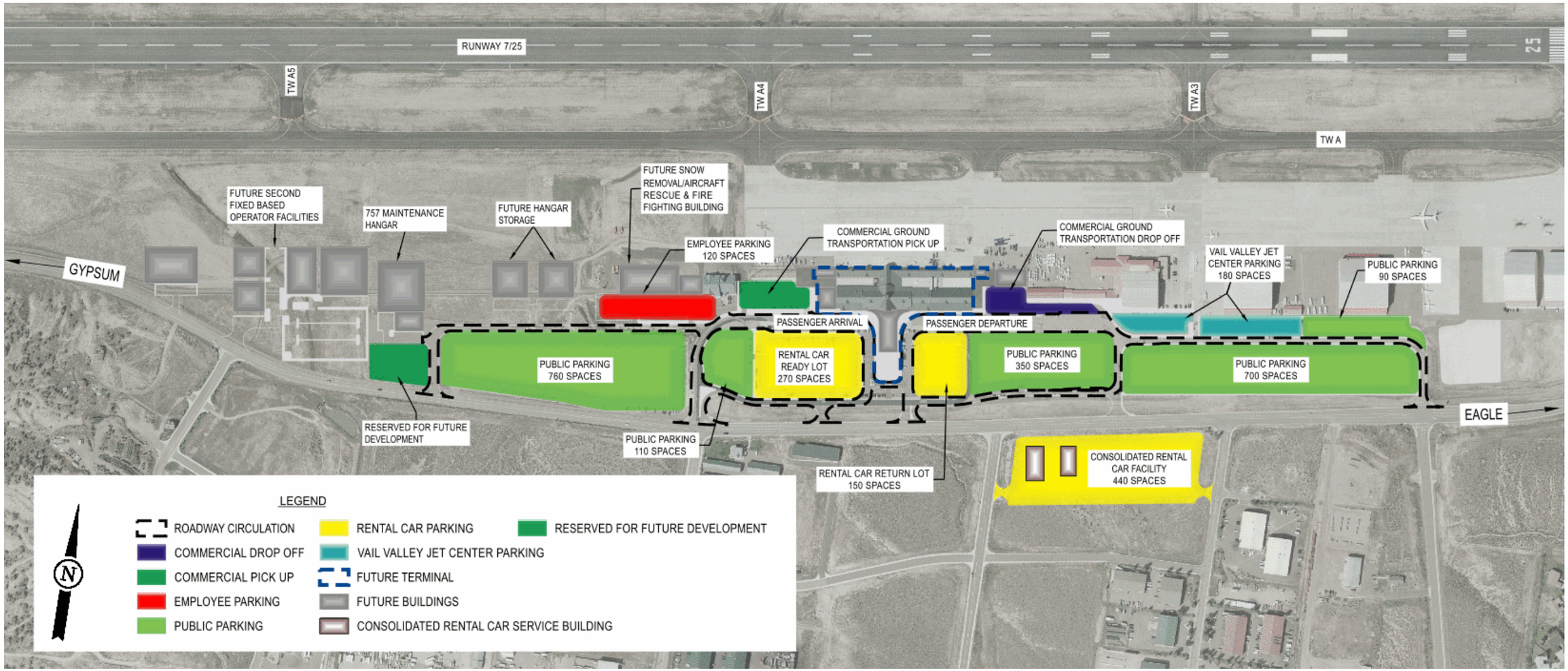
Consolidated rental car maintenance facilities must be relocated from its existing location to an area south of Cooley Mesa Road, requiring future land acquisition. Relocation of the facility requires rental car agencies to shuttle vehicles back and forth across Cooley Mesa Road. This has a potential to impact rental car staffing and decrease roadway capacity. Adding additional entrances/access roadways from the airport to Cooley Mesa may impact traffic flow. Additionally, this alternative proposes to add one additional access road compared to Alternative 1. The Town of Gypsum reviewed proposed roadway layouts and comments received were incorporated into this layout. The size of the facility would be determined with the direct input from the rental agencies and sized accordingly.

While proposed development will be located on previously disturbed land, this alternative has more impervious surface than that proposed in Alternative 1. Changes to parking and the roadway system will also alter stormwater drainage and detention facilities. Finally, the construction material use is greater than that proposed in Alternative 1.

The cost for this alternative, which includes land acquisition, is approximately $26,500,000 for 2020 expansion requirements and $2,100,000 for 2030 expansion requirements. However, there are many opportunities to phase the development and share development costs.

[67] FAA Advisory Circular 150/5360-13, Planning and Design Guidelines for Airport Terminal Facilities, Chapter 9, Section 151. Public Parking Facilities

FIGURE 5-6 – ALTERNATIVE 2 RECONFIGURATION WITH OFF-SITE CONSOLIDATED RENTAL CAR FACILITY



Source: Jviation, Inc.

TABLE 5-7 – ACCESS ROADWAY AND PARKING COMPARISON MATRIX

	Roadway/Parking Program Requirements	Landside Level of Service	Scalability	Sustainability	Construction Cost
Alternative #1: Split Circulation with Single Rental Car Parking Lot	• This alternative provides sufficient capacity for all landside vehicle movements, staging locations, rental car operations, and parking requirements for the near term (2020) and the long term (2030)	**Advantages** • Having rental car facilities located together increases efficiency and enhances wayfinding. • Close-in parking is available for meeter-greeters and resident travelers. • Average walking distance to all public parking spaces is shorter **Disadvantages** • All rental car movements will occur in the Departures loop, potentially further decreasing the Level of Service at peak times	**Advantages** • The concept is fully scalable, allowing for incremental increases as demand warrants • Off-season changes to parking lot designations are also possible **Disadvantages** • None	**Advantages** • Improved roadway efficiency reduces auto emissions, fuel consumption and fuel costs resulting in increased passenger satisfaction (social, economic, financial) • Opportunity to utilize sustainable building materials and construction practices • Less construction material used • Less of an increase in paved surface **Disadvantages** • None	• $24,500,000 for 2020 • $1,900,000 for 2030
Alternative #2: Split Circulation with Two Rental Car Parking Lots	• This alternative provides sufficient capacity for all landside vehicle movements, staging locations, rental car operations, and parking requirements for the near term (2020) and the long term (2030)	**Advantages** • Splits Rental Car functions to coincide with the arrival and departure areas of the Commercial Terminal **Disadvantages** • Longer average walking distance to public parking spaces • Divides rental car operations into three areas complicating logistics and potentially reducing efficiency and processing times, and complicating wayfinding	**Advantages** • The concept is fully scalable, allowing for incremental increases as demand warrants • Off-season changes to parking lot designations are also possible **Disadvantages** • None	**Advantages** • Improved roadway efficiency reduces auto emissions, fuel consumption and fuel costs resulting in increased passenger satisfaction (social, economic, financial) • Opportunity to utilize sustainable building materials and construction practices **Disadvantages** • More construction materials used	• $26,500,000 for 2020 • $2,100,000 for 2030

Source: Jviation, Inc.

