



Reno-Tahoe Airport Authority

DECEMBER 2018



CHAPTER 4: Airport Alternatives

AIRPORT ALTERNATIVES

Introduction

Chapter 2 – Aviation Activity Analysis and Forecast, identifies the anticipated future aviation demand over the 20-year planning period (2016-2036) at RNO. **Chapter 3 – Facility Requirements**, presents the terminal, landside, support, and airside facility recommendations to meet future capacity and modernization needs. The Consulting team and Reno-Tahoe Airport Authority (RTAA) used these identified needs to develop terminal, landside, support, and airside facility improvement alternatives to accommodate the future aviation demand. This chapter is a record of the analysis of alternatives, organized as follows.

- ❖ Alternatives Evaluation Process
- ❖ Sufficient Facilities
- ❖ Passenger Terminal
 - Terminal Concourses
 - Terminal Building
- ❖ Landside
 - Terminal Roadway and Curbside
 - Parking
 - Rental Car Facilities
- ❖ Support Facilities
 - Cargo Facilities
- General Aviation
- Maintenance and Operations
- ❖ Airside Facilities
 - Runway 16R CAT-II Approach
 - Deicing Aprons
 - Taxiway System
 - Run Up Aprons
 - Continued Maintenance and Operation of Existing Infrastructure and Facilities
- ❖ Environmental Analysis
- ❖ Preferred Alternative Summary

Alternatives Evaluation Process

The development of airport alternatives included months of discussion with RTAA staff, the Consultant team, airport stakeholders, and the public. The process to analyze airport alternatives that documented the condition of existing facilities and recommendations for improvements began in April 2017. The discussion in **Chapter 3** guided the development of preliminary alternatives, a process organized by five key project phases.

In Phase 1 the RTAA hosted an in-person alternatives charrette with stakeholders to develop the criteria that would be used to evaluate the future alternatives and to identify preliminary concepts for terminal, landside, support facility, and airside alternatives to be considered in Phase 2.



Next in Phase 2, the Consultant team compared these preliminary concepts to goals and objectives set early in the master planning process to determine feasibility. Because the Phase 2 concepts were broad, the Consultant team had the opportunity to anticipate fatal flaws and limitations for implementing a concept if it continued forward for consideration. The Consultant team presented Phase 2 alternatives in three workshops and one public meeting. The workshops were open house style meetings with RTAA employees, airport tenants and stakeholders, and the Master Plan Working Group (MPWG), which included the Federal Aviation Administration (FAA), airlines, general aviation (GA) tenants, concessionaires, and RTAA senior management staff who provided feedback and recommendations throughout the master planning process. These workshops and the public meeting generated valuable comments and recommendations to be considered in Phase 3 of the alternatives analysis.

In Phase 3, the Consultant team and RTAA removed some of the alternative concepts from further consideration and worked together to refine others to better align with evaluation criteria. The Consultant team and RTAA scrutinized the remaining Phase 3 alternatives for components of each functional area (terminal, landside, support, and airside). For example, the Consultant team analyzed concourse size and gate capacity, one-way versus two-way taxiways between concourses, the location and size of the Customs and Border Protection (CBP) facility, the orientation and size for public parking and rental car facilities, and the expansion of GA on the east side of the Airport. These are addressed in each of the functional areas.

After refining each of these components and developing them into individual alternatives, the Consultant team re-evaluated them using the evaluation criteria established in Phase 4. RTAA received the detailed description and illustration of each alternative for review and comment. RTAA's comments led to additional changes that included an additional concept for a consolidated rental car facility (CONRAC). The CONRAC concept maximized the capacity of public parking by relocating rental car activities from the first floor of the parking garage into a stand-alone facility. Another changed concept shifted the existing passenger departure exit point within the terminal to the north near baggage claim to reduce passenger congestion near the Security Screening Check Point (SSCP).

In Phase 5, the final step in the process, the Consultant team prepared and submitted the final alternatives to RTAA with detailed narrative analysis and graphical depiction of each terminal, landside, support, and airside alternative considered and its recommended alternative for implementation. To wrap up Phase 5, the Consultant team presented the preferred alternative of the four functional areas to the RTAA Board of Trustees on November 17, 2017, at their annual retreat. The Board approved the preferred alternative on December 14, 2017, at their regularly scheduled monthly meeting.

Outreach and Workshops

Transparency has been an important goal for RTAA while preparing the RNO Airport Master Plan. To promote transparency and public input, RTAA invited stakeholders, local organizations, and user groups to participate in workshops about the preliminary alternatives and invited feedback throughout the process. By conducting these workshops as an open house, attendees enjoyed a relaxed environment that facilitated conversations about each alternative. These workshops also gave RTAA staff, airport tenants/users, and the public the opportunity to offer comments and recommendations. Members of the Consultant team and RTAA were present at each workshop.

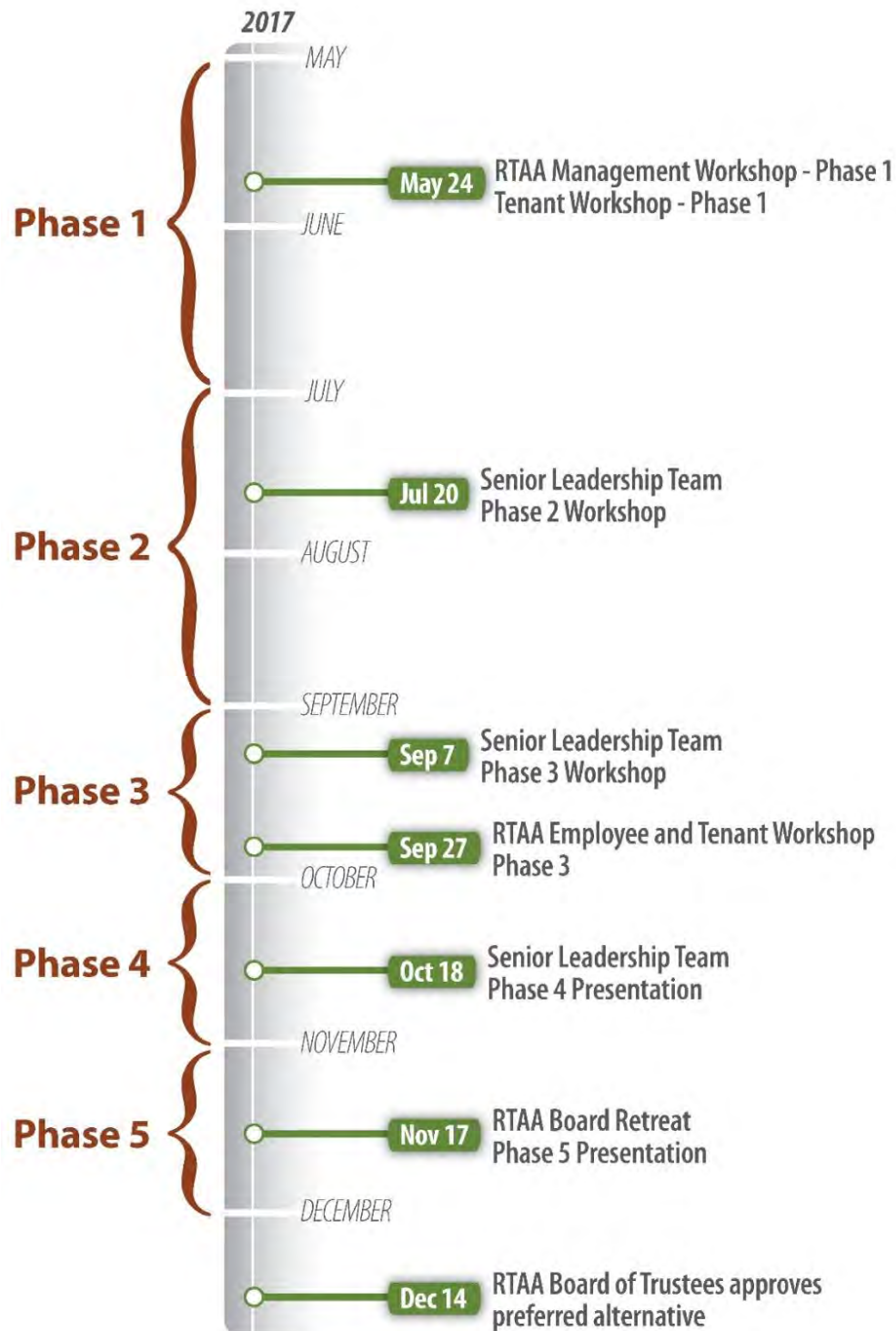


The participating groups include the following.

- ❖ RTAA Board of Trustees
- ❖ RTAA Staff
- ❖ The MPWG
- ❖ RTAA Boards and Committees
 - Planning & Construction
 - Airport Noise Advisory Panel (ANAP)
 - Community Outreach Committee (COC)
 - Reno-Tahoe International Airport (RTIA) Users Committee
 - Airline Affairs
 - Station Managers
- ❖ Public
- ❖ Passengers
- ❖ Groups
 - Reno Young Professionals (Millennials)
 - Rotary Club of Reno
 - Kiwanis
 - Nevada Women’s History Project
 - Pathways to Aviation
 - National League of Cities and Municipalities
 - Reno Tahoe Aviation Group (RTAG)
- ❖ FAA
- ❖ Transportation Security Administration (TSA)
- ❖ City of Reno
- ❖ City of Sparks
- ❖ Washoe County
- ❖ Economic Development Authority of Western Nevada (EDAWN)
- ❖ Reno Sparks Convention and Visitors Authority (RSCVA)
- ❖ University of Nevada, Reno (UNR)
- ❖ Regional Transportation Commission (RTC)
- ❖ Nevada Commission on Tourism (NCOT)
- ❖ Tenants
 - Airlines
 - Concessions
 - Rental Cars
 - General Aviation
 - Nevada Air National Guard (NVANG)

At each workshop, the Consultant team used a prepared presentation to describe the alternatives and always encouraged guests to ask questions and provide comments. Feedback collected during each workshop helped shape the revisions made along the way. In addition, weekly calls between the Consultant team and RTAA staff were important in offering immediate feedback. **Figure 4-1** identifies the alternatives analysis timeline.



Figure 4-1: Alternatives Analysis Timeline

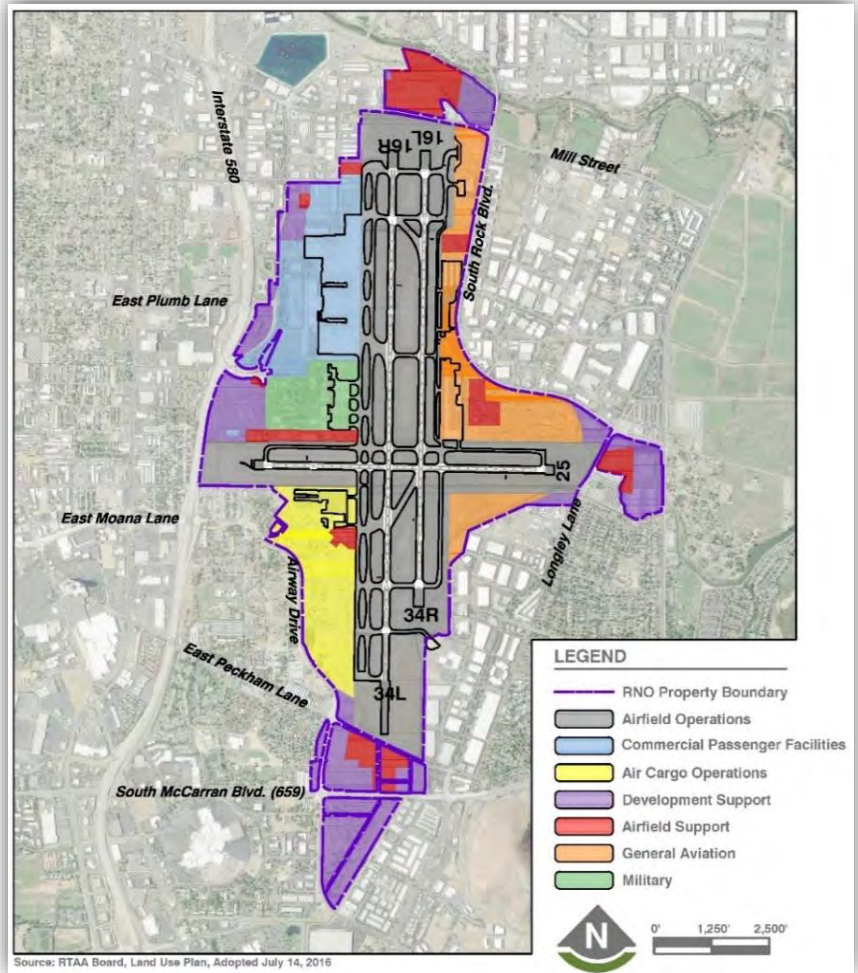
RTAA Land Use Plan

The RTAA Land Use Plan (LUP) for RNO was adopted in 2016, is presented in **Chapter 1**, and is illustrated in **Figure 4-2**. This master plan validates the LUP: the preferred alternatives in this master plan reached the same conclusions, in terms of facility placement, as the findings in the LUP.

Terminal development and expansion focused on the current footprint and expansion to the north into the cargo area. Future cargo facility development focused on the southwest quadrant. Consolidating GA activity and facilities to the east side of the airport creates open land for cargo operations on the southwest quadrant and follows the LUP. Maintenance and Support facilities were focused on the north side of Runway 7/25 and south side of the NVANG.

While the LUP helped guide facility development, preliminary alternative analysis also helped support the LUP. For example, relocating air cargo to the east side of the airfield is not advisable, as it would require massive relocation of GA facilities, most of which are adequate, and it is a smaller area than the southwest quadrant. The southwest quadrant provides a “greenfield” area for cargo facility development and an opportunity to construct facilities to industry standards. This opens space for terminal expansion to the north. The existing terminal was found to be in a good location for landside access and may be used during expansion. Total terminal relocation to another quadrant would likely be more disruptive to the passenger experience than cargo relocation.

Figure 4-2: RNO Land Use Plan

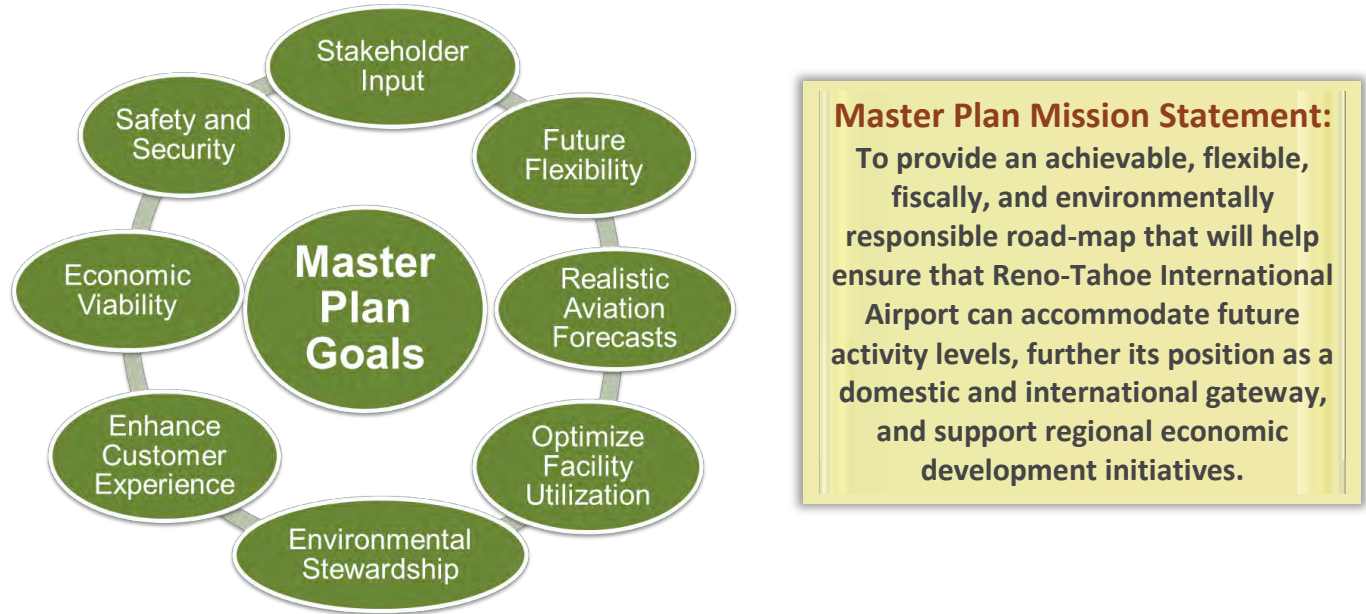


Evaluation Matrix

Relationship to Goals and Objectives

The evaluation criteria directly relate to the goals established for the master plan at the onset and detailed in Figure 4-3.

Figure 4-3: Master Plan Goals and Objectives



Identification of Evaluation Criteria

Early in the alternatives process, the Consultant team and RTAA developed a set of criteria based on the master plan goals to evaluate alternatives. These criteria are identified below and include a general description of their purpose to achieve project goals.

- ❖ Addresses Forecast Demand
 - How well does the alternative develop facilities to meet the preferred forecasts for operations, passengers, or cargo movement?
- ❖ Provides Flexibility in Design
 - Do the proposed alternatives allow for different layouts of the proposed facility or adjacent facilities?
- ❖ Improves Passenger Experiences or Facilitates Safety and Security
 - For the passenger experience, does the alternative enhance the experience for people (i.e. improve wayfinding, comfort, add concessions/customer amenities, and interior space in and around the terminal)?
 - For safety and security, does the alternative enhance protection of the Airport?



- ❖ Facilitates Efficiency/Operational Performance
 - Does the proposed alternative improve or encumber operations for aircraft, passenger movement, traffic, parking, cargo operations, support, and other aviation related operations?
- ❖ Reasonable Constructability and Implementation
 - Is the proposed facility alternative able to be built and executed to meet the needs of the Airport or is the facility unattainable?
 - What level of impact does the alternative have on the operation of the existing facilities?
- ❖ Relies on or Limits Other Design Alternatives or Addresses Land Use Planning and Environmental Considerations
 - For limiting other design alternatives, does the proposed alternative reduce the opportunities for other design features or adversely affect alternatives for other components around the terminal?
 - For land use and environmental, does the alternative adversely affect the environment or have greater impacts than other alternatives?
- ❖ Preliminary Estimated Cost
 - What are the costs for alternative development compared to the other alternatives? FYI: These costs are general and meant to relate to the comparative alternatives.
- ❖ Financial Impact/Optimizes Economic Return
 - Does the alternative enhance the potential for greater revenue or limit costs to RTAA?

An evaluation matrix presented a snapshot of the evaluation criteria for each alternative. An example is provided in **Figure 4-4** below. The criteria are rated from “less than desirable” to “best” and the recommended alternative is outlined.

Figure 4-4: Example Evaluation Matrix

Evaluation Criteria	Alternatives		
	A Compact	B Centralized	C 3-Pier
Addresses Forecast Demand	○	○	⊕
Provides Flexibility in Design	●	●	⊕
Improves Passenger Experiences	⊕	●	◐
Facilitates Efficiency / Operational Performance	◐	●	⊕
Reasonable Constructability and Implementation	○	●	⊕
Relies On or Limits Other Design Alternatives	⊕	●	●
Preliminary Estimated Cost	\$\$	\$\$\$	\$\$\$\$
Financial Impact / Optimizes Economic Return	●	◐	●

**RECOMMENDED
ALTERNATIVE**

LEGEND ○ Less than Desirable ◐ Moderate ● Good ⊕ Best



Sufficient Facilities

As noted in **Chapter 3**, the following facilities are adequate throughout the planning period, and therefore, did not require additional alternatives to be developed:

❖ Terminal Building

- Airline ticketing: The facility requirements analysis identified that the length of the ticketing lobby is sufficient to handle the forecasted demand through the entire planning period; however, as described in the Terminal Building section, the depth of the ticketing hall limits the ideal layout for queuing and circulation space. As part of the development of Terminal Building alternatives, the Consultant team evaluated opportunities to improve passenger flow, how future technologies and processes may impact the ticketing lobby, and the ticketing hall's potential for growth beyond the forecasted demand either within or outside of the planning period as part of the Terminal Building and Concourse alternatives.
- Baggage Claim/Make Up: The facility requirements analysis determined that the size of the Baggage Claim and Baggage Makeup areas are sufficient to handle the forecasted demand through the entire planning period. If additional capacity is needed, both systems could gain that capacity if RNO modifies operations to reduce preferential use by individual airlines. If additional capacity is needed and RNO feels that operational changes alone will not meet anticipated demand, the recommendation is to conduct a specific baggage optimization study. While the master plan is limited to the planning period, the Consultant team has considered growth beyond the forecasted demand. While not specifically identified, the potential for Baggage Claim and Make Up expansion has been considered while developing the preferred alternatives.
- Airline Ticket Office (ATO) space: As of February 2018, nine airlines currently provide service at RNO. Based on the facility requirements analysis, the existing space dedicated to ATO has the capacity to serve up to 12 individual airlines. This capacity meets the forecasted demand.

❖ Landside

- Existing off-airport ground transportation infrastructure, including roads and freeways, is sufficient to meet the forecasted demand with no changes. I-580 connectivity via the direct connect ramps and the Plumb Lane interchange is the most important connectivity for airport users including air cargo operations.
- The capacity of the existing terminal roadway and curbside infrastructure is sufficient to accommodate the forecasted demand, except for some needed improvements to achieve the Americans with Disabilities Act (ADA) compliance by 2036. The team discovered the need for these improvements while developing the Terminal and Landside alternatives. During analysis, the team measured the ability of both the terminal roadway and curbside, including both vehicle and pedestrian access, to all proposed rental car and public parking facilities, to support any proposed development. The landside discussion later in the chapter addresses the ADA improvements.
- Adequate land (no property acquisition): The preferred Terminal and Landside Alternatives do impact underused assets or assets proposed to be relocated elsewhere within the master plan. For example, the ground support equipment (GSE) maintenance building will be removed to develop a CONRAC north of the parking garage. All proposed improvements occur on land currently within RTAA's control. Therefore, no property acquisition is proposed.



❖ Support

- Snow Removal Equipment Building (SRE) and Material Storage: The SRE building was constructed in 2013 and rated above average in the Facilities Condition Assessment (FCA) located in **Appendix A**.
- Military (NVANG): Analysis of the NVANG was not a part of this study. The Department of Defense (DoD) and Federal Government manage the facility and long-term plans. Based on the remaining terms of their existing lease, the NVANG was treated as continuing operations in the current footprint throughout the planning period.
- Air Traffic Control Tower (ATCT): The ATCT was built in 2008 and is in good condition. Analysis found clear line of sight to all airfield movement areas.
- Fuel Facilities: The analysis found the existing fuel facilities and capacity for commercial and GA services adequate throughout the planning period based on forecasted operations.
- Central Disposal Facility (CDF): The CDF was built in 1994 with an addition in 2015. The CDF rated in above average condition. Terminal expansion will not require relocation of this facility.
- Perimeter fencing and security gates: A perimeter fence surrounds the airport. A portion of the existing fencing is not in full compliance with FAA standards; however, a Passenger Facility Charge (PFC)-approved project is already in place to bring all perimeter fencing up to current security standards.

❖ Airside

- Runway system (runway length and airfield capacity): Analysis found the runway lengths and capacity sufficient for the planning period.
- Airfield pavement strength: Runway and taxiway pavement strength meets existing and future fleet mix need over the planning period. Pavements should be maintained at their current strength.
- Runway design surfaces (for example, the runway safety area [RSA]): The facility requirements analysis found critical design surfaces adequate. The RSAs are under Airport control, clear of obstructions, and at grade. Other design surfaces meet standards with these two exceptions:
 - The Taxiway A object free area (OFA) north of the cargo facility has a fence and storage facilities too close to the taxiway. This situation will be alleviated with future terminal expansion and cargo relocation.
 - The perimeter service road is within the Runway OFA (ROFA) at various locations. The presence of a 24-hour control tower helps relieve this situation. Traffic on the service roads should clear movement with the ATCT before entering the ROFA at these locations.
- Navigational Aids (NAVAIDs): The analysis found the NAVAIDs adequate for Runway 16L/34R and 7/25 for the planning period. The airport is equipped with approaches for aircraft to use during low visibility. Additional NAVAID facilities to Runway 16L/34R were a possibility initially, but preliminary analysis found enhancing the utilization with additional NAVAIDs would not significantly increase capacity on Runway 16L/34R.



Passenger Terminal Development Alternatives

In response to the deficiencies of the passenger terminal identified in **Chapter 3**, the Consultant team developed alternatives independently for the terminal concourses and the terminal building; however, the development of the preferred alternative reflects their compatibility with one another.

Terminal Concourses

Facility Requirement: Capacity

The terminal concourses include the portion of the terminal beyond the security checkpoint. The concourses consist primarily of the gates, gate lounges, concessions, restrooms, support spaces, associated circulation, and the CBP facility.

Concourse Goals and Objectives

These goals and objectives are based on the results of the facilities requirements analysis and became prerequisites for each of the alternatives developed:

- ❖ Provide 24 gates, with a clear path of future expansion to achieve a total of at least 27 gates;
- ❖ Provide adequate space within the concourse, and on the apron, to support the targeted gate count;
- ❖ Provide taxilanes sized to accommodate aircraft similar in size to the Boeing 757 (B757);
- ❖ Provide a new CBP facility sized to process 400 passengers per hour and provide an integrated passenger experience;
- ❖ Provide administrative office space sized and located to meet current and future needs;
- ❖ Improve revenue generating opportunities; and
- ❖ Allow for future flexibility and growth beyond the forecasted demand.

Considerations

Five design drivers summarized in the following paragraphs guided development of the Terminal Concourse alternatives: aircraft gate density and operations, the number and type of taxilanes between concourses, integrating CBP into the terminal, existing site constraints, and implementation. Each of these five drivers influenced each of the alternatives; however, their level of priority varies from one to the next. This approach demonstrates the importance an individual design driver has on the development of a terminal concourse alternative and its ability to accommodate future changes that may occur over the 20-year planning period (year 2036).

Gate Density and Operations

Passenger forecasts and facility requirements identified the need for a total of 24 gates through the 2036 planning period. This requirement is based on continued preferential gate service with additional capacity available through improved gate management and shared use gates, should capacity be needed in the future. Establishing a high growth target of 27 gates allows for an additional carrier with preferential gate requirements to enter the market.

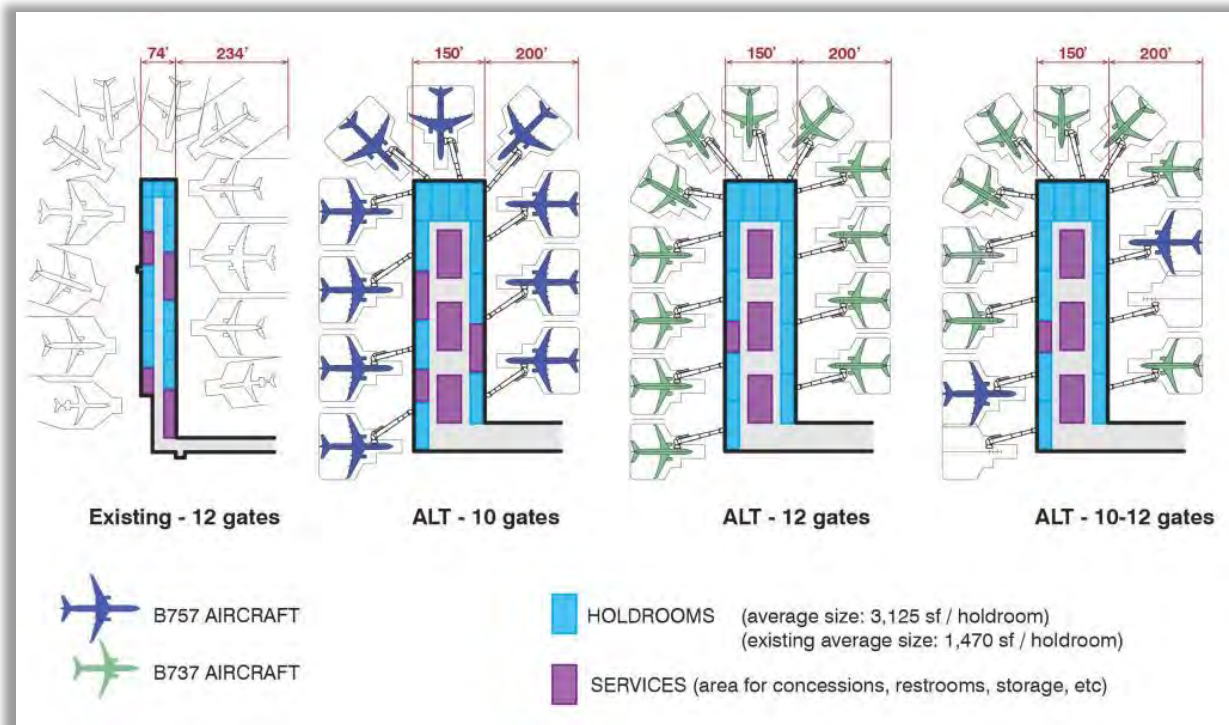


Industry standards confirm the existing concourses are too narrow for adequate circulation space and have undersized passenger holdrooms. While the current concourse piers support either 11 or 12 gates, based on the interior square footage and optimum gate sizes, these concourses should only accommodate a maximum of 5-6 gates to maintain an optimum level of service. The age and limits of the existing concourses, such as ceiling height and existing mechanical and electrical systems, also factor into the alternatives.

Passenger concourses currently are approximately 74 feet wide. New passenger concourses a minimum of 110 feet wide would adequately support the holdrooms with concessions, restrooms, and general circulation. The Consultant team used a consistent concourse width of 150 feet to provide future flexibility during design. The alternatives further investigated individual concourse piers supporting up to 12 gates each. Ideally each gate would support up to a B757 aircraft; however, planning each gate to accommodate a Boeing 737 (B737) aircraft and to allow aircraft similar to B757 aircraft to be served through irregular operations (i.e., occupying the apron and holdroom space of an adjacent gate during use) would be acceptable and a more practical approach.

Figure 4-5 illustrates the existing conditions along with the potential gate densities used to develop the terminal concourse alternatives.

Figure 4-5: Gate Density



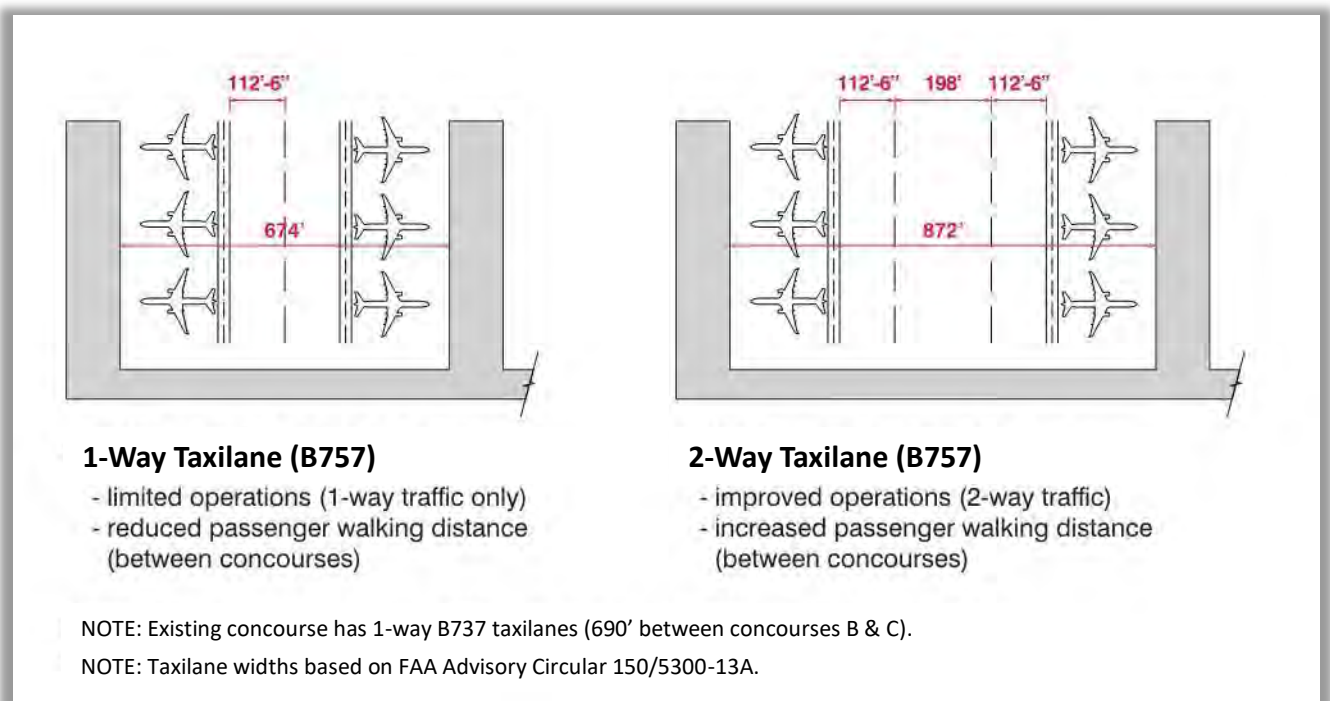
Concourse Taxilanes

The aircraft parking length and the size of the taxilanes determine the distance required between each concourse. An established goal is to provide taxilane widths to support the B757 aircraft according to FAA standards identified in Advisory Circular 150/5300-13A, Change 1, *Airport Design* (AC-13A). The design driver influencing the terminal concourses alternatives is the decision of one-way versus two-way aircraft traffic. Currently the taxilanes support one-way aircraft traffic, which means if an aircraft from one pier is using the taxilane, aircraft on the opposing pier must remain either at the gate or on the taxiway until cleared to proceed.

While one-way taxilanes yield more compact development, reducing passenger travel distances between concourses, there are operational sacrifices. The developed terminal concourse alternatives further investigate how the passenger travel distance and aircraft operations should be prioritized.

Figure 4-6 illustrates the difference between one-way and two-way taxilanes and their respective impacts to the passenger travel distance and development footprint.

Figure 4-6: Concourse Taxilanes



Customs and Border Protection

All the terminal concourse alternatives share the goal of increasing the capacity of CBP facilities. Additional critical factors were maintaining operations and having flexibility to serve various types of aircraft. Primarily, the existing CBP facility must remain operational during all phases of development prior to its replacement. In addition, the developed terminal concourse alternatives offer ultimate flexibility in terms of the aircraft served by the CBP facility, allowing for an Airbus A330-type aircraft, which is larger than a B757. Using a sterile corridor, the alternatives identify swing gates that can serve both domestic and international flights. Generically, **Figure 4-7** illustrates this concept.

Site Constraints

Future development should be evaluated against its impact to existing adjacent airport functions. As **Figure 4-8** illustrates, these site constraints are worth further consideration:

- ❖ The southern boundary for future development is the NVANG property, just south of the existing apron. If deemed beneficial, the existing de-icing and remain overnight (RON) parking spaces on the south side of the apron can be relocated.
- ❖ Vassar Street is the hard boundary to the north for future development.
- ❖ The existing concourses are an obvious area of impact when laying out the new concourses and when phasing construction.
- ❖ The CBP facility footprint is available for redevelopment after these facilities are relocated. This order to improvements provides continued operation.
- ❖ The air cargo facilities to the north can be relocated, offering a significant new area for the terminal concourse expansion.
- ❖ Other airport facilities to the north of the terminal building can also be relocated, if necessary.

Figure 4-7: Customs and Border Protection

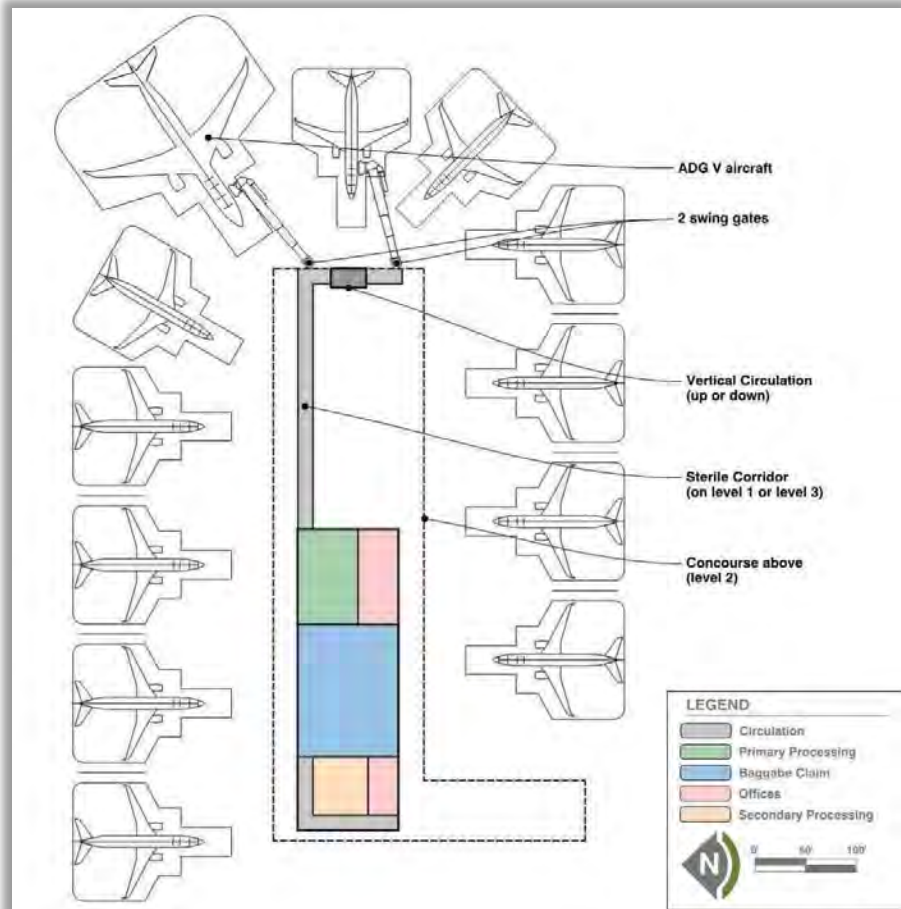
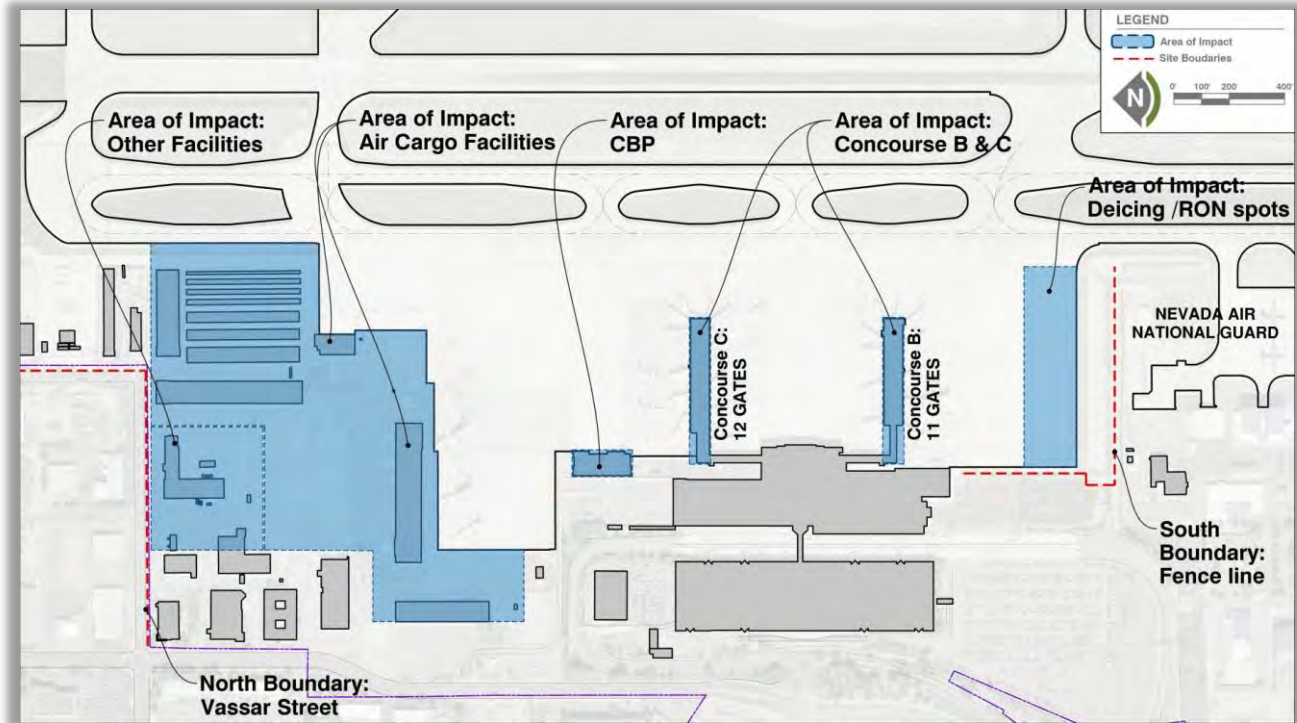


Figure 4-8: Site Constraints

The evaluation of the terminal concourse alternatives addressed varying levels of impact to adjacent facilities and their impact on overall site development.