5.3.3.3 Preferred Alternative

Comments received during a tenant focus group meeting held on November 15, 2012 identified several operational difficulties introduced by relocating the consolidated rental car facility south of Cooley Mesa Road. This would require rental car personnel to frequently cross Cooley Mesa when repositioning cars between the maintenance facility and parking. Due to the nature of operations employees often may drop a car off at one facility and not have one ready to reposition, thus requiring an employee shuttle or crossing of a busy roadway on foot. This could result in operational inefficiencies or potential safety hazards. In addition, a split rental car ready and return lot on either side of the future terminal extension was identified as a potential operational impact. It is more efficient to have all rental car functions located on a single lot and provides a higher level of service for passengers. As a result of these comments, the preferred Access and Roadways Alternative by County and Airport Staff is a third option, as show in **Figure 5-7**. This alternative eliminates the segregated consolidated rental car maintenance facility and incorporates elements from both Alternative 1 and 2.

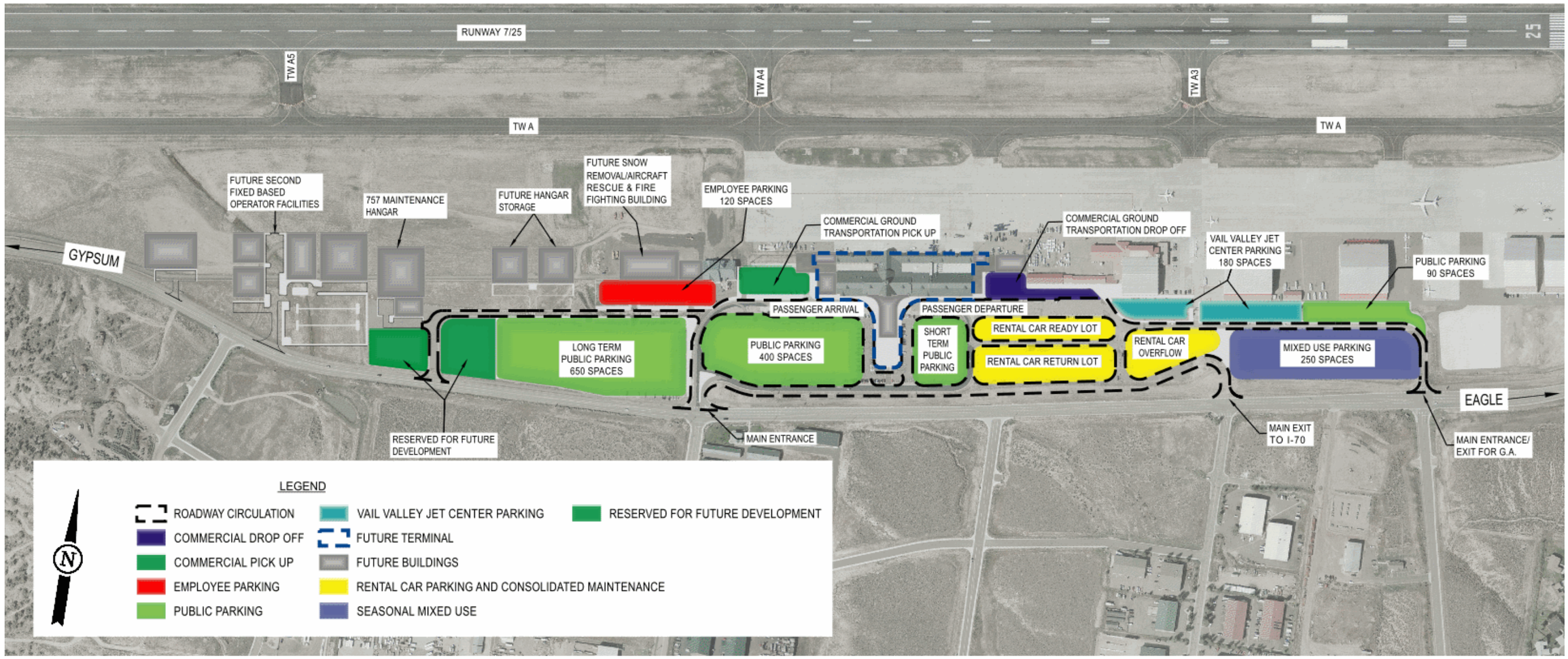
This alternative differs from Alternatives 1 and 2 in that a consolidated rental car parking lot with maintenance facility is located southeast of the main terminal entrance. To facilitate this, a portion of space previously reserved for public parking is shifted to rental car uses. To recoup a portion of this public parking, and understanding that close in parking to the terminal provides a better passenger level of service, a row of public parking spaces is located adjacent to the passenger departure side of the terminal along the circulation roadway. Additionally, a portion of the parking lot located on the east end terminal roadway system is reserved for mixed use parking. Given the seasonal peaks in operations this parking lot provides flexibility in that its use can be for either rental car overflow, temporary public parking, or other airport uses.

The primary advantage with this alternative is operational efficiency. Consolidating rental cars into one lot on existing airport property eliminates the impacts identified in crossing Cooley Mesa Road. This also eliminates the additional cost required for land acquisition.

The disadvantage with this alternative is that a consolidated rental car facility on airport property is done so at the expense of public parking. Finally, the rental car lot is located on the east side of the terminal, which requires passengers to travel back across the terminal from the baggage claim and rental car check-in counters.

The cost for this alternative is approximately $22,400,000 for 2020 expansion requirements and $2,100,000 for 2030 expansion requirements. However, there are many opportunities to phase the development and share development costs. Detailed cost analysis and project phasing will be discussed in **Chapter 7**, *Financial Implementation.*

FIGURE 5-7 – PREFERRED ALTERNATIVE - CONSOLIDATED RENTAL CAR FACILITY NORTH OF OF COOLEY MESA ROAD



Source: Jviation, Inc.