Implementation

The ability for any plan to be implemented is critical. During alternatives evaluation, the implementation schedule for any proposed terminal concourse alternatives had to be tested against a phasing strategy that would allow the proposed plan to be constructed while maintaining acceptable levels of service.

Concourse Alternatives

The Consultant team investigated and evaluated conceptual alternatives against the established goals and objectives before refining them to be presented in the Master Plan. This exercise determined which alternatives could truly meet the established goals and objectives and were worthy of further development.

Concourse Layout

The layout of multiple concourses and their associated gates directly impacts the passenger experience, operations, implementation, and future flexibility. The two layout approaches evaluated for the concourses were Pier and Linear configurations, as **Figure 4-9** illustrates.

The Pier configuration incorporates up to three piers, each oriented east-west. That maximizes the potential number of gates and efficiently uses the existing apron. However, this configuration requires significant passenger travel distances, and each pier must provide the required amenities and support services to create an acceptable passenger experience.

The Linear configuration provides a singular concourse experience and organizes the gates along a north-south axis. However, a single-loaded linear concourse configuration did not provide the targeted gate count within the established limits of development. Consequently, this configuration was eliminated as a formal alternative.

A remote linear configuration was a possibility to increase the gate density. This configuration again provides a singular concourse experience by way of a double-loaded linear concourse organized in the north-south direction, east of the terminal building. This configuration met the targeted gate count and allowed for future expansion. It also took full advantage of the existing apron depth. However, achieving a clear path to its ultimate implementation was not feasible without significant disruption to existing airport operations during construction. Therefore, this configuration was eliminated as a formal alternative.

Concourse Alternative A

Alternative A (**Figure 4-10**) provides for the dual priorities of minimizing passenger travel distances and meeting the established goals and objectives within the smallest development footprint possible. These assumptions formed the basis of its configuration:

- ❖ Two new concourse piers, each containing up to 12 gates, for a total of 24 gates at full build out;
- ❖ One-way taxilanes, minimizing the distance between concourse piers;
- ❖ Future terminal development located as far south as possible;
- ❖ Relocation of the existing RON aircraft parking spaces from the south to the north;
- ❖ CBP facilities located within level 1 of the proposed new northern concourse pier;
- ❖ New administrative office space located on level 2 above the existing employee parking lot to the south of the existing ticketing hall and baggage makeup area; and
- ❖ Future expansion by way of a third pier, once the need arises and air cargo facilities are relocated.

Alternative A successfully limits passenger travel distances and yields a minimal development footprint; however, it limits both aircraft operations and future flexibility.



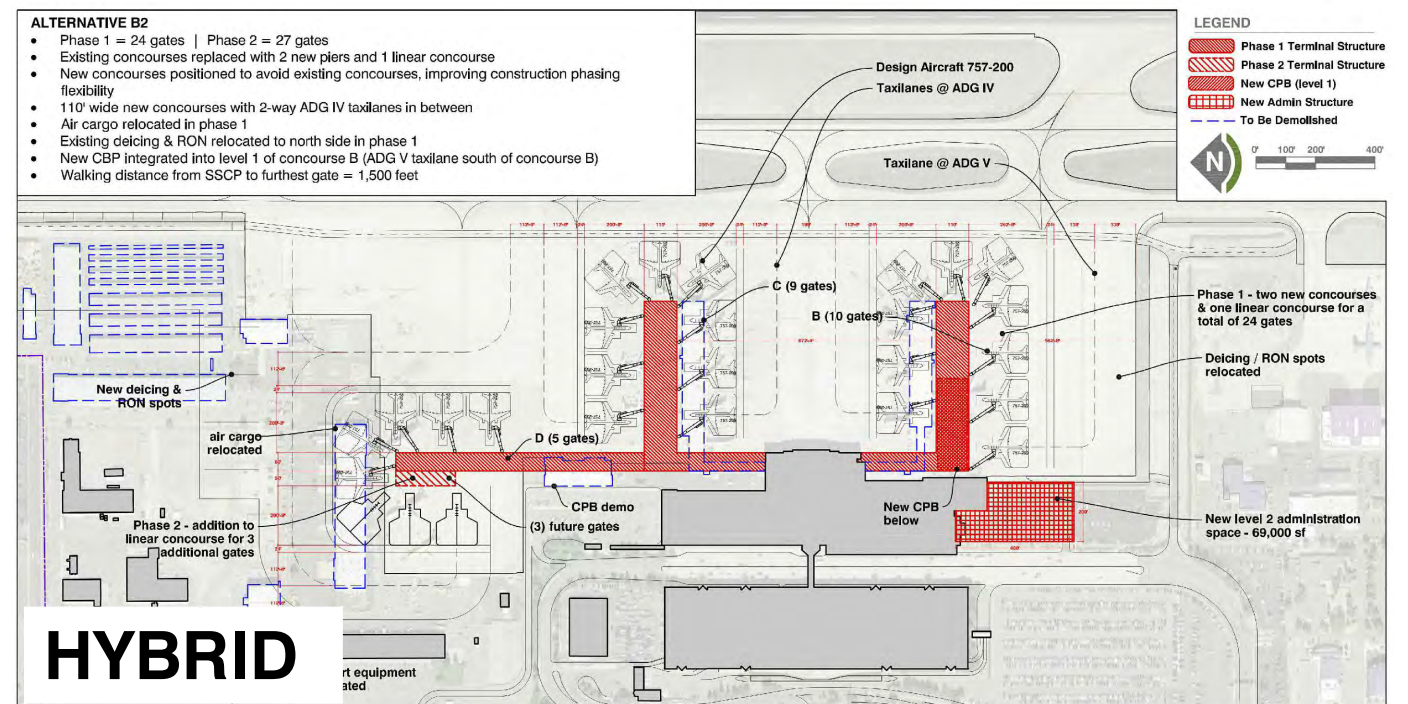
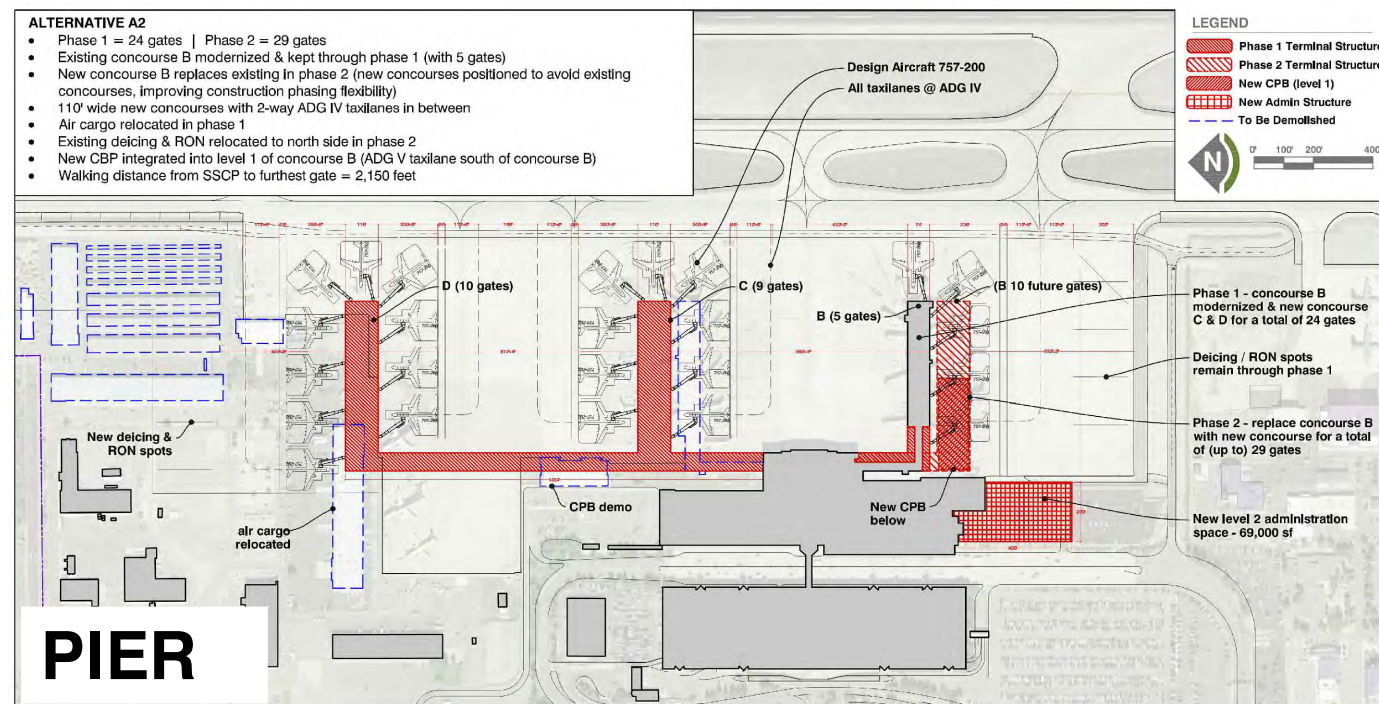
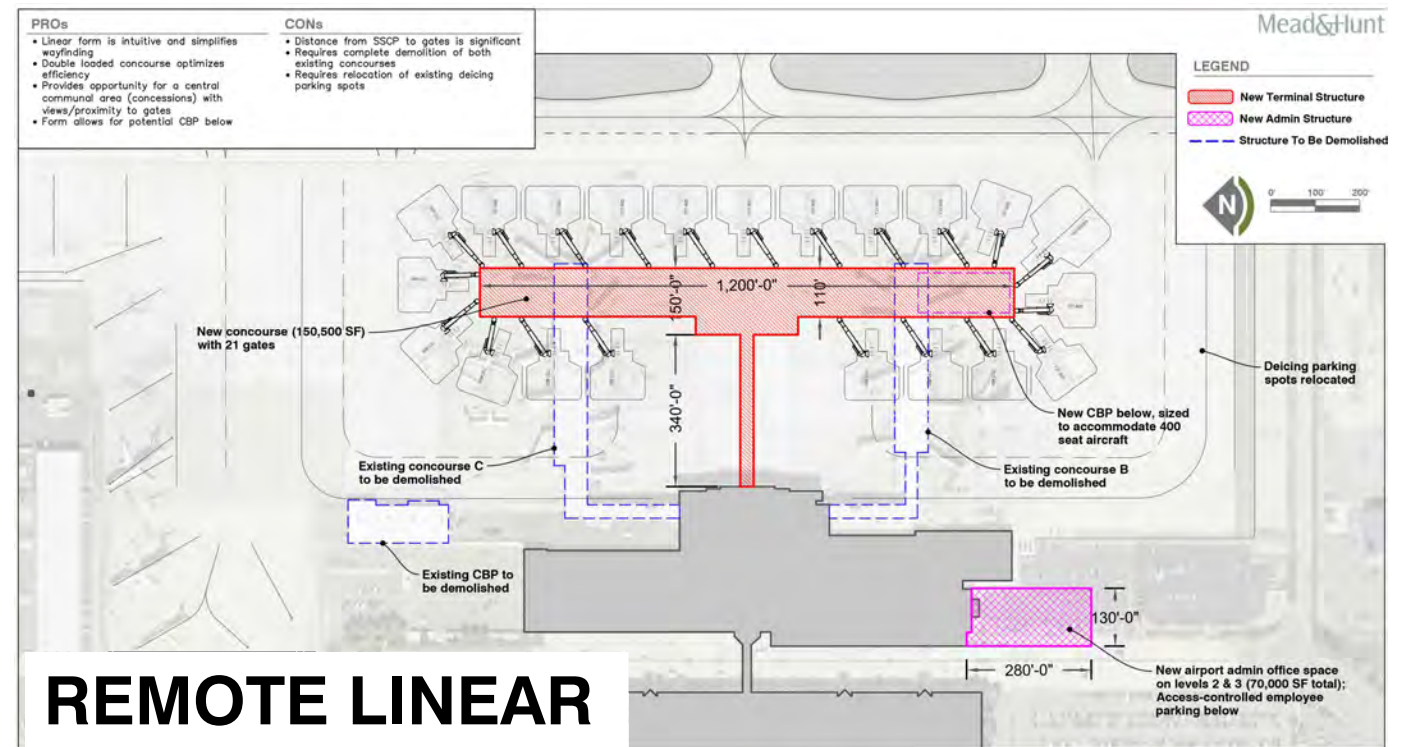
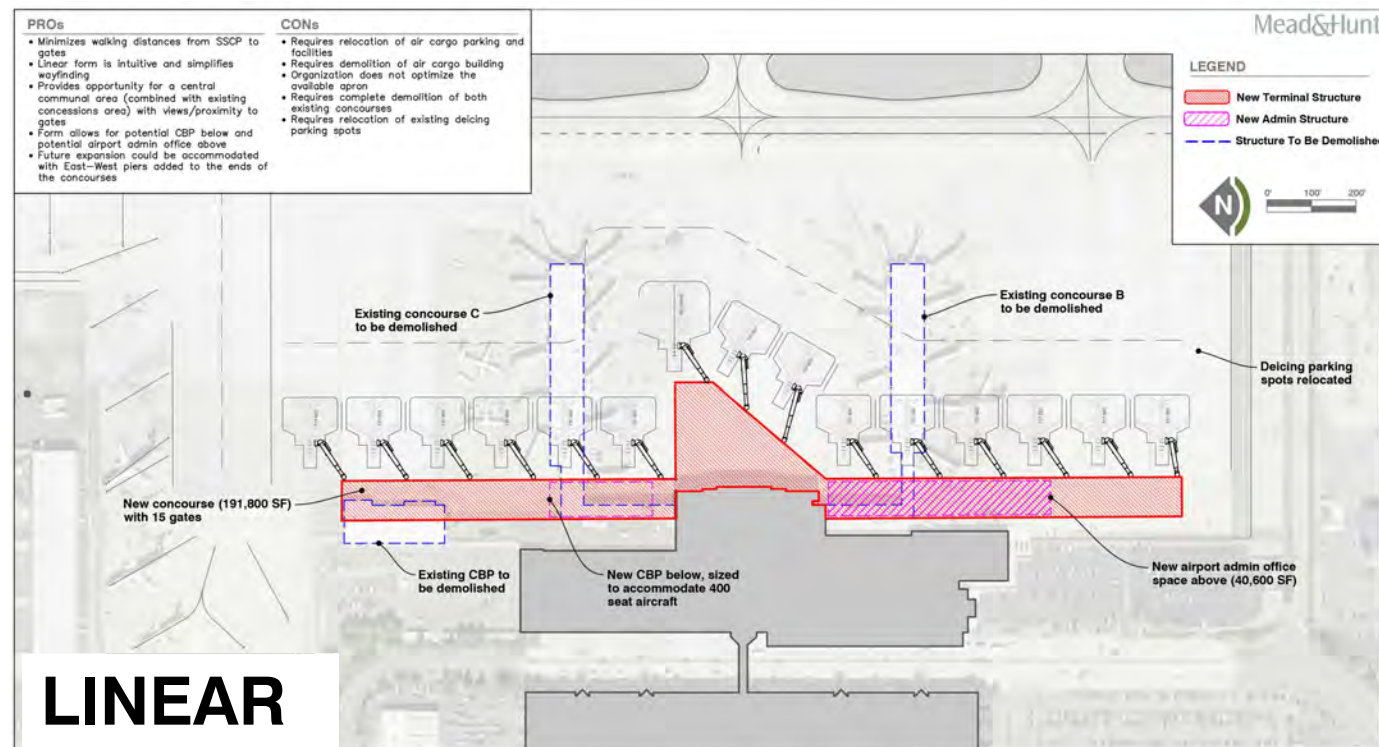


Figure 4-9
Terminal Concourse
Alternative Layouts

ALTERNATE A - COMPACT

- 24 GATES (EXPANDABLE TO 35)
- ONE-WAY ADG IV TAXILANES
- NORTH RON/DEICE SPOTS
- REPLACES ALL EXISTING CONCOURSES
- AIR CARGO REMAINS (UNTIL EXPANSION)

LEGEND

- New Terminal Structure
- Future Terminal Expansion
- New Admin Structure
- New CBP
- Extents of New Apron
- - - Extents of Future Apron

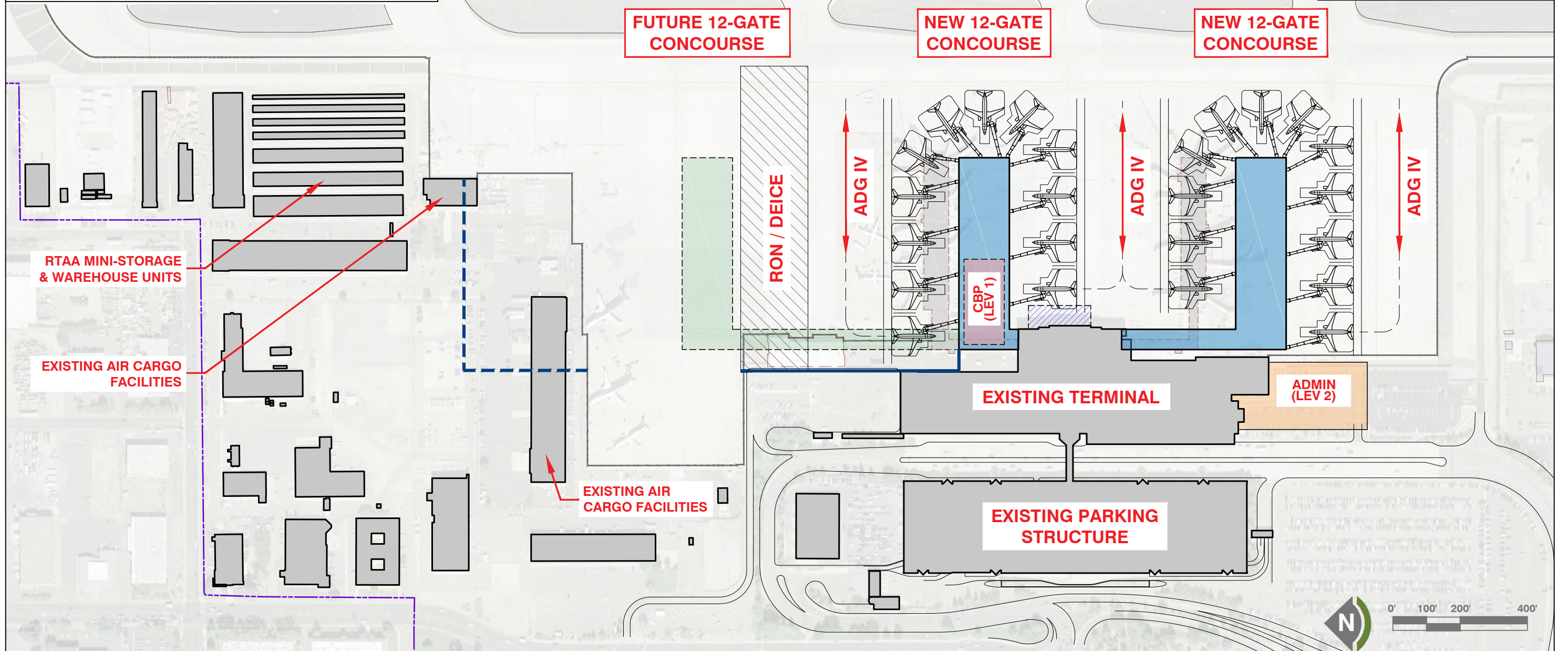


Figure 4-10
Terminal Concourse
Alternative A

Concourse Alternative B

Alternative B (**Figure 4-11**) builds on the configuration of Alternative A but shifts the priority from passenger travel distances and development footprint to aircraft operations. These assumptions guided its configuration:

- ❖ Two new concourse piers, each containing up to 12 gates, for a total of 24 gates at full build out;
- ❖ Two-way taxilanes between concourses, allowing for simultaneous aircraft operations with one-way taxilanes to the north and south;
- ❖ Existing RON parking spaces and de-icing pads to the south would remain and would establish the southern edge of development;
- ❖ CBP facilities located within level 1 of the proposed new northern concourse pier;
- ❖ New administrative office space located on level 2 above the existing employee parking lot to the south of the existing ticketing hall and baggage makeup area; and
- ❖ Future expansion by way of a third pier, once the need arises and air cargo facilities are relocated.

Alternative B resolves the potential issue with limited aircraft operations but still limits future flexibility in terms of both terminal development and changes in fleet mix, primarily due to the assumed gate density per concourse pier. Incremental growth is limited since any demand beyond 24 gates triggers the need for a third concourse pier or creates significant constraints on the size of aircraft served at any given gate.

Concourse Alternative C

Alternatives A and B both assumed a gate density of 12 gates per pier. Alternative C (**Figure 4-12**) prioritizes increased future flexibility and aircraft/airline operations and assumes new concourse piers to support 10-11 gates. The result is a three-pier configuration required to meet the established goals and objectives. These assumptions guided the configuration of Alternative C:

- ❖ Ultimate build out of three concourse piers, containing 10-11 gates each;
- ❖ Two-way taxilanes between concourses, allowing for simultaneous aircraft operations with one-way taxilanes to the north and south;
- ❖ Available apron space east of the SSCP at level 1 to allow for future SSCP expansion to the east;
- ❖ Existing RON parking spaces and de-icing pads to the south to move as far south as possible and establish the southern edge of development;
- ❖ CBP facilities located within level 1 of the proposed new central concourse pier;
- ❖ New administrative office space located on level 3 at the northeast corner of the terminal building, within Phase I of the proposed new development; and
- ❖ An interim option of modernizing existing Concourse B and equipping it to appropriately support 5-6 gates using existing space.



ALTERNATE B - CENTRALIZED

- 24 GATES (EXPANDABLE TO 35)
- DUAL ADG IV TAXILANES BETWEEN PIERS
- RON/DEICE SPOTS ON SOUTH & NORTH
- REPLACES ALL EXISTING CONCOURSES
- AIR CARGO RELOCATED

LEGEND

- New Terminal Structure
- Future Terminal Expansion
- New Admin Structure
- New CBP
- Extents of New Apron
- - - Extents of Future Apron

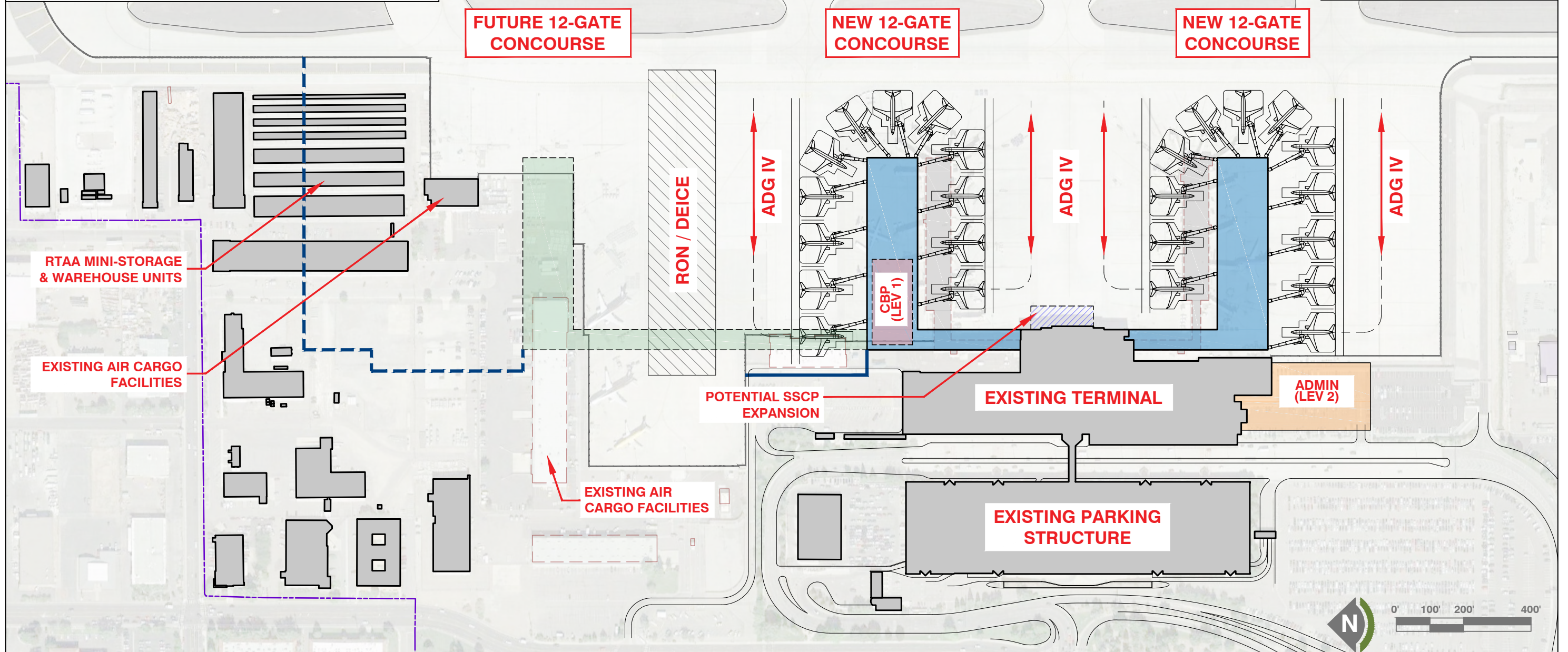


Figure 4-11
Terminal Concourse
Alternative B

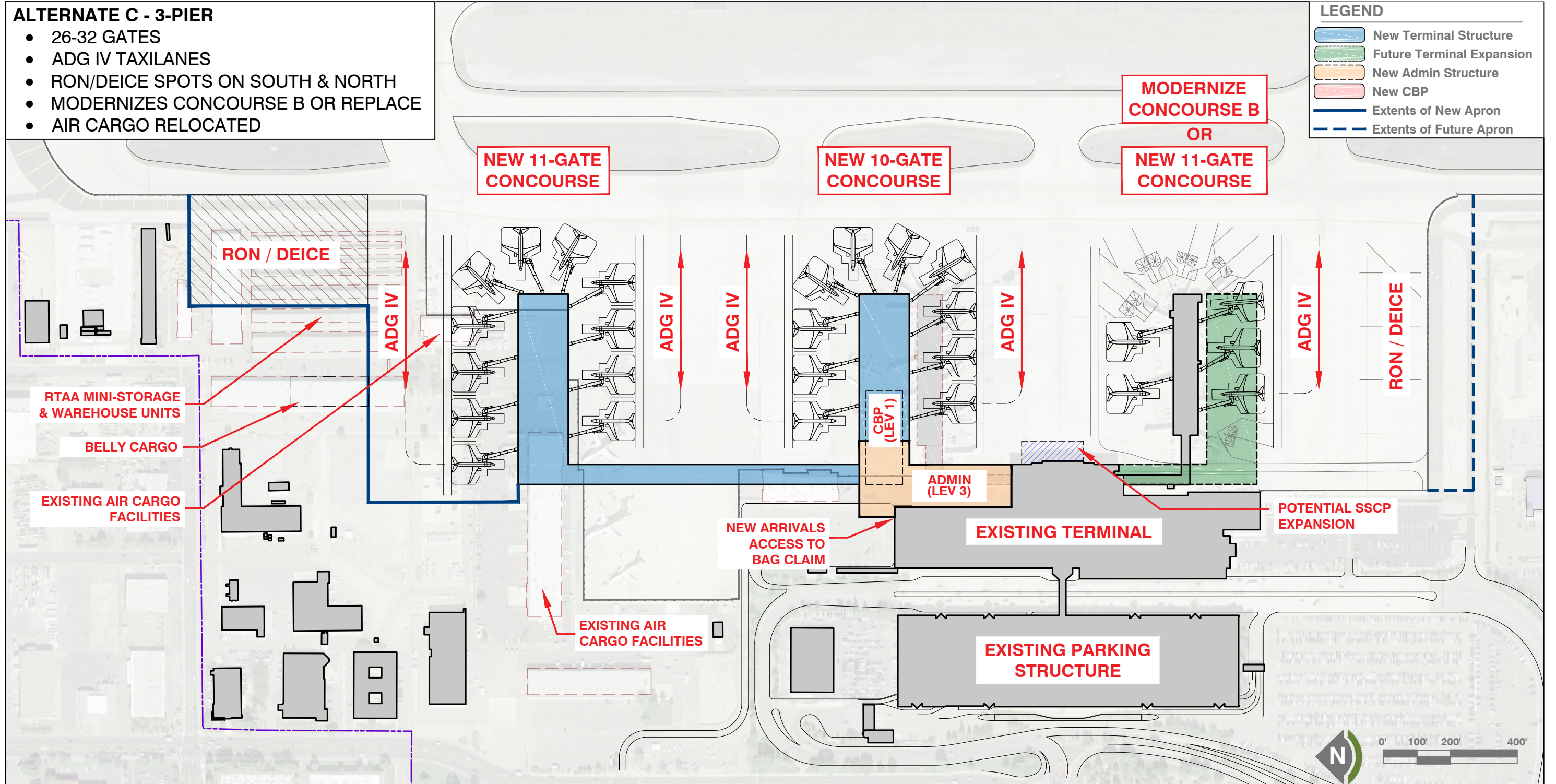


Figure 4-12
Terminal Concourse
Alternative C

Alternative C represents the highest level of required development but also creates the highest level of future flexibility, including multiple paths to its ultimate build out. By acknowledging early on that three piers are required, the infrastructure can be developed to allow for incremental growth as needs arise.

Terminal Concourse Evaluation Matrix and Recommendation

All three options presented meet the established terminal concourse goals and objectives. The evaluation matrix (**Figure 4-13**) illustrates how each individual alternative addresses and in some instances prioritizes the other design drivers considered during its development.

Figure 4-13: Concourse Evaluation Criteria Matrix

Evaluation Criteria	Alternatives		
	A Compact	B Centralized	C 3-Pier
Addresses Forecast Demand	○	○	⊕
Provides Flexibility in Design	●	●	⊕
Improves Passenger Experiences	⊕	●	◐
Facilitates Efficiency / Operational Performance	◐	●	⊕
Reasonable Constructability and Implementation	○	●	⊕
Relies On or Limits Other Design Alternatives	⊕	●	●
Preliminary Estimated Cost	\$\$	\$\$\$	\$\$\$\$
Financial Impact / Optimizes Economic Return	●	◐	●

RECOMMENDED
ALTERNATIVE

LEGEND

○ Less than Desirable

◐ Moderate

● Good

⊕ Best

Preferred Alternative

Through further dialogue concerning the evaluation matrix, a process that identified future flexibility and operational performance as high priorities, Alternative C emerged as the preferred alternative. Alternative C best allows for the following:

- ❖ A plan that both meets, and appropriately exceeds, the forecasted demand and associated gate count;
- ❖ Future flexibility in terms of additional gates and preferential use of those gates should additional carriers enter the market;
- ❖ A development strategy that does not rely on the relocation of the existing air cargo facilities to begin projects, maintains an acceptable level of operation during construction, and allows for either the modernization or replacement of the existing Concourse B, depending on how the forecasted demand evolves;



- ❖ An integrated CBP facility that can be constructed while the existing CBP facility continues operations;
- ❖ Administrative office space that can be constructed as part of Phase I and solve immediate needs in an integrated manner;
- ❖ The potential for a new arriving passenger experience at the north end of the existing baggage claim area;
- ❖ Belly cargo processing space with access to both the apron and landside facilities; and
- ❖ Increased passenger travel distances that can be mitigated through the inclusion of moving walkways.

Terminal Building

Facility Requirement: Modernization

The terminal building consists of the functional areas in the non-sterile zone, including the ticketing hall, main lobby, SSCP, and baggage claim areas. The facility requirements analysis showed the size of these areas is sufficient throughout the planning period (2036). However, the airport currently experiences congestion, queuing issues, and wayfinding issues due to inefficient organization or operations. This section identifies physical improvements related to the ticketing hall, main lobby, and SSCP targeted at improving the passenger experience and making operations more efficient.

Terminal Building Goals and Objectives

These are the goals and objectives for the development of the terminal building alternatives and recommendations:

- ❖ Improve ticketing hall circulation and queuing;
- ❖ Improve intuitive wayfinding;
- ❖ Improve flexibility of, and passengers getting through, the SSCP; and
- ❖ Improve revenue generating opportunities.

Considerations

The Consultant team considered the compatibility of terminal building alternatives and recommendations with the terminal concourse alternatives, especially the preferred terminal concourse alternative. The focus of improvements to the terminal building is to provide an improved and consistent passenger experience throughout the airport. Since the preferred terminal concourse alternative allows for growth beyond the forecasted demand, the terminal building recommendations and alternatives also provided similar flexibility, should the need arise.

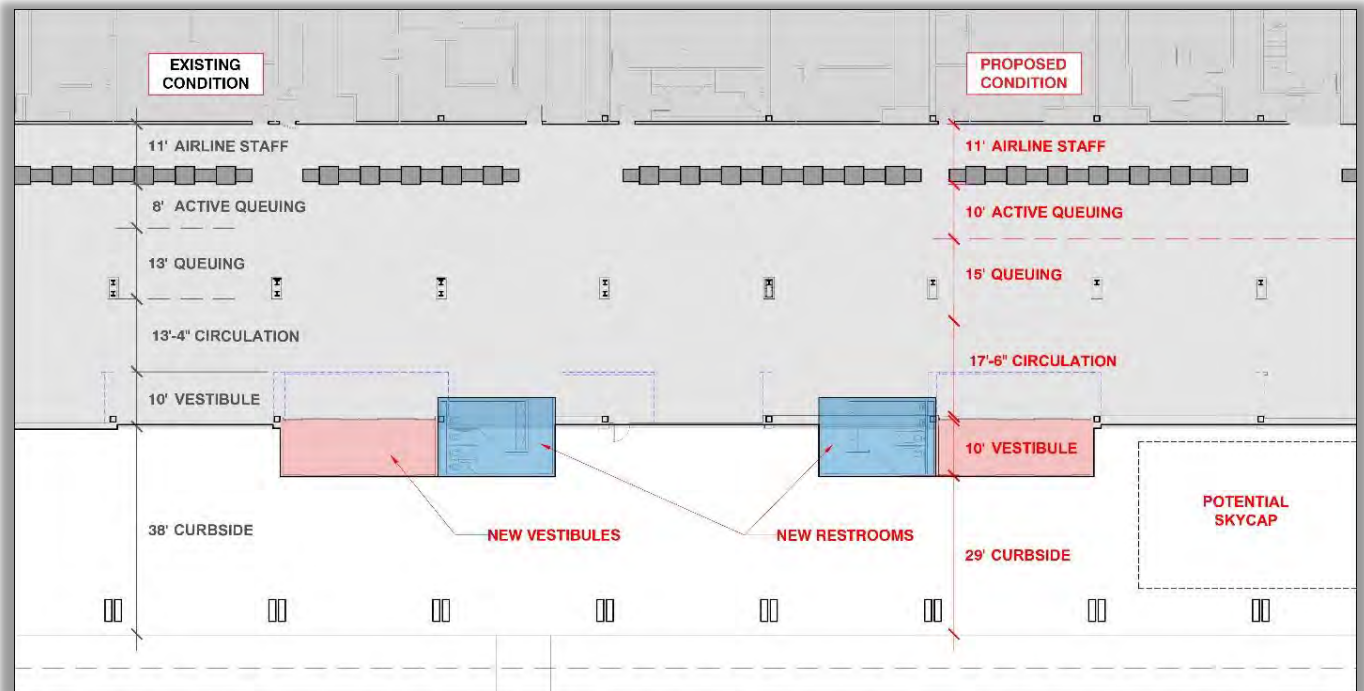


Terminal Building Alternatives and Recommendations

Ticketing Hall

Although the length of ticket counter frontage is properly sized, the depth of the ticketing hall limits the ideal layout for queuing and circulation space. This contrast causes inefficiencies and congestion during periods of high demand. The recommendation, as **Figure 4-14** illustrates, relocates the existing entry vestibules and adjacent support spaces outboard of the existing building envelope. In addition to expanding the actual queuing area depth by 4 feet, this would expand the existing circulation zone, which is 13 feet, 4 inches deep, to 17 feet, 6 inches, allowing the queuing area to overflow when necessary during periods of high demand without impeding the cross-circulation routes. The curbside still maintains a comfortable 29-foot depth in front of the new vestibules and a 38-foot depth in those areas without vestibules.