5.4 PHASED DEVELOPMENT CONCEPTS

The remaining sections of this chapter discuss development concepts in established development areas that are capable of meeting the development needs. Discussion centers around the phased development of these projects.

5.4.1 RUNWAY 7/25 EXTENSION

A runway length analysis was studied in **Section 4.2.1.3**, using performance data provided by Jeppesen for the most critical aircraft for Runway 7/25. This included the design aircraft (Boeing 757-200) identified in **Chapter 3**, *Aviation Activity Forecasts*. Additional aircraft included two configurations of the Boeing 737-700, based on the length of haul typically flown by these aircraft. Forecasts identify that these aircraft will continue to be flown through the majority of the forecast period. All performance data identified obstacle clearance as the significant limiting factor in determining maximum allowable takeoff weight. **Table 5-8** summarizes maximum allowable takeoff weight for these critical aircraft.

TABLE 5-8 – MAXIMUM ALLOWABLE TAKEOFF WEIGHT

Aircraft	Temp	RWY 25 Limited Takeoff Weight (lb)	RWY 07 Limited Takeoff Weight (lb)	Max Certified Takeoff Weight (lb)
Boeing 757-200*	86°F	166,669	161,158	269,997
	32°F	186,952	180,779	
Boeing 737-700W CFM56-7B26**	86°F	111,995	107,585	179,998
	32°F	118,608	113,978	
Boeing 737-700W CFM56-7B22**	86°F	96,562	93,035	179,998
	32°F	109,790	105,601	

*Source: Jeppesen OpsData Center, *EGE Design Aircraft, **Engine Type*

While the Boeing 757-200 is identified as the design aircraft, it may not remain the design aircraft for the entire planning period. The aircraft is no longer being manufactured and thus airlines may be replacing with at EGE with other newer generation aircraft types once the B757-200 is retired from airline fleets.

The types of aircraft that could be chosen (among those being manufactured today) are either larger than the current design aircraft (e.g. B787 or similar), or smaller (e.g. latest generations of B737 or A319/320). If smaller aircraft are used in place of the retired B757-200, it is likely that the current runway length is adequate. However if larger aircraft are introduced, especially on longer international routes, then additional runway length could be warranted.

Previous master plans for EGE included a 1,000 foot extension to Runway 7.This plan carries forward the Runway 7 extension in order to establish general requirements for the County and surrounding jurisdictions to proactively protect airspace and land use needs in the event future activity at the airport warrants a runway extension.

5.4.2 HIGH SPEED TAXIWAY EXIT

Standard high speed taxiway exits provide a 30-degree acute-angled exit taxiway. This configuration increases runway capacity by allowing aircraft to exit the runway at higher speeds, facilitating increased use of the runway for both landing and departing aircraft. As previously mentioned, while the capacity analysis in **Chapter 4** indicates capacity at EGE will be sufficient throughout the

planning period; existing current peak hour demand is at 19 operations per hour and forecast to increase to 20 by 2030. It should be noted that during the peak operations period during the 2010/2011 and 2011/2012 seasons peak hour traffic reached 30 operations per hour[68]. This warrants planning consideration for enhanced capacity. FAA Advisory Circular 150/5300-13A, *Airport Design,* recommends high speed taxiway exits when hourly operations reach 30 per hour to maintain adequate capacity.[69] Planning for the installation of these exits typically begins at 50 percent of max capacity, or 15 operations per hour. The following paragraphs summarize the potential of constructing a high speed taxiway for Runway 25.

Consideration was given to the location of the high speed taxiway exit using guidance in Chapter 4 of FAA Advisory Circular 150/5300-13A, *Airport Design.* Per AC guidance, the amount of runway occupancy time increases by ¾ of a second for every 100 foot increase in distance from the runway threshold. Conversely, runway occupancy time decreases by ¾ of a second for every 100-foot decrease in distance from the runway threshold.[70]

Following this guidance, construction of the high speed taxiway in the vicinity of the existing Taxiway A5 right angle exit was determined to be the most logical location, as depicted in **Figure 5-8**. Currently Taxiway A5 is used most often by arriving aircraft on Runway 25 exiting the runway after landing and rollout. The placement of an acute angled taxiway exit 6,000 feet from the displaced threshold of Runway 25 could permit the highest percentage of aircraft capable of utilizing the exit. At 6,000 feet from the displaced threshold, this location permits 48 percent of large aircraft to exit the runway during wet conditions. During dry conditions, 98 percent of large aircraft can utilize this exit. Percentages for all aircraft classifications are detailed in **Table 5-9**.

TABLE 5-9 – EXIT TAXIWAY CUMULATIVE UTILIZATION PERCENTAGES

Taxiway	**Distance from Threshold**	**Percent of Airplanes Exiting (By Category)**											
		Wet Runways				**Dry Runways**							
		Right & Acute Angled Exits				**Right Angled Exits**				**Acute Angled Exits**			
		S	T	L	H	S	T	L	H	S	T	L	H
Existing Taxiway A5	5,500 feet	100	100	27	0	100	100	75	24	100	100	92	81
Future Taxiway A5	6,000 feet	100	100	48	10	100	100	92	71	100	100	98	95
S – Small, Single Engine (12,500 pounds or less) T – Small, Twin Engine (12,500 pounds or less)		L – Large (12,500 to 300,000 pounds) H – Heavy (300,000 pounds)											

Source: FAA Advisory Circular 150/5300-13A, Airport Design. Section 411. Table 4-9, Exit Taxiway Cumulative Utilization Percentages.

[68] Monthly Air Traffic Control Operation Counts.
[69] Federal Aviation Administration. (2012). Airport Design (AC 150/5300-13A). Chapter 4, Taxiway and Taxilane Design. Section 411. pp. 139.
[70] Federal Aviation Administration. (2012). Airport Design (AC 150/5300-13A). Chapter 4, Taxiway and Taxilane Design. Section 411, Subsection e. p. 141.

The construction of a new acute angled taxiway could potentially increase runway capacity by allowing landing aircraft to exit Runway 25 at higher speeds compared to the existing right-angled connector. However, apron location requires double back operations, where aircraft reverse course 180° from the landing direction on the parallel taxiway. The radius required to facilitate this operation results in aircraft reducing speed to a level that offsets the benefits for installing a high speed exit. At 50% more pavement than a traditional right angle exit, there is no benefit to this installation.