Figure 4-14: Ticketing Hall Recommendation



Currently, the ticketing hall areas lack available restroom facilities. The recommendation suggests that men's and women's restroom facilities be incorporated outboard of the existing building envelope to provide the necessary facilities to serve this portion of the terminal building without further reducing the already deficient spaces.

Since current Southwest Airlines skycap facilities are on the southern-most end of the curbside, the skycap operations would be unaffected by the recommended modifications. Additionally, the recommended solution allows for future ticketing hall and/or baggage handling growth to occur to the south.

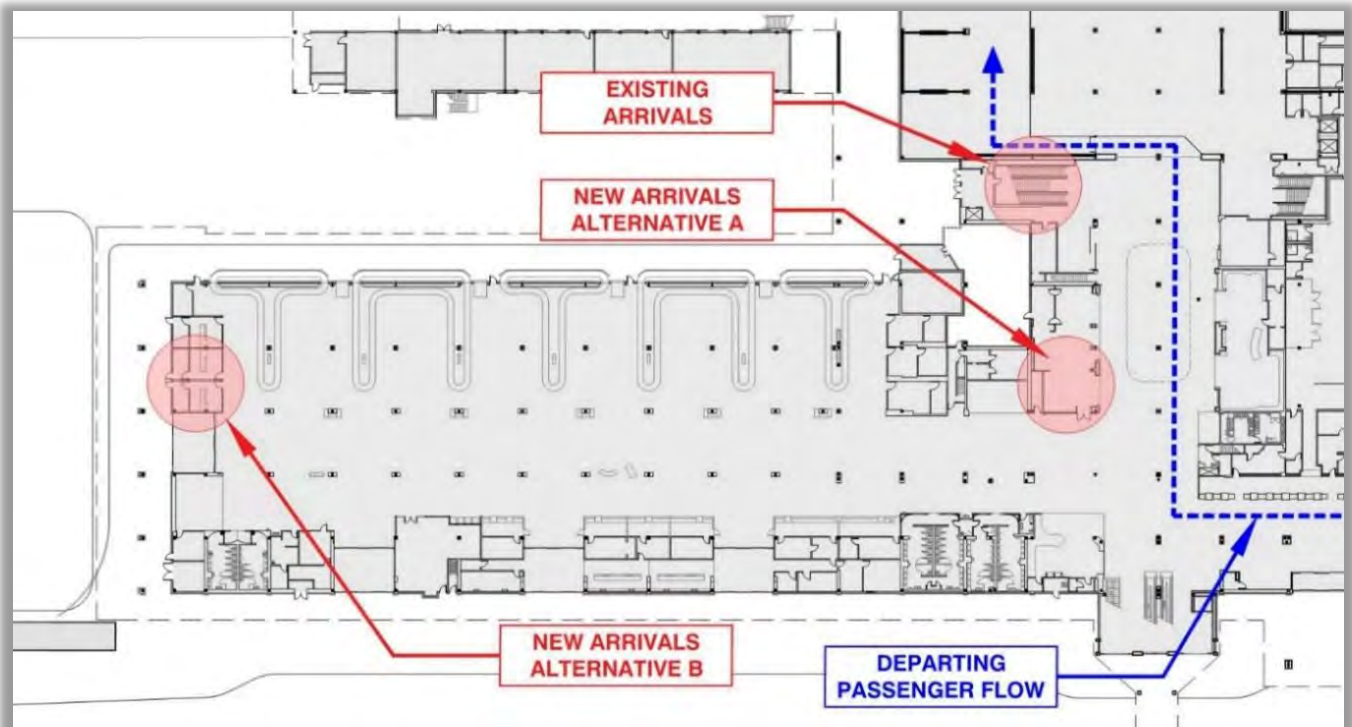
Security Screening Checkpoint

The SSCP is currently sized and equipped to handle the projected demand through the planning period; however, the organization of the current SSCP provides a less than ideal passenger experience and limits future growth opportunity to accommodate changes in technology and/or procedures that alter the required footprint of each lane. Improvements to the SSCP area are contingent on other developments throughout the airport. Instead of providing complete recommendations or alternatives for the entire area, the individual goals and objectives developed can be implemented overtime, as needed, and in a manner compatible with ongoing airport development.

Arriving Passengers

Currently, arriving passengers move from the level 2 concourses to level 1 of the terminal building at the northwest corner of the SSCP area. This point of arrival at level 1 happens to coincide with the formal entry to the SSCP area causing potential confusion and congestion during regular operations, but even more so when SSCP queuing overflows. In addition, the vertical circulation associated with the arriving passengers requires outbound passengers to go around the stair and escalators, resulting in an inefficient layout of the SSCP area. Two identified opportunities to relocate the point of passenger arrival each resolve current issues of cross flow between arriving and departing passengers and provide the SSCP area with both additional space and improved spatial geometry.

Figure 4-15: Arriving Passenger Alternatives



Alternative A, as **Figure 4-15** illustrates, is contingent upon the relocation of the level 2 administrative office space and the reorganization of existing level 1 concession space. Alternative A suggests that the arriving passenger enters the terminal building at the south end of the baggage claim area, providing for a more natural and intuitive passenger flow.

Alternative B complements Terminal Concourse Alternative C, the preferred terminal concourse alternative. Alternative B relocates the point of passenger arrival to the north end of the baggage claim area, once again providing a more natural and intuitive experience for the arriving passenger.

Checkpoint Depth and Passenger Flow

The goals of any work with the SSCP area should include providing adequate depth for both current and anticipated TSA screening lane technologies and procedures. Additionally, any future work should provide for a linear and intuitive passenger flow into the SSCP area, through the screening lanes, and ultimately up to the level 2 concourses.

The spatial limitations of the current screening lanes compromise distances between the document checking podiums and the lanes themselves, space for passengers to divest, and space for passengers to collect their belongings and recompose. This compromised depth and the existing geometry of the space make the transition between the post-security recomposure area and the vertical movement to the level 2 concourses less than intuitive with limited visibility.

Ideally, passenger flow through the security checkpoint should be linear with the passengers always moving toward their destination. However, passengers currently move through the queue from west to east, which requires them to then backtrack through the screening lanes east to west. This process concludes with an overreliance on signage to navigate up to the level 2 concourses, which is discussed later in this chapter.

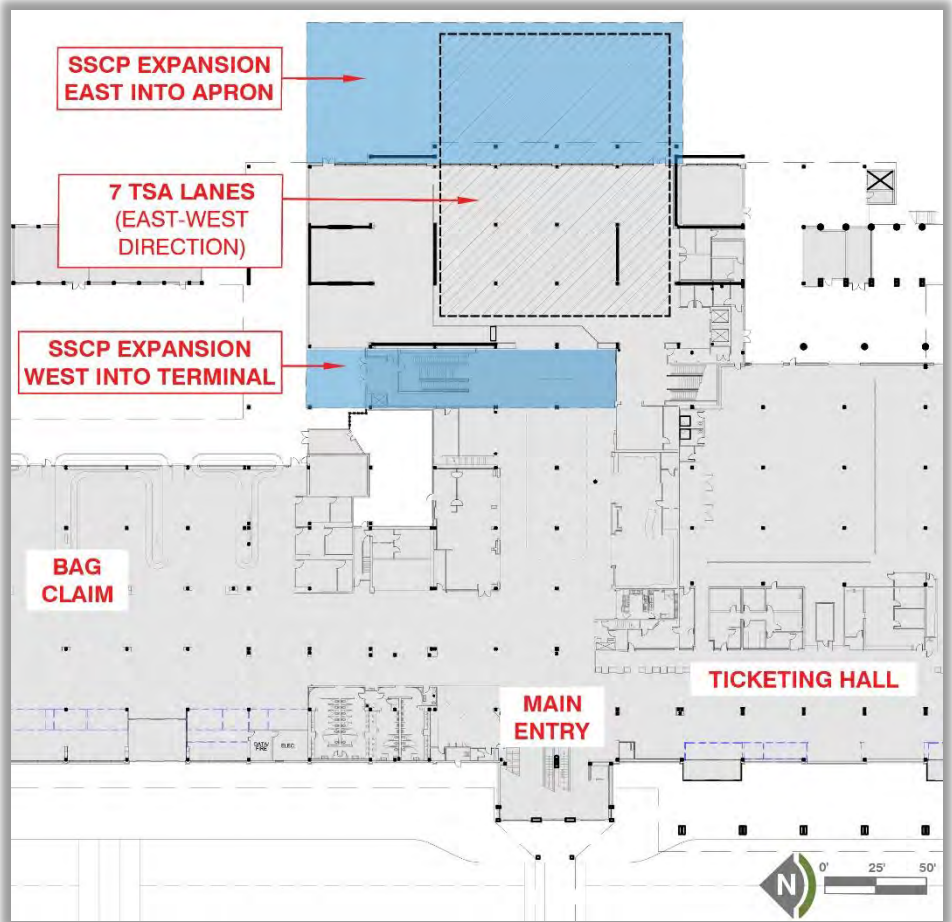
The goal of any future SSCP development should be to increase passenger screening lane depth and provide more intuitive passenger flow that moves directly from the post-security recomposure area toward level 2. This could be accomplished by either expanding the SSCP area to the east allowing the current lanes to lengthen, or by rotating the lanes to a north-south orientation. Either solution should be evaluated against its ability to provide additional passenger screening lanes at some point in the future and accommodate both current and future technologies and procedures.



SSCP Expansion

The potential for growth due either to changes in the forecasted demand or changes in SSCP technology or procedures make it important to incorporate future growth capabilities into the overall master planning process. As **Figure 4-16** shows, areas for future growth are available to the east of the existing SSCP area and to the west, assuming modifications to the existing vertical circulation. This potential expansion allows for additional screening lanes and associated queuing. The identified area was critical in identifying Terminal Concourse Alternative C as the preferred alternative because it allowed for this future growth without compromising the terminal concourse goals and objectives.

Figure 4-16: SSCP Expansion



Belly Cargo

Currently, the Airport does not have a dedicated belly cargo facility. Belly cargo is loaded onto aircraft at the gate. Belly cargo storage should be positioned near the terminal to minimize the distance tugs must travel to load and unload freight carried in the belly of passenger aircraft. The recommended terminal alternative requires the relocation of belly cargo to provide adequate space for future terminal development. The recommendation is to relocate the belly cargo facility further north along the edge of the future commercial aircraft parking apron, as shown at the end of the chapter in **Figure 4-30**.

Intuitive Wayfinding

The basic layout at RNO allows for intuitive passenger wayfinding. However, wayfinding relies heavily on signs due to the current organization of concessions, art, gaming, and other amenities. The sheer volume of this signage diminishes the intuitive nature of the airport layout. Separation of the arriving and departing passenger paths, as suggested with the SSCP recommendations, would further clarify wayfinding through the terminal building. These opportunities for improvement, as **Figure 4-17** illustrates, are based primarily on the central hall connecting the primary entry to the SSCP area, but apply to wayfinding throughout the entire terminal building:

- ❖ Clarity of signage, including location, size, and contrast;
- ❖ Consolidation and hierarchy of messages;
- ❖ Airport signage and functions having prominence over competing retail signage and gaming activities;
- ❖ Floor finishes and layouts delineating intended passenger paths of travel and supporting intuitive wayfinding;
- ❖ Passenger paths of travel unimpeded by physical construction or other elements;
- ❖ Height and organization of equipment and installations such as art and gaming machines.

The following recommended strategies would resolve the issues identified and ensure that future work promotes a consistent and intuitive passenger experience:

- ❖ Develop signage standards and design guidelines to be implemented throughout the airport;
- ❖ Develop design guidelines to inform consistent use of materials, advertising opportunities, and appropriate display of art and other displays; and
- ❖ Develop a Design Review Committee to ensure overall compliance with the established standards and guidelines.

Figure 4-17: Main Lobby Wayfinding



Summary of Terminal Development Alternatives

In aggregate, the preferred Passenger Terminal Development Alternatives and Recommendations provide airport facilities of adequate size to serve the forecasted demand. The recommendations provide for a consistent, integrated, and intuitive passenger experience throughout the terminal and have the flexibility necessary to adapt to growth beyond the forecasted demand or changes in technology and/or procedures.



Landside Development Alternatives

The landside development alternatives consider the terminal roadway, curbside, public parking facilities, and the public portion of the rental car facilities. The Consultant team focused on developing alternatives individually while also considering the synergies between these various components. A single preferred landside development alternative is presented at the end of this section.

In 2017, the Nevada Department of Transportation (NDOT) initiated environmental efforts for the Spaghetti Bowl project, which will reconstruct the Interstate 80 / Interstate 580 system-to-system interchange. Some of NDOT's alternatives remove the airport direct connect ramps. Removal of the direct connect ramps negatively impacts all the landside development alternatives, airport connectivity to off-airport ground transportation infrastructure, and ease of access into RNO. In 2018, the RTAA contracted with Kittelson & Associates, a transportation engineering and planning firm, to develop alternatives to NDOT's alternatives which maintain ground access connectivity for airport users and work with the landside development alternatives. Kittelson & Associates' alternative is presented at the end of the chapter in **Figure 4-67**.

Landside Goals and Objectives

These are the goals and objectives for the landside alternatives:

- ❖ Provide additional short-term public parking to meet future needs;
- ❖ Provide flexibility for varied parking products and associated price points;
- ❖ Provide a CONRAC to house all public rental car activities;
- ❖ Allow for future growth in rental car demand in alignment with forecasted enplanement growth; and
- ❖ Provide both public parking and rental car facilities near the terminal.

Terminal Roadway and Curbside

The NDOT is currently evaluating improvement plans that may impact the terminal roadway's connection to adjacent streets and highways. The passenger experience begins and ends with an airport's ability to provide intuitive and direct access to major vehicular routes, as RNO currently provides. The recommendation is that any future NDOT improvements or modifications be evaluated and that direct access to and from Interstate 580 remain an airport priority.

The facility requirements indicate the existing curbside is sufficient to meet both current and forecasted demand due to the number of traffic lanes and overall length. Any maintenance or construction activities that impact the terminal roadway, curbside, or adjacent facilities should consider these improvements:

- ❖ Signage and wayfinding, both vehicular and pedestrian;
- ❖ Pedestrian lines of sight, areas of refuge, and traffic calming measures at crosswalks; and
- ❖ Accessible pedestrian paths and curb cuts between airport facilities that comply with current ADA standards.



Parking

Facility Requirement: Capacity

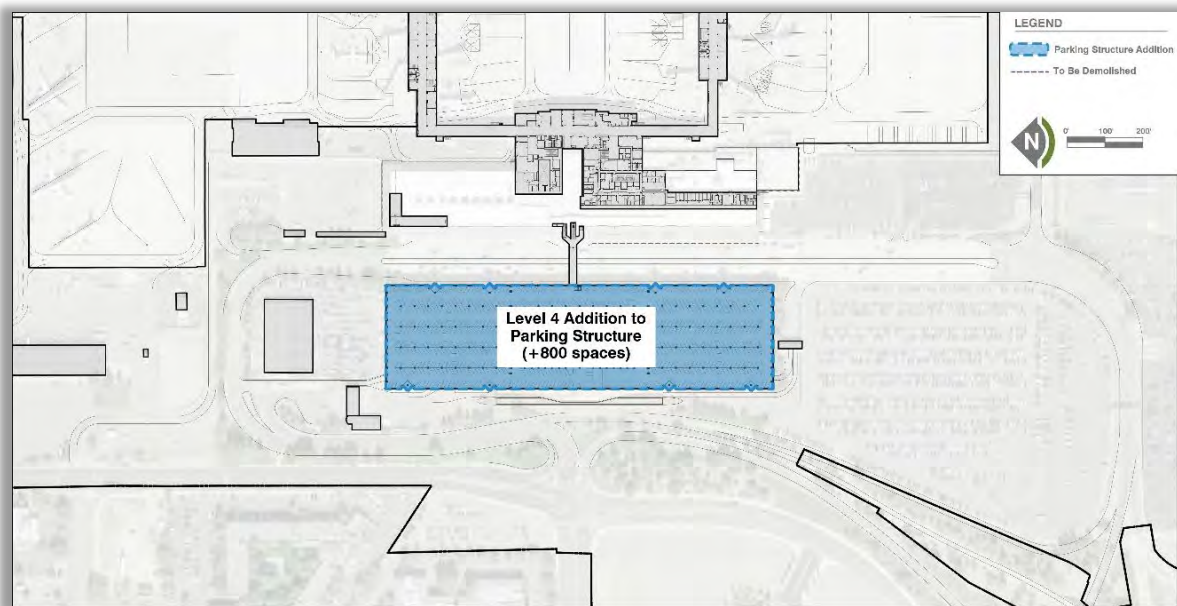
Passengers and RTAA highly value the proximity of the public parking to the terminal. This proximity, along with providing a variety of different parking products at different price points, was key in the development and evaluation of the alternatives.

The facility requirements analysis documents parking space deficiency without consideration of the impact Transportation Network Companies (TNC) such as Uber and Lyft and autonomous vehicles may have on public parking demand in the future, which is still somewhat unknown. To mitigate the potential risk of a reduced demand on public parking, parking alternatives that include new or expanded parking structures should consider how to design and construct structured parking to allow for the future conversion to occupiable space. This would include designing towards flat parking plates, floor to floor heights sufficient to support future uses, and using existing circulation of vehicles or keeping the circulation outside of the usable footprint of the new structure.

Parking Alternative A

Alternative A (**Figure 4-18**) takes advantage of structural provisions within the existing parking structure and proposes a fourth level of public parking. Approximately 800 additional parking spaces can be developed to take advantage of the existing circulation of vehicles and infrastructure. These new parking spaces would be close to the terminal building. Vertical pedestrian circulation, including stairs and elevators, would need to be extended to a new fourth level. In addition, managing to continue operations during construction would be necessary to avoid temporary parking deficiencies.

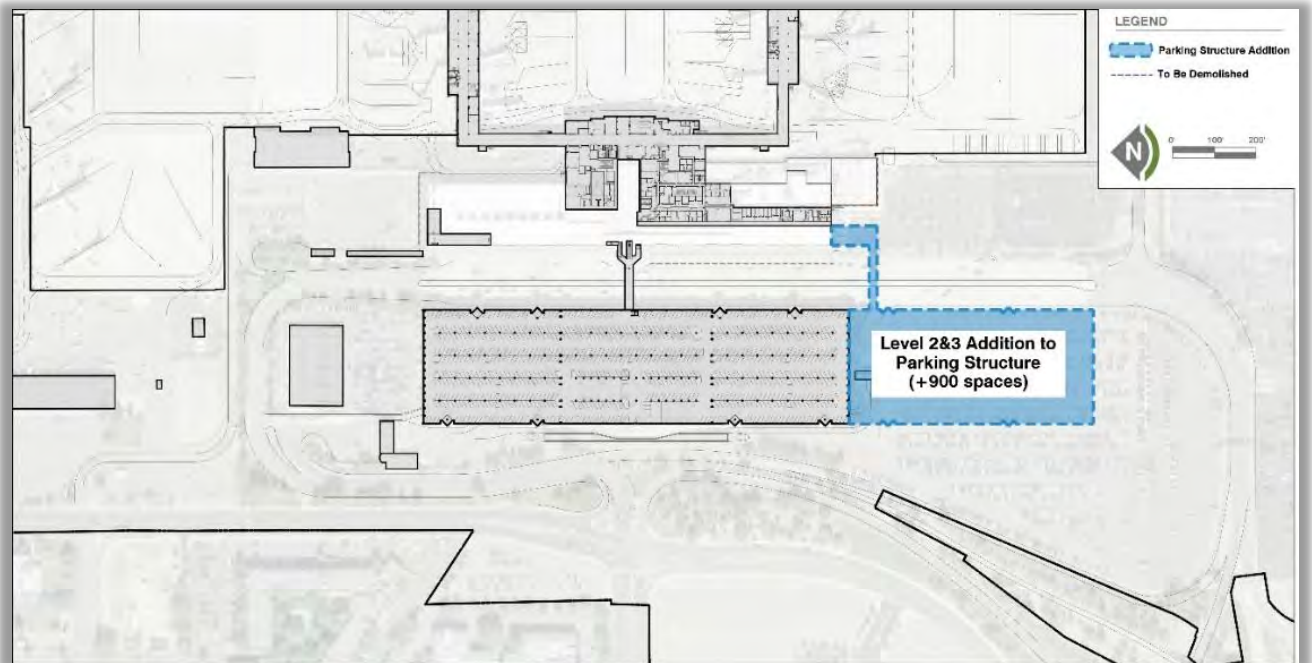
Figure 4-18: Parking Alternative A



Parking Alternative B

Parking Alternative B (**Figure 4-19**) proposes a two-level addition to the south of the existing parking structure. This alternative has the potential to phase the addition of up to 900 parking spaces. The existing circulation of vehicles can once again be used to access the addition. However, more pedestrian circulation and possibly a new level 2 connection to the terminal building would need to be added. This alternative replaces existing surface lot spaces with spaces in the parking structure and extends the overall footprint of the parking structure to the south. These changes move parking further from the terminal building and reduce overall diversity in parking products offered.