While the benefit of installing a high speed taxiway is not justified, there is a benefit in relocating the A5 exit taxiway 500 feet to the west. This would locate the taxiway 6,000 feet from the displaced threshold of Runway 25. At this location the percentage of large category aircraft capable of exiting at A5 is increased for both wet and dry conditions. Specifically, for wet runway conditions the percentage increases 21 percent, from 27 to 48 percent. For dry conditions, percentage of aircraft increases by 17 percent, from 75 to 92 percent.

The cost to relocate the A5 exit taxiway is approximately $1,012,000. Detailed cost analysis is discussed in **Chapter 7,** *Financial Implementation.*

FIGURE 5-8 – HIGH SPEED TAXIWAY EXIT

Source: Jviation, Inc.

5.4.3 NORTH SIDE PARALLEL TAXIWAY

A proposed parallel taxiway will support existing and future GA development on the north side of the airport. The north side of the airport represents one of the few areas available for future GA development.

Until recently, a partial parallel taxiway and two associated connector taxiways provided access to and from the north side facilities and Runway 7/25. As currently configured, aircraft on the north side have no direct access to the runway ends and must back taxi or cross the runway to access Taxiway A for access to the runway thresholds. This is in direct conflict with requirements outlined in FAA Advisory Circular 150/5300-13A, *Airport Design*[71], and in Engineering Brief 75. As development and aircraft activity increases on the north side, a parallel taxiway becomes more critical in providing an increased level of safety for aircraft accessing or departing the north airfield by eliminating any need for taxi/back taxi and crossing of aircraft on the active runway.

The following paragraphs discuss the design rational and phased implementation of a full parallel taxiway, depicted in **Figure 5-9**. This taxiway will be a mirror of Taxiway A and be sized for Aircraft Design Group IV aircraft. This allows for a uniform parallel taxiway system that is capable of handling existing aircraft, to include the Boeing 757, in the event that an aircraft must exit to the north.

Due to land constraints and the location of the HAATS facility and GA apron it is not possible to achieve anything greater than a 400 foot separation from the taxiway centerline to the centerline of Runway 7/25.[72] Additionally, there are earthwork requirements in order to construct the east end of the proposed taxiway, this is necessary to eliminate the existing grade differences between the runway threshold and ground elevation in the proposed taxiway location. To accommodate this earthwork and to maintain adequate safety areas, there will also be additional land acquisition requirements.

A full parallel taxiway is also dependent on the relocation of the ILS glideslope antenna, located near the end of Runway 25. In its current location, the antenna sits on the future centerline of the proposed taxiway. FAA Airport Traffic Organization (ATO) equipment technicians advise that perpendicular movement of the glide slope antenna closer to the runway edge presents less of an issue than longitudinally up or down the runway. The relocated equipment must remain clear of the Runway Safety Area (RSA) and Runway Obstacle Free Zone (OFZ). Analysis indicates glideslope antenna relocation can be accomplished while meeting these criteria. Significant impacts to current instrument approach procedures are not anticipated as a result of the necessary relocation of the glideslope antenna.

Construction of the parallel taxiway is proposed in three phases. The first phase is the construction of the taxiway between Taxiways B3 and B4. This layout will tie into the future location of A3 and

[71] Federal Aviation Administration. (2012). Airport Design (AC 150/5300-13 A). Chapter 4,Taxiway & Taxilane Design. Section 401 b. Paragraph 5 (c). p. 117

[72] Federal Aviation Administration. (2012). Airport Design (AC 150/5300-13A). Chapter 3. Runway Design. Table 3-9. p. 95.

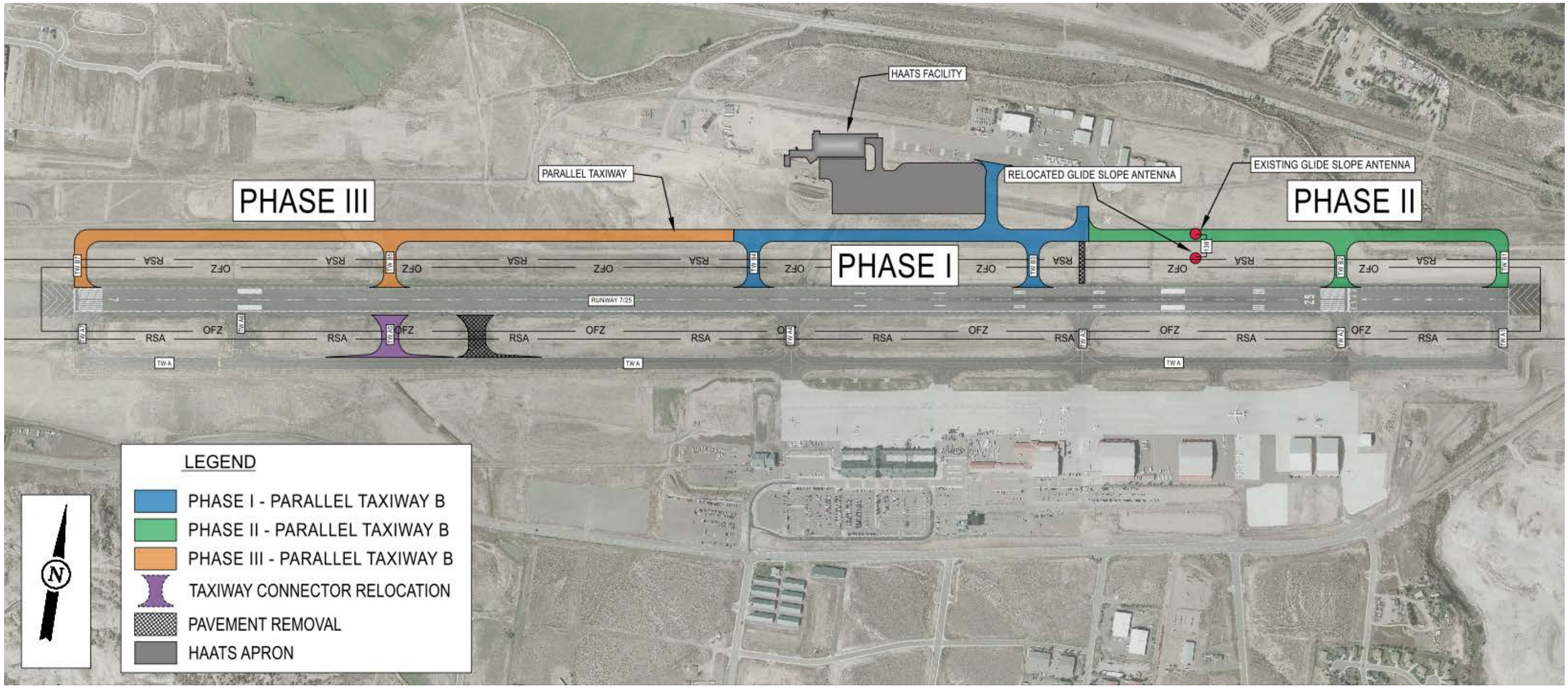
A4, which require relocation to meet FAA design requirements in Advisory Circular 150/5300-13A. This first phase ensures that aircraft based on the north apron maintain two access points, so as not to constrain taxiway circulation.

The second phase proposes to construct Taxiway B from the north apron entrance at B3, east to the threshold of Runway 25. Relocation of the ILS glideslope antenna will also occur during this phase. As Runway 25 is the primary departure runway, providing direct access to Runway 25 provides the greatest operational efficiency, compared to Runway 7. Providing direct access to Runway 25 also increases level of safety, as the requirement for aircraft to cross an active runway is reduced.

The third and final phase connects Taxiway B from Taxiway B4 west to the threshold of Runway 7. Due to the limited use of Runway 7 for departing aircraft, this phase provides the least operational benefit. However, it should be noted that this phase can also be driven by future GA development. Portions of phase three can be accelerated to ensure that west GA development areas have adequate circulation and access to the runway.

Final development costs for the full parallel taxiway will be developed prior to the start of each phase.

FIGURE 5-9 – NORTH PARALLEL TAXIWAY



Source: Jviation, Inc.

5.4.4 CONNECTOR TAXIWAY RECONFIGURATION

As described in **Chapter 4**, new requirements set forth in Engineering Brief 75 and FAA Advisory Circular 150/5300-13A, *Airport Design,* require airports to address runway/taxiway configurations which have the potential to result in runway incursions.[73] One such configuration is a taxiway connector system that provides direct access for taxiing aircraft directly from an apron to a runway.

Currently, EGE has four such access points: Taxiways A2, A3, and A4 on the south side of the airport and Taxiway B3 on the north side, as shown in **Figure 5-10**. All four configurations allow aircraft direct access from the apron to Runway 7/25. In addition to these four access points, the FAA Runway Safety Action Team (RSAT) has identified the apron area east of Taxiway C2 as a hot spot due to the high density of operations that occur in this location[74]. It is recommended that air carrier aircraft avoid leaving the apron environment east of Taxiway C2. At the time of this master plan, a phased project to rehabilitate the primary south side apron is underway. Phase one took place on the west end of the existing commercial apron adjacent to the Taxiway A4. Coordination took place with the FAA Denver Airport District Office (ADO) to consider addressing A4 for compliance with Engineering Brief 75 and FAA Advisory Circular 150/5300-13A, *Airport Design,* as part of the apron project. Current mitigation measures including signage and lighting was sufficient to address incursion potential and this configuration could remain intact for the short term. To meet these new requirements, reconfiguration of Taxiways A2, A3 and A4 will be necessary as part of a future project(s) to comply with Engineering Brief 75 and FAA Advisory Circular 150/5300-13, *Airport Design,*.

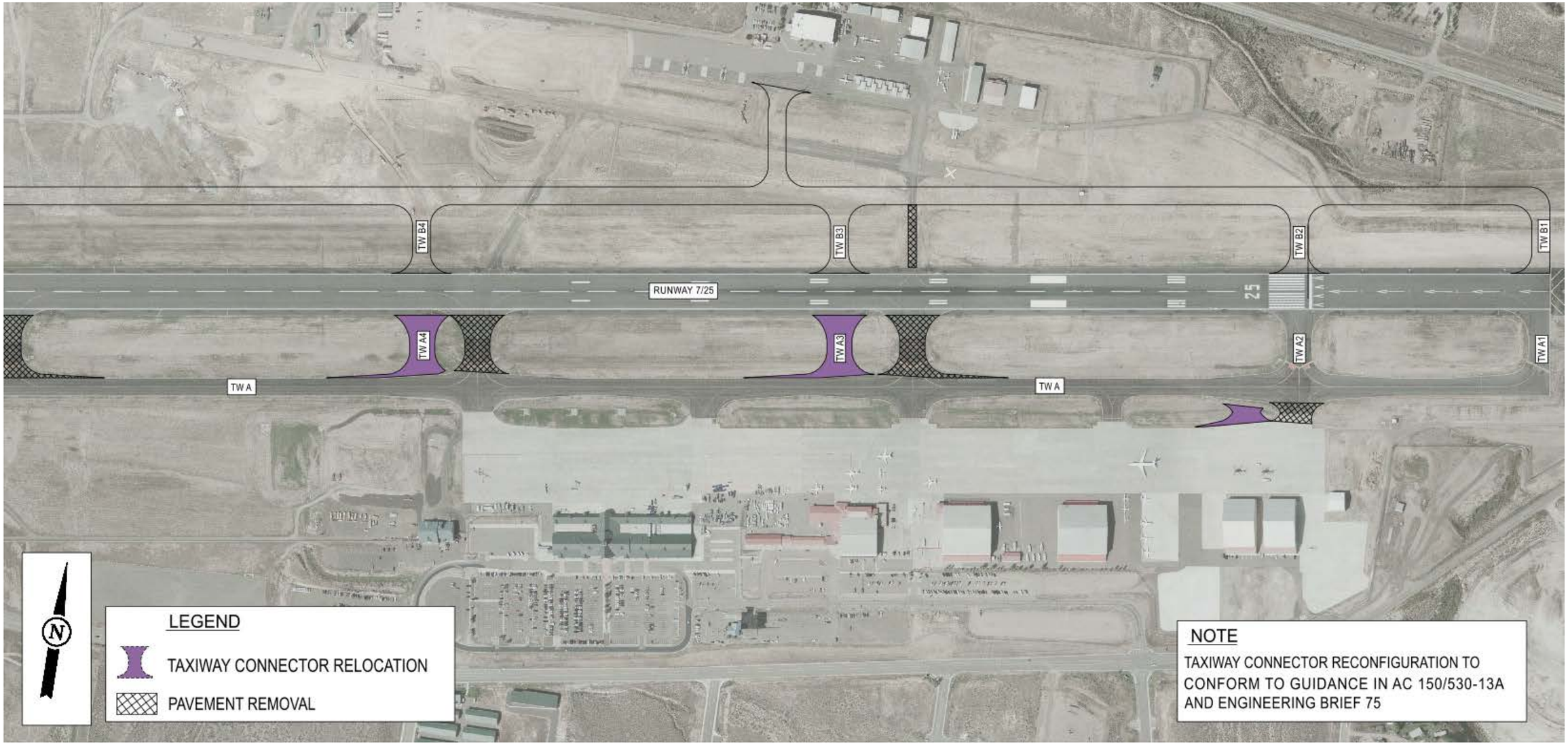
Alternatives were considered to determine the best possible relocations of these alternatives. It was determined that relocating the portion of Taxiway A2 between Taxiway A and the apron was the most practical and serves to keep the connector taxiway between Taxiway A and the Runway located at the displaced Runway 25 threshold. Due to grade issues, it was determined that relocating the portion of Taxiways A3 and A4 between Runway 7/25 and Taxiway A was the preferred correction. The relocated Taxiways A2, A3, A4, and B3 will be depicted on the updated ALP for planning purposes.