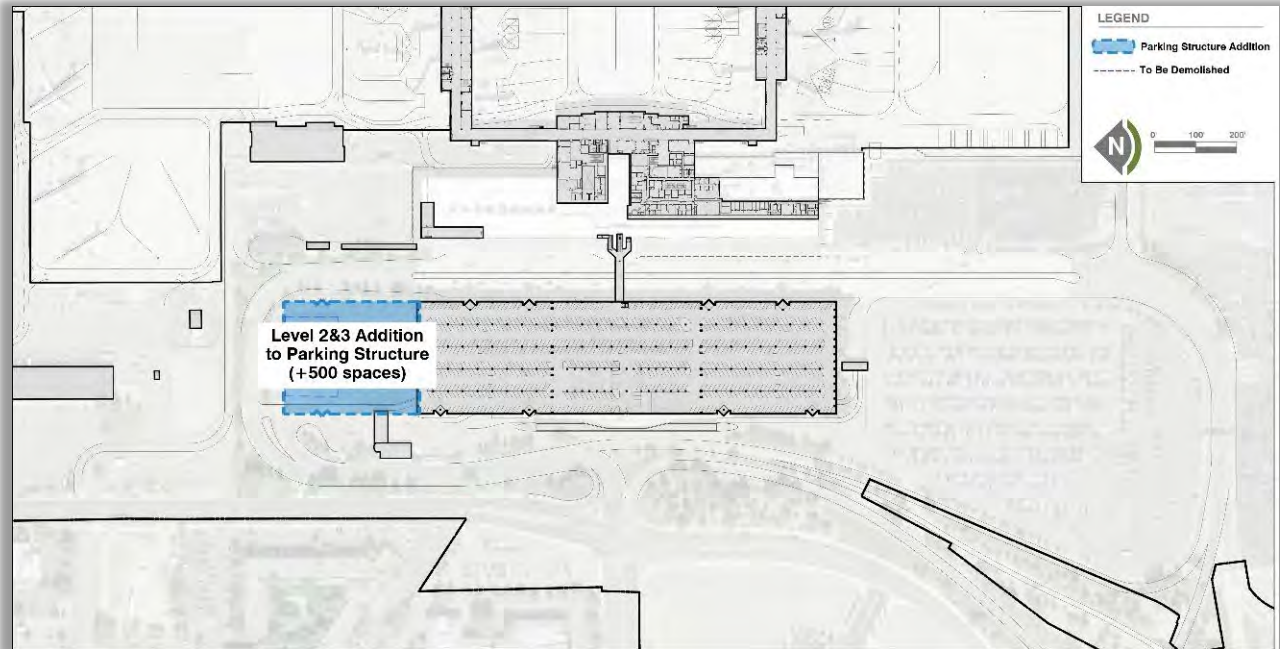
Figure 4-19: Parking Alternative B



Parking Alternative C

Alternative C (**Figure 4-20**) proposes a two-level addition to the north of the existing parking structure. This alternative has the potential to add up to 500 parking spaces but requires the relocation of the existing rental car quick turnaround (QTA) facility. The existing terminal roadway limits the addition's capacity, but the parking structure growth is in the direction of anticipated future terminal and concourse development. Additionally, structural provisions have already been made at grade to support this alternative.

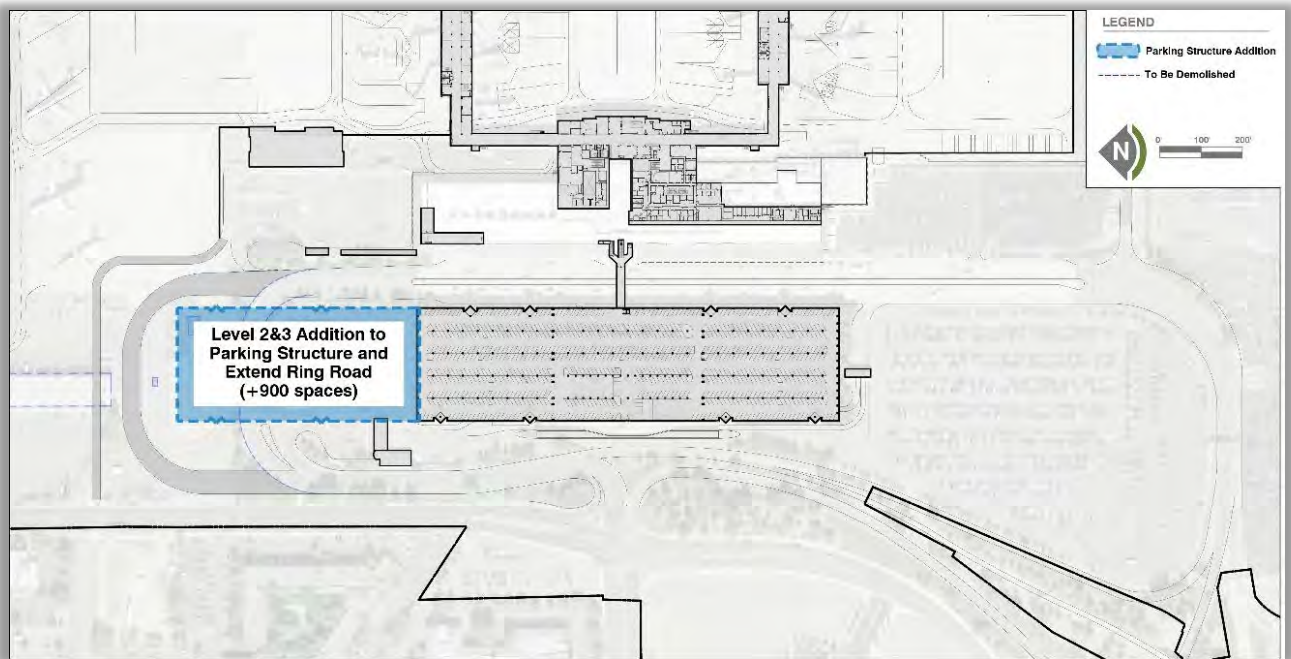
Figure 4-20: Parking Alternative C



Parking Alternative D

Alternative D (**Figure 4-21**) proposes to relocate the terminal roadway to remove the capacity limitations of Alternative C. This alternative increases the overall scope of work, including modifications to or the relocation of the air cargo operations, but also provides up to 900 additional parking spaces.

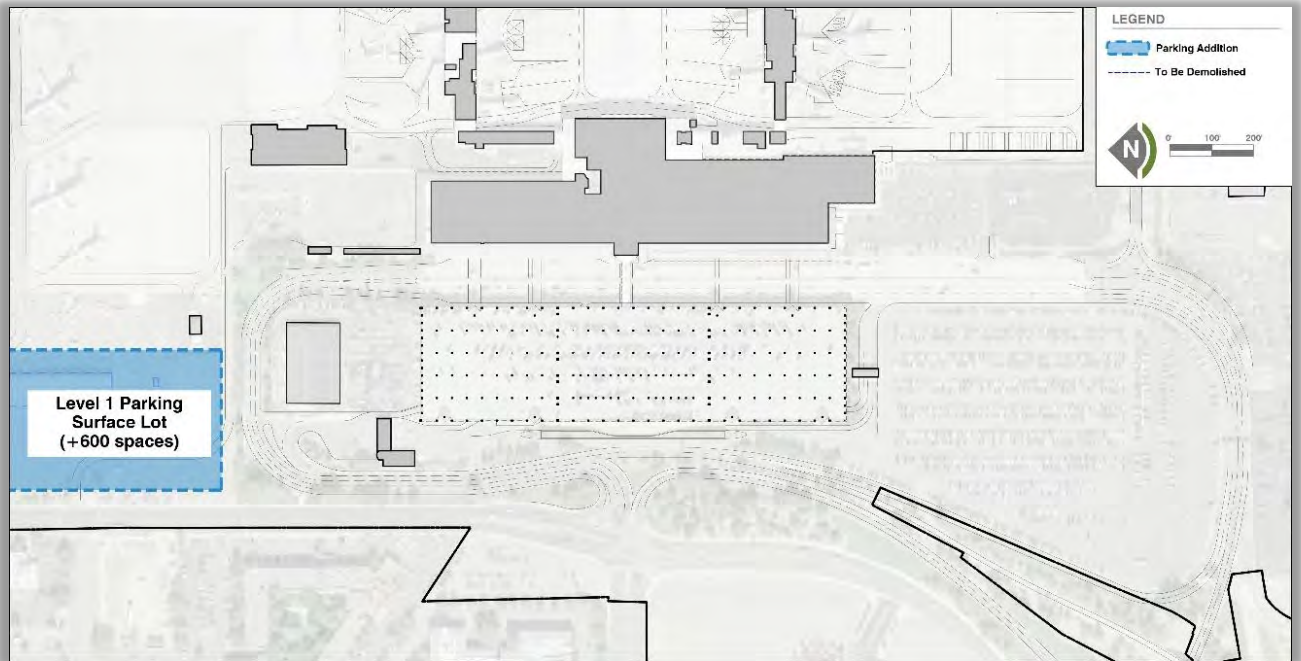
Figure 4-21: Parking Alternative D



Parking Alternative E

Alternative E (**Figure 4-22**) illustrates the potential of adding up to 600 surface parking spaces north of the existing terminal roadway. These new spaces are uncovered and further from the terminal building, and the location limits the overall intensity of development, but the new spaces increase the potential variety of parking products offered.

Figure 4-22: Parking Alternative E



Evaluation Matrix and Recommendation

Figure 4-23 shows all five options presented meet the established landside goals and address objections as they relate to public parking but with different areas of emphasis. Ultimately, the recommended alternative was selected based on its compatibility with the preferred Rental Car Facilities alternative.

Figure 4-23: Parking Evaluation Criteria Matrix

Evaluation Criteria	Alternatives					RECOMMENDED ALTERNATIVE
	A 4 th Level Addition	B South Addition	C North Addition	D Expanded North Add.	E Lot near Air Cargo	
Addresses Forecast Demand	●	+	◐	+	+	
Provides Flexibility in Design	◐	●	◐	●	+	
Improves Passenger Experiences	+	●	●	○	●	
Facilitates Efficiency / Operational Performance	+	●	●	◐	●	
Reasonable Constructability and Implementation	◐	◐	●	○	●	
Relies On or Limits Other Design Alternatives	●	●	●	●	○	
Preliminary Estimated Cost	\$\$\$	\$\$\$	\$\$	\$\$\$\$	\$	
Financial Impact / Optimizes Economic Return	●	◐	●	○	●	

LEGEND ○ Less than Desirable ◐ Moderate ● Good + Best

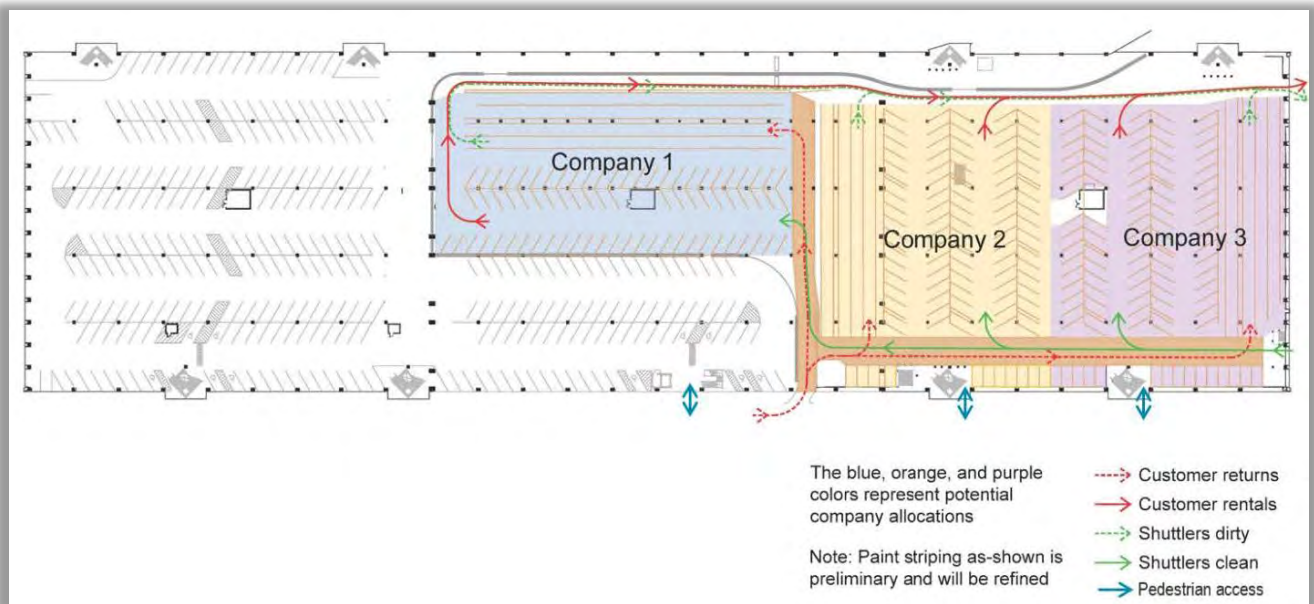


Rental Car Facilities

Facility Requirement: Capacity and Modernization

Analysis of the rental car facilities revealed an immediate need for additional rental car ready/return capacity. As such, a separate study, completed in 2017, identified a preferred short-term solution to improve the overall efficiency of the current rental car facilities on level 1 of the parking structure. As **Figure 4-24** illustrates, this recommended layout allocates the existing return area to one rental car company and the existing ready area to two rental car companies. By providing company specific ready/return areas, companies can flex between rental ready and rental return space as needed, independent of the needs of other rental car companies. The study further confirms that, because this is a short-term solution that does not fully resolve the rental/ready capacity issue, the development of further long-term alternatives is warranted. The recommended layout for temporary improvements is compatible with all the proposed landside alternatives.

Figure 4-24: Recommended Temporary Rental Car Ready/Return Layout



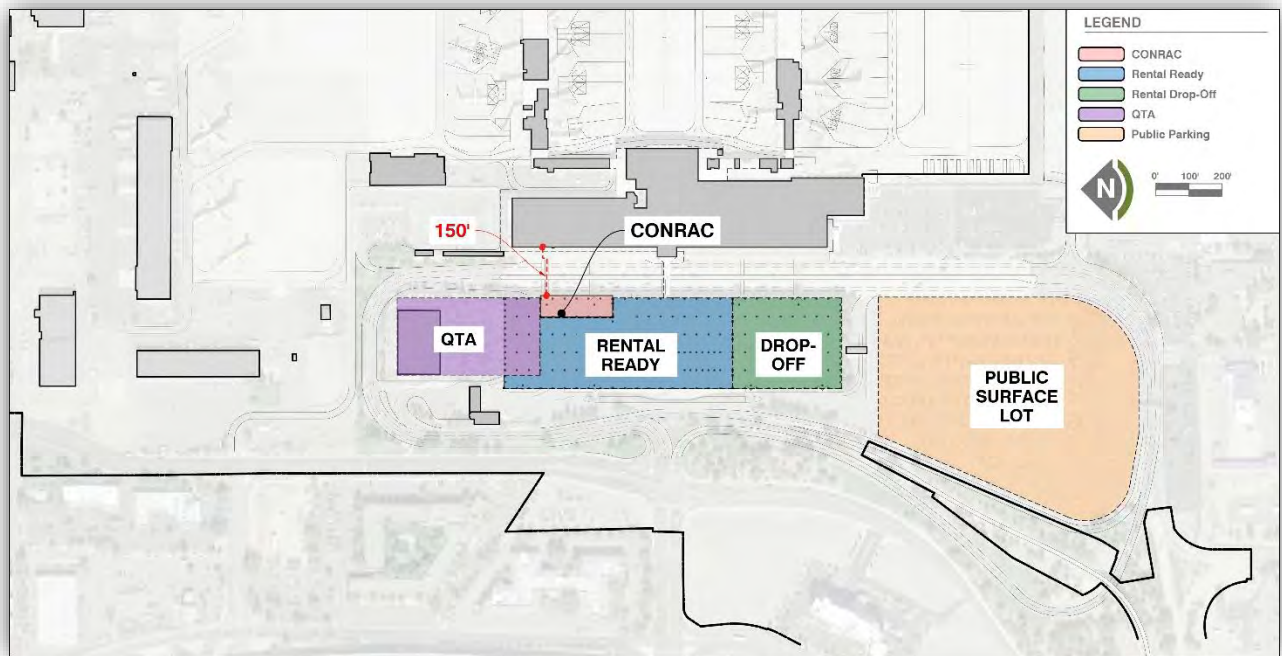
Source: InterVISTAS, *Rental Car Facility Optimization*, December 2017, Figure 34: Preferred Rental Car Facility Layout

Rental Car Alternatives

Rental Car Alternative A

With rental car activities already occupying a significant portion of level 1 of the existing parking structure, Alternative A (**Figure 4-25**) proposes that level 1 in its entirety be dedicated to rental car activities. Rental ready and return functions can be located based on departing and arriving passenger needs, which means the rental ready area would be on the north end of the garage near the baggage claim with the rental return area near ticketing. Rental car offices can be relocated from within the terminal building to the parking structure to consolidate the car rental experience. The QTA facility would be expanded into the parking structure to accommodate forecasted demand. This alternative requires limited physical development but limits future growth of rental car demand to the footprint of the parking structure and the area immediately to the north. In addition, the existing level 1 short-term parking would need to be relocated elsewhere.