Final cost estimates for each connector will be developed prior to construction.

[73] Federal Aviation Administration. (2012). Airport Design (AC 150/5300-13 A). Chapter 4,Taxiway & Taxilane Design. Section 401 b. Paragraph 5 (g). p. 117

[74] Federal Aviation Administration (September 2012) Airport/Facility Diagrams – Southwest U.S. Hot Spots.

FIGURE 5-10 – TAXIWAY CONNECTOR RELOCATION



Source: Jviation, Inc.

5.4.5 Aircraft Rescue and Fire Fighting / Snow Removal Equipment Storage

Aircraft Rescue and Fire Fighting (ARFF) and Snow Removal Equipment (SRE) storage are both located at the existing ARFF station and adjacent apron. Current storage is provided by both indoor and outdoor facilities. As discussed in **Section 4.6**, storage is undersized with equipment exposed to the elements. This exposure has led to decreased vehicle useful life due to the exposure to the elements.

In addition to the lack of equipment storage, the existing ARFF station also serves as the airport administration office, maintenance facility, and operations center. As a result, the building is not only undersized for storage but for administrative functions as well.

The following paragraphs discuss the design rationale and phased implementation for the facility expansion. It should be noted that airport administrative functions are assumed to be relocated to the commercial terminal in the future. This allows for additional expansion to Fire Fighter/Operations administrative areas as they are currently at maximum capacity.

The proposed SRE facility and ARFF building expansion, as depicted in **Figure 5-11**, constructs a dedicated SRE storage building to the immediate west of the current ARFF facility. All snow removal equipment would be relocated from the apron and existing ARFF Building into the new facility. Space is also reserved for the future expansion of the ARFF Building to the west.

By constructing the SRE adjacent to the existing ARFF building all personnel and equipment will be located in the same area. This allows for more efficient maintenance operation as staff is not spread around the airfield. This location also keeps equipment closer to the higher priority pavement areas during snow removal operations.

Capacity constraints that currently exist in the ARFF Facility are relieved by constructing a dedicated SRE building. Equipment currently stored inside the vehicle bays would be relocated, allowing for future ARFF equipment additions. In addition to relocating airport administrative functions to the Commercial Terminal, maintenance operations would also be relocated, freeing up space for ARFF and Operation administrative expansion. Finally, this expansion ensures that future expansion of the Commercial Terminal to the west, as well as the west Commercial Ground Transportation lot is maintained.

The cost to construct to build the dedicated SRE Facility is $5,500,000. Cost estimates for expansion of the ARFF Building will be determined prior to construction. Detailed cost analysis and project phasing will be discussed in **Chapter 7**, *Financial Implementation.*

FIGURE 5-11 – AIRCRAFT RESCUE AND FIRE FIGHTING / SNOW REMOVAL EQUIPMENT STORAGE EXPANSION

Source: Jviation, Inc.

5.4.6 NORTH SIDE GENERAL AVIATION HANGAR DEVELOPMENT

Existing based aircraft hangar storage is provided by the Airport, Vail Valley Jet Center (VVJC) and an assortment of general aviation tenants, as detailed in **Section 2.5.2**, with a majority of based aircraft hangar storage located on the north side of the airfield. Aircraft storage located on the south side of the airfield is mostly provided by VVJC, with the exception of one privately owned hangar on the farthest southeast end of the apron.

While the number of based aircraft has decreased as a result of the recent economic recession, aviation activity forecasts, identified in **Chapter 3**, indicate that based aircraft will increase by a compound annual growth rate of 2 percent over the 20-year planning period. Based on this level of growth, there will be a requirement for 30,845 square feet of additional hangar space by 2020, and an additional 55,300 square feet by 2030, for a total shortfall of 86,145 square feet by the end of the 20-year planning period. In examining the current ALP and airport lease agreements, it is clear that available land for additional aircraft hangar storage on the south side is limited. Development of additional based aircraft storage is focused on the north side, where based hangar storage currently exists, and where additional storage is planned through an existing lease with a private developer. Existing and future demand for hangar facilities on the north side is expected to be primarily associated with Design Group I and II aircraft.[75] These two groupings represent approximately 64 percent of the existing based aircraft and will represent 50 percent of based aircraft forecast through 2030. It should be noted that while based jet aircraft are expected to increase at a greater rate than single- and multi-engine aircraft over the 20-year planning period, facilities on the south side are better suited to accommodate these larger aircraft, and typically prefer the amenities that already exist on the south airfield.

A phased development is proposed for providing additional GA Facilities on the north airfield, depicted in **Figure 5-12**. Phasing will ensure that demands in both the 2020 and 2030 planning periods are adequately met. Future development locations proposed also facilitate expansion beyond the 20 year planning period. Finally, it was identified through user surveys and from discussions with the PAC that affordable hangar options be considered in future development. Various hangar types are incorporated into this phasing to provide varying levels of hangar storage costs.

Phase one of this alternative proposes hangar development on the east end of the north GA apron. This area is currently under lease to a private entity for the purpose of aircraft hangar storage. Proposed development for this area includes a mix of box hangar structures varying in size from 60 feet x 60 feet to 160 feet x 80 feet. Allowing for aircraft storage for small GA jets like that of the Cessna Citation up to the largest GA Jets, like that of the Gulfstream 550. Conceptual development plans also depict additional lower cost T-Hangar structures, providing storage options for smaller aircraft, including most single engine aircraft. This phase also relocates the existing airport T-Hangar shelters currently adjacent to the HAATS apron to an area directly east of the self-serve fuel farm.

[75] Aircraft Design Group II, a wingspan equal or greater than 118 feet and less than 117 feet. Federal Aviation Administration, (2012), Airport Design (AC 150/5300-13A). Chapter 1, *Introduction*. Table 1-2. P 13.

Relocating these structures allows for additional ramp area for aircraft tie-down, staging, or future development. Hangar building height is limited in this phase due to the close proximity of the BI-6 radar. Development in this phase meets demand through the 2020 planning period.

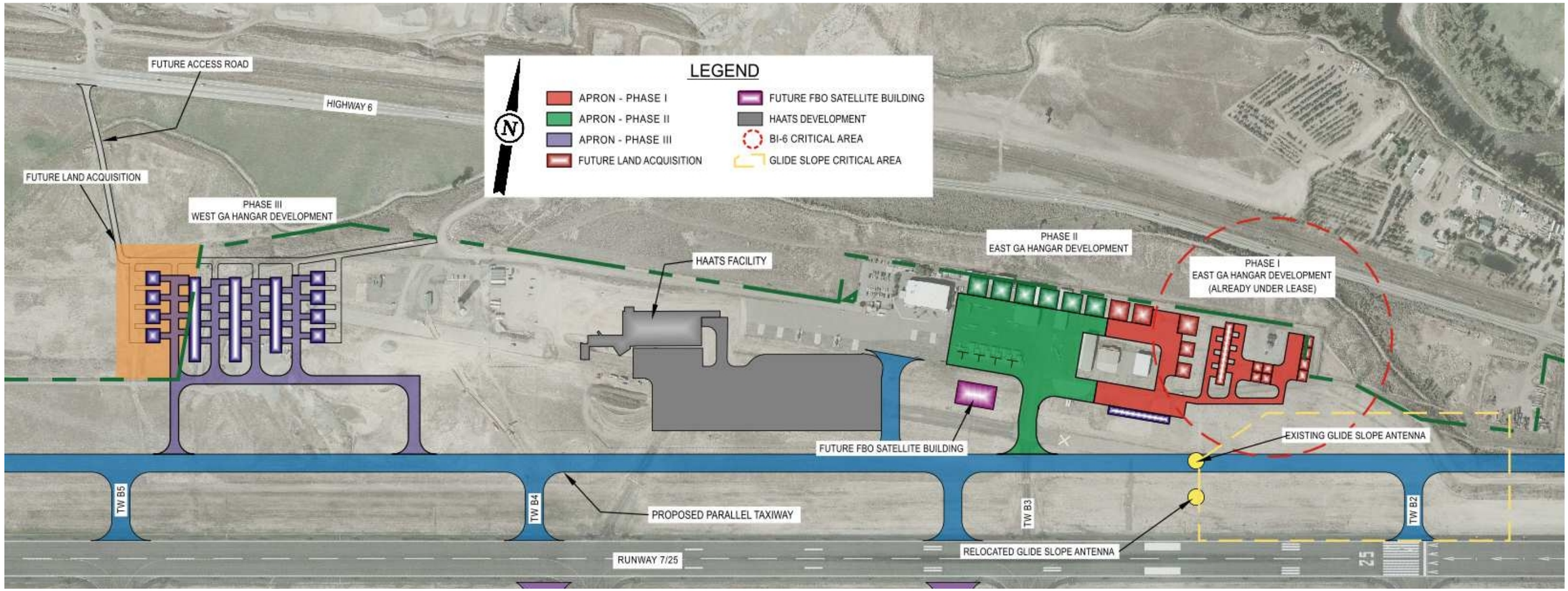
Phase two as proposed in this development serves to redevelop the apron area between the current HAATS facility and Taxiway B3. These buildings would serve to accommodate additional hangar demand through the 2030 planning period. Hangars proposed in this phase would serve to replace existing structures that will be nearing the end of their useful service life. Replacement of these structures will not occur prior to the end of a buildings service life. With the increase in based aircraft operators there may be a requirement for a second FBO, or satellite FBO facility, to ensure adequate level of service is maintained. A proposed structure is located south of the phase two apron area in a location between B3 and the HAATS Apron. This location is conceptual and can be located in an area that better serves overall development.

The third and final phase proposed for the north GA development area is located north of the future parallel taxiway between Taxiways B4 and B5. Development in this location would serve demand beyond the 2030 planning period. However, this development area can be constructed earlier based on future demand. Development of the west hangar area requires additional land acquisition for full build out and a second access road from Highway 6 is recommended so that the existing access road does become congested by the additional vehicle traffic accessing these development areas. There are significant grade differences in the vicinity of this development area. These will require earthwork to ensure future development can adequately tie into the future Taxiway B elevation. Finally, a line of sight analysis was conducted on the west hangar development buildings. This study ensured that proposed hangar development does not impact the line of sight from the Air Traffic Control Tower to the threshold of Runway 7.[76]

The cost for the east GA Development area is approximately $7,000,000. The cost for the west development area is approximately $9,600,0000. Detailed cost analysis is discussed in **Chapter 7**, *Financial Implementation.*

[76] Visibility from the ATCT Cab shall allow an unobstructed view of all controlled movement areas of an airport, including all runways, taxiways, and any other landing areas, and of air traffic in the vicinity of the airport. Federal Aviation Adminstration. (April 2006). Airport Traffic Control and Siting Process (Order 6480.4A). Chapter 2. Siting Criteria. Section 201. p. 2-1.

FIGURE 5-12 – NORTH SIDE GENERAL AVIATION HANGAR DEVELOPMENT



Source: Jviation, Inc.

5.4.7 SOUTH SIDE DEVELOPMENT AREA

These alternatives address future development of apron, potential second FBO, and additional support roadway to support growth on the south airfield. The proposed development location is in the land adjacent to the Commercial Terminal and west until it reaches the Airport property line. This area is currently undeveloped with the exception of the ARFF station, equipment storage, and overflow parking for public and rental car parking. The current ALP shows a potential second FBO located on the west end of this development and this location will be maintained in this proposed development. In addition to a potential second FBO, a lease exists, expiring January 1, 2015, between the County and Vail Valley Jet Center (VVJC) for a future Boeing 757 maintenance hangar. This future hangar and associated apron/parking space will be maintained in the proposed development. This apron expansion will occur so as not to impact planned expansion of the Commercial Terminal and includes expansion of the commercial apron.