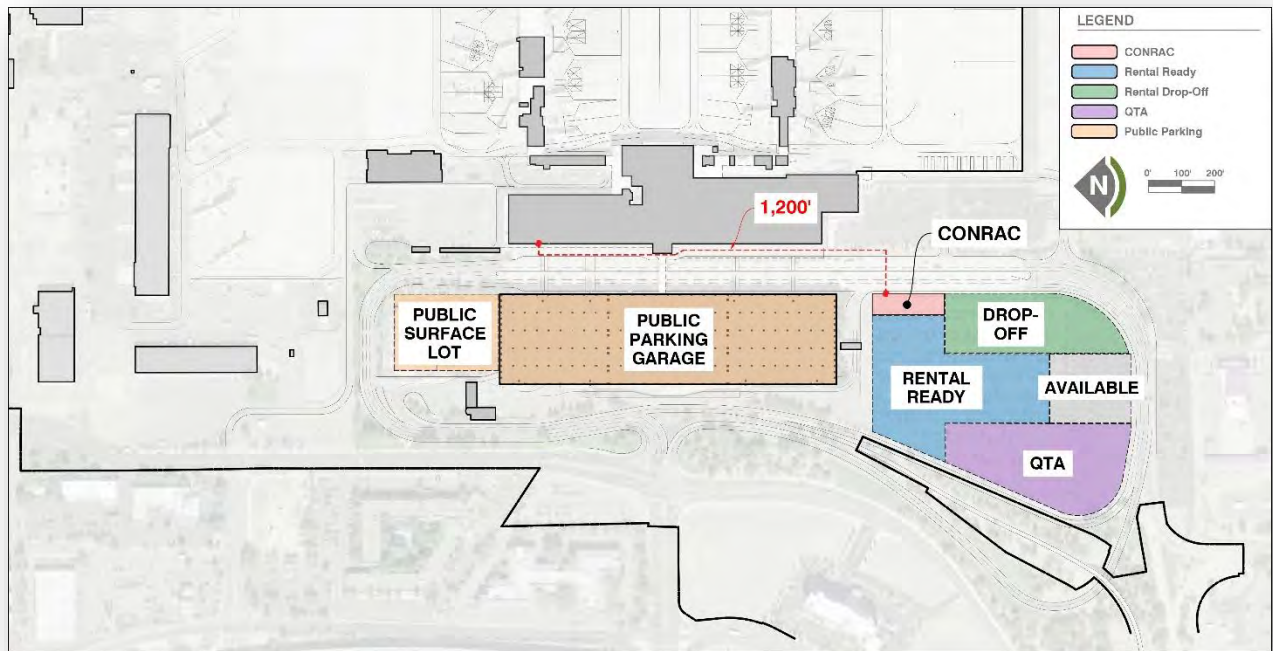
Figure 4-25: Rental Car Alternative A



Rental Car Alternative B

Alternative B (Figure 4-26) proposes a CONRAC in the existing surface lot south of the parking structure. The remainder of level 1 within the parking structure would return to public parking. This alternative consolidates landside activities and provides proximity for departing passengers but displaces the long-term surface parking product entirely and extends the travel distance for arriving passengers to reach the CONRAC.

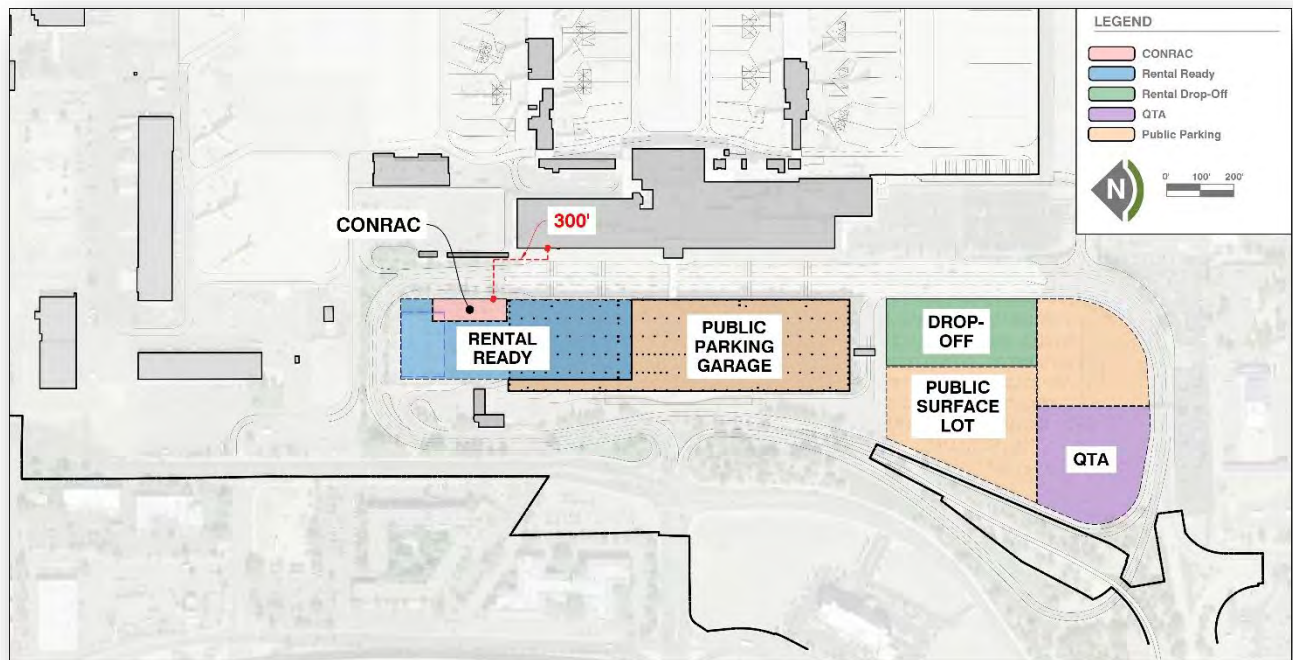
Figure 4-26: Rental Car Alternative B



Rental Car Alternative C

Alternative C (**Figure 4-27**) proposes splitting rental car operations so that the rental ready and return functions are both very close to their respective airport function. This alternative also allows public parking to remain close to the terminal but reduces the long-term surface parking product to the south. This alternative does provide good customer service but also compromises rental car operations by splitting their staff into two separate locations and introduces unnecessary vehicular traffic onto the terminal roadway system.

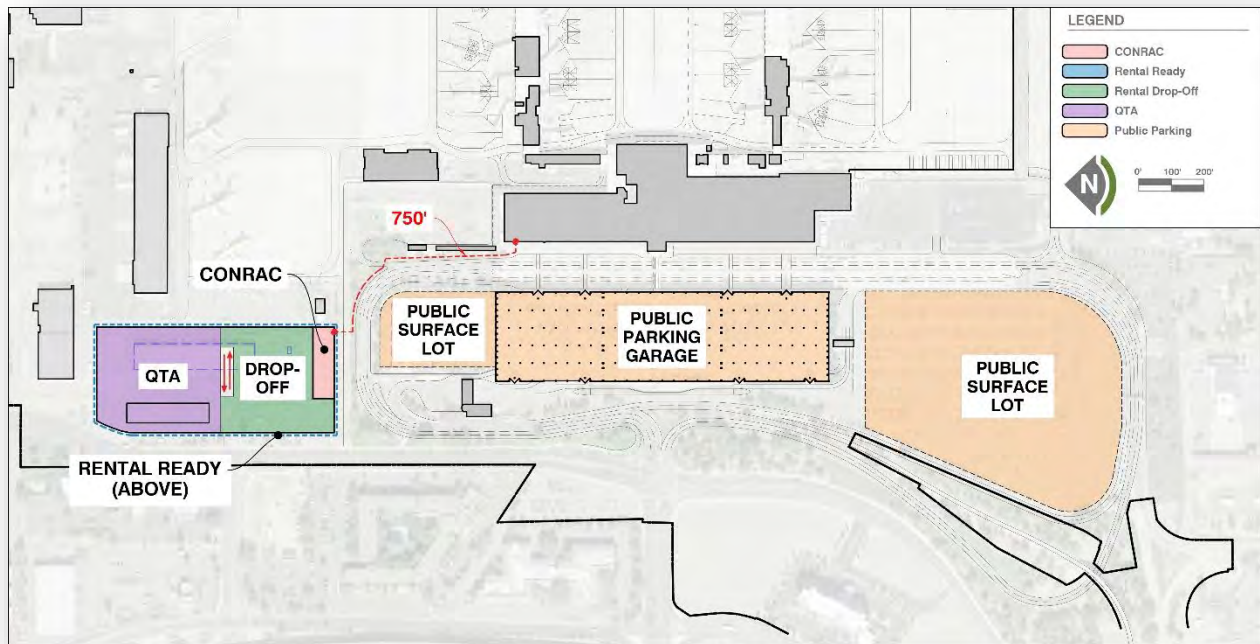
Figure 4-27: Rental Car Alternative C



Rental Car Alternative D

Alternative D (**Figure 4-28**) completely separates the public parking and rental car facilities by proposing a CONRAC north of the terminal roadway, replacing an underused asset associated with the air cargo facility. This alternative does increase passenger travel distances but does not require the use of bussing operations necessary at many other airports. This alternative also clarifies operations between all landside functions.

Figure 4-28: Rental Car Alternative D



Evaluation Matrix and Recommendation

Figure 4-29 details that all four alternatives meet the established landside goals and addresses objections as they relate to rental car operations. The preferred alternative was selected based on its compatibility with the preferred Public Parking alternative.

Figure 4-29: Rental Car Evaluation Criteria Matrix

Evaluation Criteria	Alternatives			
	A Parking Structure	B South Surface Lot	C Split Operations	D Air Cargo
Addresses Forecast Demand	●	●	●	+
Provides Flexibility in Design	◐	●	◐	+
Improves Passenger Experiences	+	○	◐	●
Facilitates Efficiency / Operational Performance	●	+	○	+
Reasonable Constructability and Implementation	◐	+	●	+
Relies On or Limits Other Design Alternatives	○	○	○	◐
Preliminary Estimated Cost	\$	\$\$	\$\$	\$\$\$
Financial Impact / Optimizes Economic Return	◐	●	●	●

RECOMMENDED ALTERNATIVE

LEGEND ○ Less than Desirable ◐ Moderate ● Good + Best

Summary of Landside Development Alternatives

Figure 4-30 illustrates the preferred landside and terminal alternatives. Both the public parking and rental car facilities would benefit from being close to the terminal; however, feedback from RTAA senior leadership and the public recommended that public parking should take priority regarding customer travel distances and convenience. The preferred landside alternatives are shown alongside the preferred terminal concourse alternative at full build out to illustrate their ultimate compatibility.

The preferred combination of public parking and rental car alternatives allows for flexible and phased development. By separating the public parking and rental car activities, the existing space currently occupied by rental car activities within the parking structure can be allocated to additional public parking immediately after the rental car facilities are relocated, increasing public parking capacity without any further development. The preferred alternative solves the immediate parking and rental car needs while allowing time for an informed decision to be made regarding the investment associated with an expanded parking structure. During this time the forecasted demand should be reevaluated to determine how TNC and autonomous vehicle use may impact the assumptions on which this master plan is based.



A standalone rental car facility can be sized to accommodate the forecasted demand while not being constrained by definitive boundaries should further growth lead to expansion. The preferred combination of landside alternatives reduces the burden placed by vehicles on the terminal roadway system and promotes a more intuitive separation of functions. Intuitive passenger flow further supports the recommendation of maintaining direct vehicle airport access to and from Interstate 580.

The preferred terminal concourse alternative, along with previous master planning efforts, suggests potential terminal building development beyond the forecasted planning period to the north of the existing terminal building. Landside development to the north, as suggested by the preferred alternatives, would support this natural shift of the airport “center” to the north while maintaining compact development with passenger convenience remaining a top priority.



PREFERRED ALTERNATES - PHASE III

- 32 GATES
- ADG IV TAXILANES (2-WAY BETWEEN PIERS)
- RON/DEICE SPOTS ON SOUTH & NORTH
- CONCOURSE B REPLACED WITH NEW PIER
- SOUTH APRON EXTENDS TO KEEP RON/ DEICE

LEGEND

- New Structure
- New Admin Area
- QTA Area
- CONRAC Drop Off Area
- New Apron

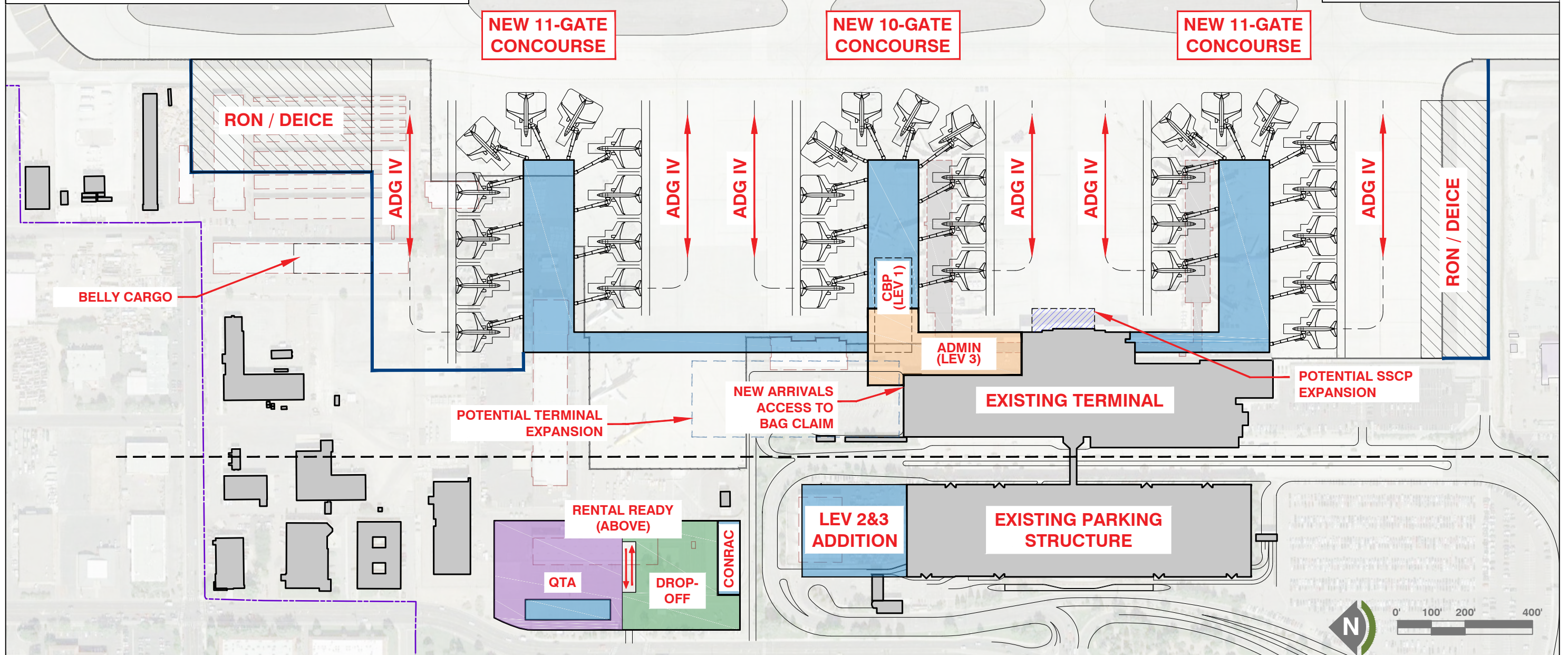


Figure 4-30
Preferred Terminal and Landside
Phase III

Support Facilities Development Alternatives

One focus of this master plan is cargo relocation to the southwest quadrant that ties to another focus, the northward terminal expansion necessary to meet existing and anticipated future demand. Existing and anticipated future demand indicates support facilities that will require upgrades including cargo facilities, aircraft storage hangars, transient aprons, and maintenance buildings. Although analysis showed that current facilities are adequate for existing and future operations, the Airport may need to implement facility expansion or relocation due to market demand or in response to operator preferences. To be ready for future expansion, the Consultant team and RTAA developed alternatives for these support facilities:

- ❖ **Cargo facilities:** Evaluate the need to expand and relocate cargo facilities to address challenges that operations currently encounter related to GSE storage, aircraft parking, and off-airport sortation.
- ❖ **GA Development:** Study locations to expand the transient apron and build additional hangars to store turboprop and jet aircraft to achieve full buildout and accommodate demand. Alternative locations should focus on the east side of the airfield and consider other GA uses on the east side such as Maintenance Rebuild and Overhaul (MRO) and fixed base operators (FBOs).
- ❖ **Airfield Maintenance Facilities:** Consider improving maintenance facilities that need updating, refurbishing, or relocation. The recommendation is to consider combining any future relocation with other existing maintenance facilities or at a new maintenance facility campus to improve efficiency between support functions.

Cargo Facilities

Facility Requirement: Capacity and Modernization

The facility requirements analysis found the existing cargo area near capacity for normal operations and over capacity during peak times. The existing cargo facilities are north of the CBP building, Concourse C, and Sky Way terminal access loop. Future expansion of the current cargo area is constrained and limits terminal expansion. The need for additional land dedicated to cargo plus north terminal expansion will necessitate the need to relocate cargo operations.

Cargo Goals and Objectives

Based on the facilities requirements analysis, the Consultant team and RTAA established these goals and objectives regarding the cargo area alternatives. These became prerequisites for each of the alternatives developed:

- ❖ Provide airside access to Runway 16R/34L;
- ❖ Make space available for passenger terminal expansion;
- ❖ Improve landside access and especially access to Interstate 580; and
- ❖ Meet the high growth forecast and allow for a fourth entrant into cargo market.



A wide expanse of area dedicated to cargo facilities is needed for efficient operations. As identified in the GA section later in this chapter, the Brookside area is a greenfield site but does not offer adequate space for required cargo facility build out and an additional market entrant. The Brookside area is better suited for hangar development. The southeast quadrant does not offer sufficient land for cargo requirements and presents access issues. The southwest quadrant provides a greenfield site that offers area needed for cargo requirements and provides access to the primary runway and roadway system.

Considerations

The Consultant team and RTAA based considerations to relocate cargo on meeting the goals above, plus several design drivers. The design drivers guided the process of developing the conceptual layouts for cargo facilities as described below.

Access to Airside Facilities and Runway 16R/34L

The Southwest quadrant location provides access to Taxiways A and B and the primary runway. Cargo operators typically use Runway 16R/34L. Locating cargo facilities on the east side of the airport would require cargo aircraft to cross Runway 16L/34R, diminishing operational efficiency.

The southwest quadrant will also separate cargo operations from commercial terminal operations. The cargo apron is located directly north of the terminal apron. During peak cargo operations, the terminal apron and Taxiway A and Taxiway B in front of the terminal apron can become congested with cargo and commercial passenger aircraft.

Terminal Expansion

Development of cargo in the southwest quadrant frees up land north of the passenger terminal for expansion. Preferred terminal alternatives show a northward expansion and require the relocation of the cargo apron and buildings.

Landside and I-580 Access

The facility requirements analysis highlighted a deficiency in the existing cargo area. This deficiency results from cargo truck congestion on the access road, Air Cargo Way, and public streets, including Vassar Street and Telegraph Road, which trucks use to access I-580 via Mill Street and Terminal Way. Vassar and Telegraph are narrow and used by other businesses and facilities related to the airport. Input from operators found these streets congested during peak operating times.

Cargo layouts on the SW quadrant would provide greater area dedicated to landside access. Airway Drive is a limited access arterial roadway with the ability to support one or two dedicated access points to cargo facilities. The distance between Airway Drive and Taxiway A allows for sufficient space for landside and warehouse facilities. Adequate room exists within this area for an internal road to support circulation between Airway Drive and cargo facilities.



Constructed in 2006, Airway Drive consists of a four-lane divided roadway with two major intersections. Airway Drive is a high volume, limited access, major arterial road classified as an expressway by the RTC. RTC serves as the Metropolitan Planning Organization and builds the regional roadway network in the metropolitan areas of Reno, Sparks, and the unincorporated areas of Washoe County.