Construction of this development area is proposed through a phased development, as depicted in **Figure 5-13**. This ensures that development occurs as demand dictates. Development of the second FBO facility is conceptual and reserves adequate space for future development. Construction of this facility will occur through private development, and will be required to meet standards dictated in the Airport Minimum Standards.

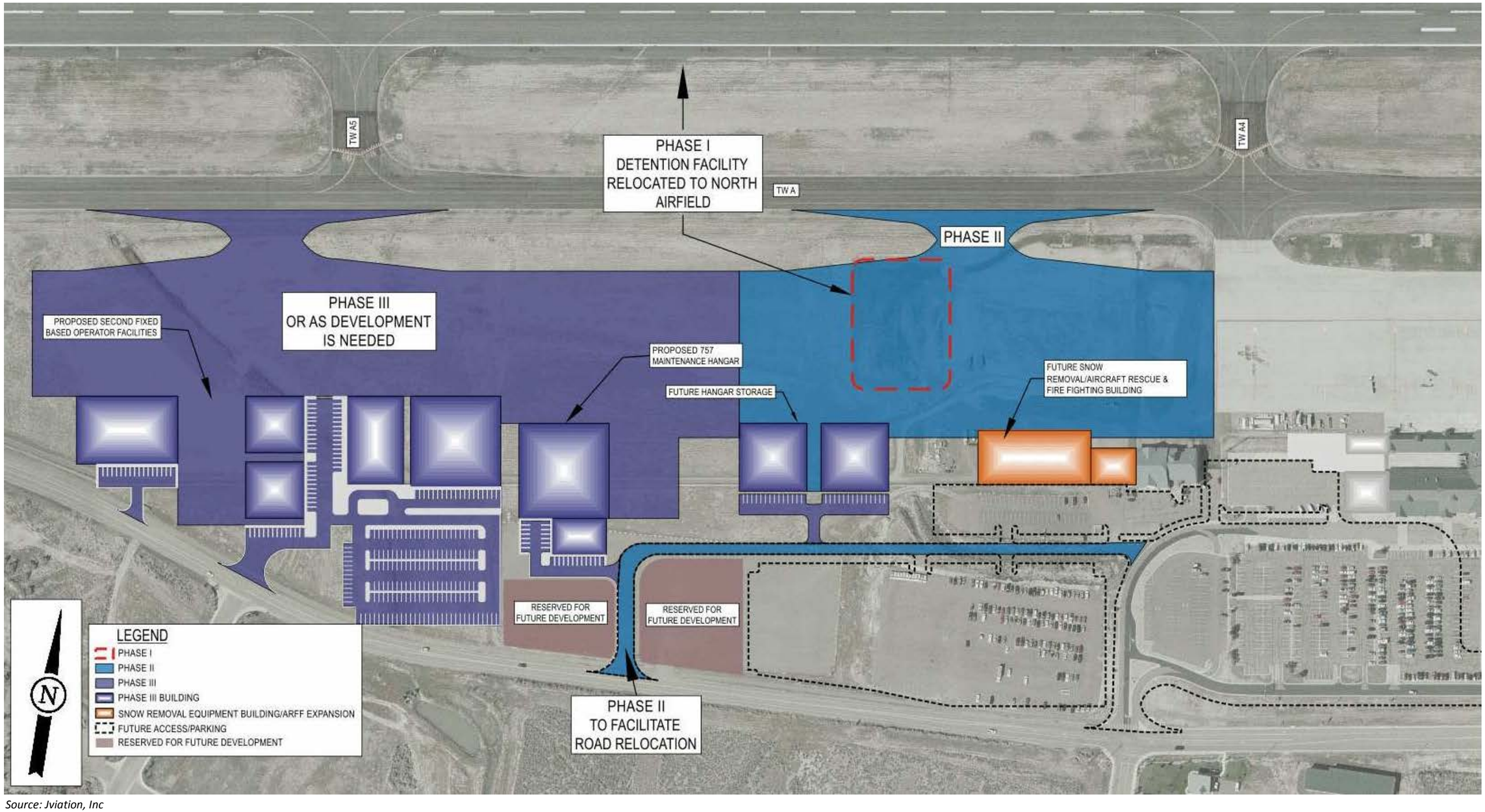
Phase one of this development is the relocation of the existing stormwater detention facilities to an area on the north airfield. Relocation of this detention facility allows for full west expansion of the apron. Existing water drainage flows to the northwest towards the Eagle River. Relocation of these facilities requires boring under, or trenching through Runway 7/25. Trenching is the more cost effective method and can coincide with a future mill and overlay of the runway. If development necessitates earlier relocation of the stormwater detention facility, boring will be required or else a temporary runway closure will be required while trenching operations occur. Prior to any relocation it is recommended that a drainage analysis be conducted on this area to identify existing drainage and potential impacts from north relocation.

Phase two of this development proposes to expand the commercial apron approximately 1,050 feet to the west. This allows for additional aircraft parking for the Commercial Terminal and future corporate hangar development adjacent to a proposed SRE Storage facility. Existing grade differences between the current apron and ARFF facility are also corrected during this expansion. A current concrete rehabilitation project is underway at the Airport, which involves replacement of the furthest west apron panels. These are being installed at the existing grade and will be capable of meeting adequate grade requirements for future expansion. Access roadway is also incorporated with this phase. This roadway provides access to the future 757 maintenance hangar location, proposed corporate hangars, as well as the ARFF and SRE Storage facilities. This roadway is required to be installed to reduce the impact to airport employees and ARFF personnel when reconfiguration of the main access roadway begins.

The third and final phase of this development is the apron area adjacent to the proposed 757 maintenance hangar leasehold and potential second FBO site. This phase of the development will not occur without an identified private developer that meets minimum qualifications under the Airport Minimum Standards. If construction of the 757 maintenance hangar begins prior to a second FBO development, only those portions of the apron required to support this operation will be constructed. Construction must be at a grade that allows for future apron expansion.

The cost for this alternative is approximately $2,500,000 for Phase I, $19,500,000 for Phase II, and $30,000,000 for Phase III. However, there are many opportunities to phase the development and share development costs. Detailed cost analysis and project phasing will be discussed in **Chapter 7**, *Financial Implementation.*

FIGURE 5-13 – SOUTH SIDE DEVELOPMENT AREA



Source: Jviation, Inc