RTC planned the 2006 construction of Airway Drive in coordination with the widening of Moana Lane and the construction of a Diverging Diamond Interchange at Moana Lane and I-580. RTC implemented these three projects to facilitate transportation from the southeast portion of Truckee Meadows. Traffic modeling at that time included relocation and expansion of RNO's air cargo facilities.

High Growth Forecast and Fourth Entrant

Table 4-1 details facility requirements and the high forecasts for cargo facilities. The Consultant team based cargo requirements on forecasts for cargo operations and total freight moved over the 20-year planning period. As noted in the **Chapter 3**, cargo operations fell into four categories: airside, GSE, warehouse, and landside. These four categories guided the conceptual design for the initial footprint for cargo operations on the southwest quadrant. To develop alternatives, the team used the base forecast for cargo operations in 2036, reserving an area within the southwest quadrant to satisfy cargo operations based on the high forecast scenario.

Warehouse facilities are the office and ancillary buildings where cargo is stored and separated. Landside refers to the area trucks use to maneuver, load, and unload; automobile parking; and access roads for circulation. The airside ramp is where aircraft maneuver and offload. GSE is the area dedicated to storing equipment dedicated to moving aircraft and cargo, such as tugs, dollies, container loaders, stairs, and ground power units. These items are typically stored on the apron; therefore, the airside and GSE requirements are combined in the cargo alternative graphics below.

Table 4-1: Summary Cargo Facilities Capacity Demand (Square Feet) for Forecast Period

	Existing	Requirement		
		2036	High Forecast	Difference ²
Warehouse	68,562	79,047	91,656	12,609
Landside Parking ¹	164,000	142,284	164,981	22,697
Airside Ramp Parking ¹	483,100	329,600	382,336	52,736
GSE ¹	151,000	214,919	249,306	34,387
TOTAL (SF)	866,662	765,850	888,279	122,429
TOTAL (Acres)	19.9	17.6	20.4	2.8

Source: Webber Air Cargo, Inc.

1. Existing apron, landside, and GSE area totals from RNO GIS line work.

2. Difference between high forecast and 2036 facility requirement.

SF = Square feet

While the current cargo area meets facility requirements for the apron and warehouse area, its configuration is not ideal for efficient operations, and cargo facilities become congested during peak month activity (December). The confined space makes the addition of another cargo operator likely not possible. The proposed alternatives show cargo facilities for the high forecast plus a fourth entrant into the market.



Cargo Alternatives

Prior to the development of the cargo alternatives presented in the Master Plan, the Consultant team developed conceptual alternatives and studied them with the established goals and objectives in mind. The alternatives described here meet the established goals and objectives. The primary difference in conceptual layout between these two alternatives is the linear alignment of either north-south or east-west.

Cargo Alternative A

Alternative A (**Figure 4-32**), shows the maximum build out for cargo on a north-south linear alignment parallel to Taxiway A. Figure 4-32 shows the space requirements for apron/GSE, warehouse, and landside cargo facilities for the high forecast and for another possible cargo provider entering the market.

Alternative A:

- ❖ Allows for north-south expansion of warehouse and landside facilities; and
- ❖ Shows the need for a wide expanse of pavement to connect the cargo apron to Taxiway A.

There are two options for this conceptual configuration:

- ❖ The warehouse and landside may be setback farther from Taxiway A for reconfiguration of the apron/GSE area; and
- ❖ A taxilane parallel to Taxiway A could be constructed that would allow maneuvering on the cargo apron and avoid pushbacks directly on to Taxiway A.

Cargo Alternative B

Cargo Alternative B, detailed in **Figure 4-33**, shows a proposed cargo layout aligned east-west, perpendicular to Taxiway A. The figure also shows the facility requirement for cargo, plus facilities for the high forecast and a fourth cargo provider. Alternative B:

- ❖ Allows for north-south expansion of warehouse and landside facilities;
- ❖ Indicates that east-west wings do not require as much pavement as Alternative A to connect to Taxiway A; and
- ❖ Offers better airfield access to auxiliary cargo development areas (west of proposed development).



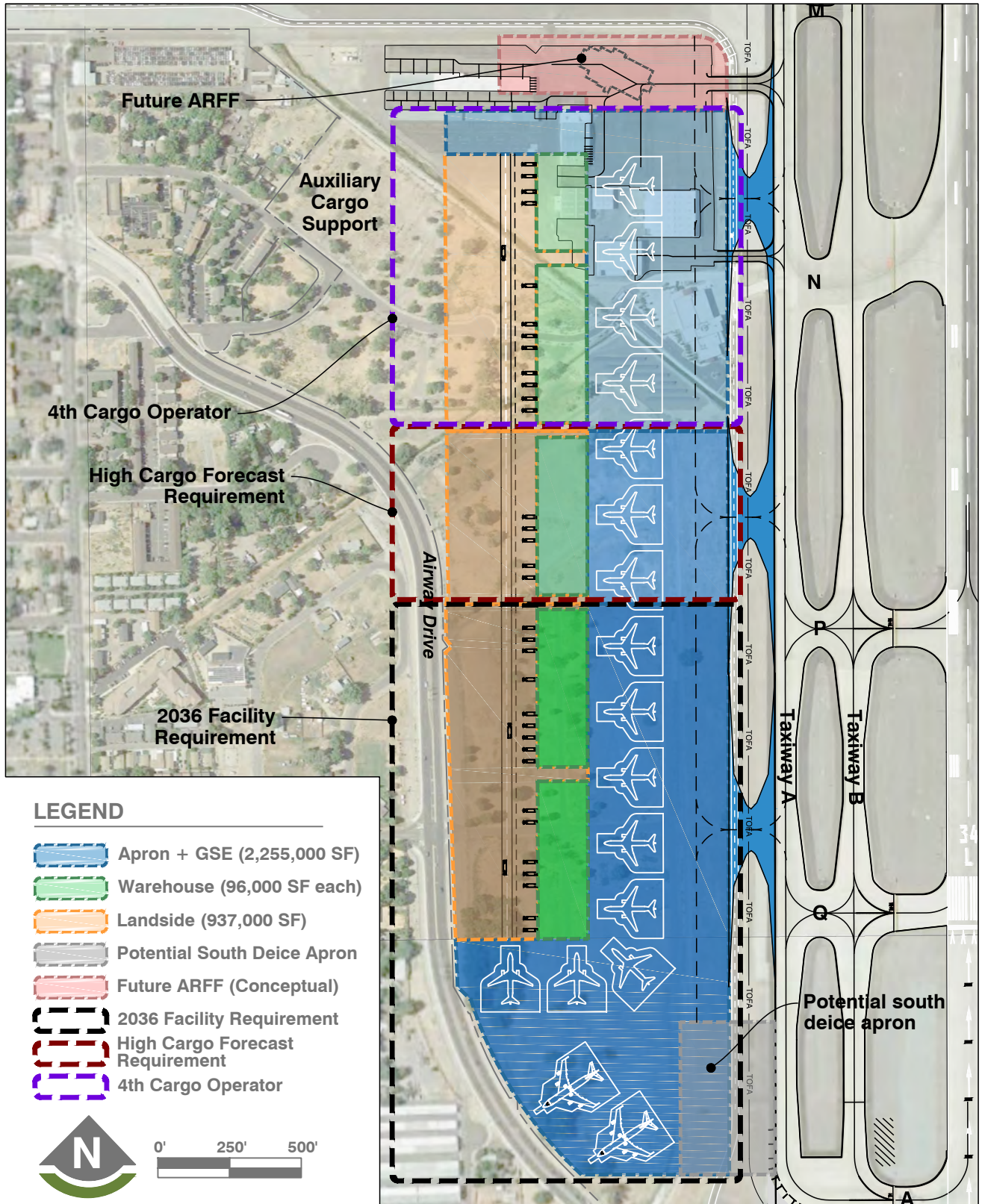


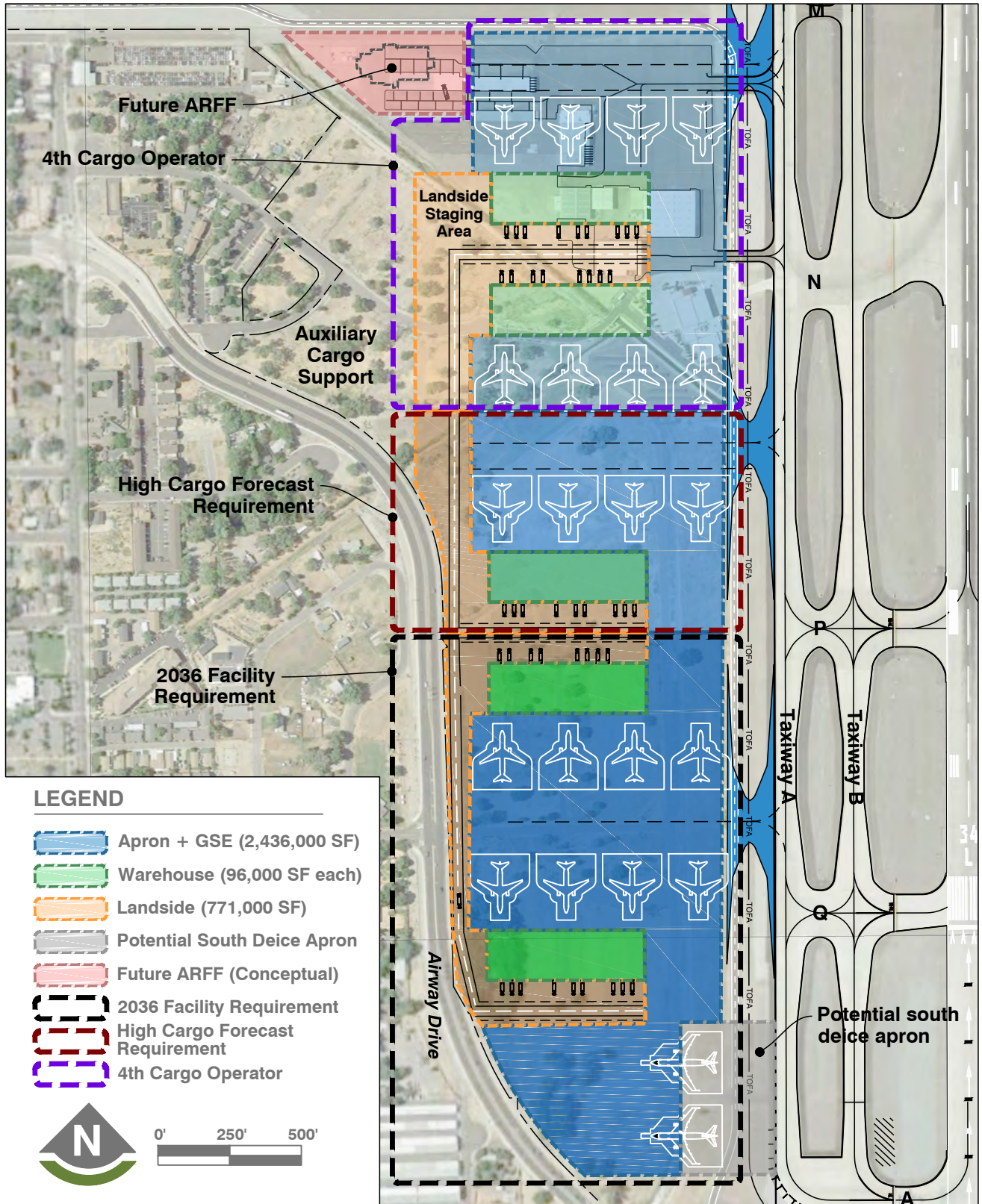
Figure 4-32

**Air Cargo Development
Alternative A**



Reno-Tahoe
INTERNATIONAL AIRPORT MASTER PLAN





Cargo Matrix Evaluation and Recommendation

Figure 4-34 shows Alternatives A and B share some design strengths. Both layouts address forecast demand; however, it is expected that the final cargo layout likely will be dictated by developer preferences and market forces. Both alternatives also facilitate safety and security, address land use planning and environmental considerations, present little difference in preliminary cost estimates, and deliver the same level of financial impacts to make the most of the economic return. Alternative A does present a few advantages over Alternative B:

- ❖ Alternative A locates cargo buildings parallel to Taxiway A with a wide apron and parallel taxilane. This location allows for better operational flow, as opposed to Alternative B, which could make aircraft congestion more likely inside each taxilane wing due to cargo flights arriving and departing at the same time.
- ❖ The linear north-south layout of Alternative A may act as a potential noise barrier on land use to the west.
- ❖ Alternative A offers greater flexibility in design and phasing. If the appropriate setbacks from the taxiways are followed, a building may be added today, and future buildings may be added to the north or south of the first building along the same flight line.

Figure 4-34: Cargo Evaluation Criteria Matrix

Evaluation Criteria	Alternatives	
	A	B
Addresses Forecast Demand	+	+
Provides Flexibility in Design	●	◐
Facilitates Safety and Security	●	●
Facilitates Efficiency / Operational Performance	●	◐
Reasonable Constructability and Implementation	+	●
Addresses Land Use Planning and Environmental Considerations	●	●
Preliminary Estimated Cost	Negligible Difference	
Financial Impact / Optimizes Economic Return	●	●

LEGEND ○ Less than Desirable ◐ Moderate ● Good + Best

**RECOMMENDED
ALTERNATIVE**



General Aviation

Facility Requirement: Capacity and Modernization

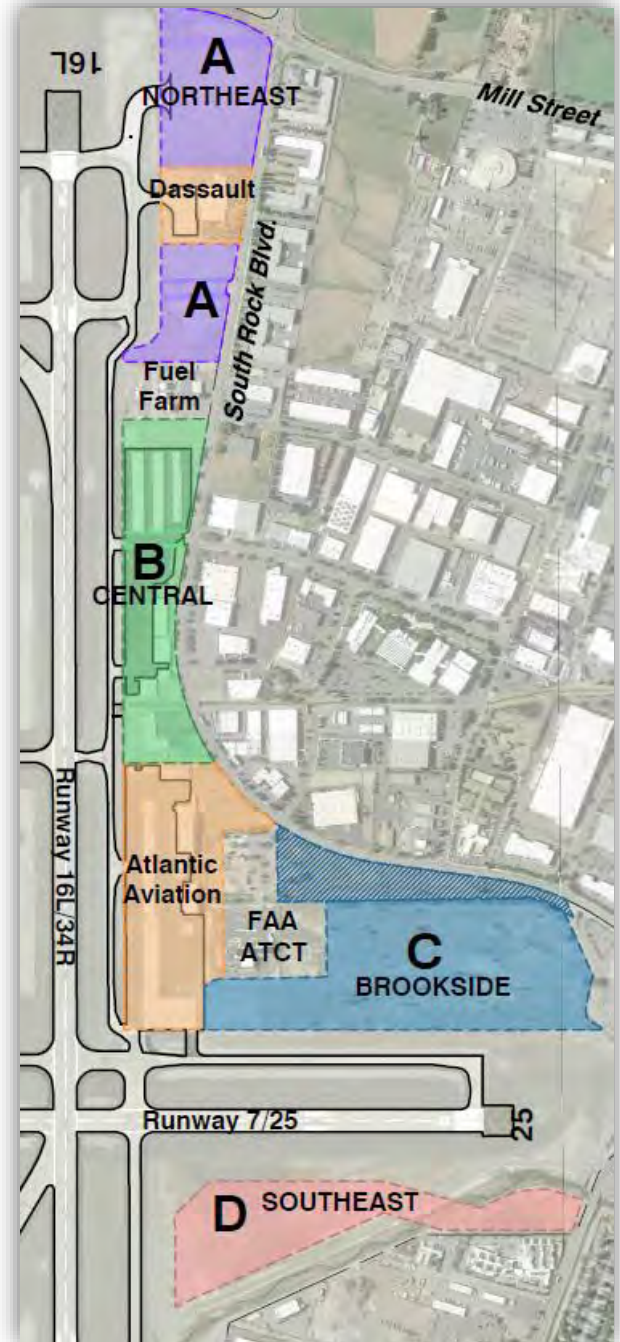
General Aviation Land Use

The initial planning for GA development focused on satisfying future hangar demand by developing a parcel of vacant land owned by the RTAA. This parcel is referred to as the Brookside area and is located immediately east of the ATCT. Planning for the Brookside area made two assumptions. First, the Brookside area will incorporate the planned relocation of GA West, an area of T-Hangars located west of Runway 16R-34L and immediately south of RW 7-25. Second, the Brookside area will accommodate the additional hangar demand identified in **Chapter 3**. Initial layouts for the Brookside area demonstrate this area can meet future hangar demand and the replacement of hangars from GA West; however, retention basins are required since this area is in Critical Flood Zone 1, as defined by the City of Reno's Land Development Code.

The Consultant team presented initial layouts of the Brookside area during the Phase 2 workshop. Feedback during the workshop indicated that land use for all of GA East be analyzed for future development; especially, the central portion of GA East that includes individual hangars and small businesses. Feedback also indicated that GA East be analyzed for the development of potential MRO or FBO facilities. As a result, the Consultant team expanded the land use analysis to include the remaining parcels in the GA East area.

The land use analysis organized GA East into four areas for potential development (**Figure 4-35**): (A) Northeast, (B) Central, (C) Brookside, and (D) Southeast. Each development area includes two alternatives, one MRO/FBO alternative and one GA hangar development alternative, with a single recommendation made per area. The result of this analysis indicated that the Dassault facility, Atlantic Aviation buildings and aprons, and the FAA's ATCT facility are capable of remaining viable throughout the planning period.

Figure 4-35: GA East Land Use



Further discussion with RTAA and stakeholders helped refine the recommendations for each GA East area. Facilities such as Dassault (MRO/FBO) should be constructed in the Northeast area, which analysis results showed this to be the best option for that area. Additionally, disruption of hangar leases in the Central area in the short- and intermediate-term to establish another use in this area was determined to likely be cost prohibitive. If determined to be necessary in the long-term, demand for these facilities can be met in the Northeast or Southeast areas.

Feedback also led to a determination that the Brookside area is best suited for immediate hangar development since it is adjacent to the transient apron at Atlantic Aviation which may provide services. The Southeast area is likely the last area of GA East to be developed due to accessibility and environmental factors but could serve as a viable area for a second FBO. A summary of the four recommendations is included at the end of the overall GA development section.

General Aviation Goals and Objectives

These are the goals and objectives for GA development:

- ❖ Consolidate GA facilities to the east side;
- ❖ Separate GA from commercial operations for safety; and
- ❖ Make space available for cargo expansion at the southwest quadrant.

Considerations

Consolidate facilities

Existing hangars on GA West were rated below average structures in the FCA. New hangar construction will modernize the hangar inventory at RNO. This construction would take place east of the existing structures in support of the goals and objectives.

Separating Operations

Locating all GA activity to the east side allows GA aircraft to use Runway 16L/34R primarily while commercial and cargo operators use Runway 16R/34L. Fuel trucks can easily reach transient and based GA aircraft on GA East instead of traveling around the perimeter roads to fuel these aircraft on GA West. Separating GA and commercial operations is important to establish airfield safety and operational efficiency. Larger commercial aircraft have higher approach speeds that create larger amounts of wake turbulence. Smaller GA aircraft must maintain longer separation distances before and after commercial aircraft arrivals and departures to maintain a safe distance.



Hangar Forecast

The aviation forecasts show moderate growth for based aircraft at RNO over the next 20 years. The future based aircraft fleet mix is predicted to shift away from being predominately single-engine propeller aircraft to include more turboprops and small business jets. Facility requirements for future apron and hangar space are shown in **Table 4-2**, with specific hangar forecasts in **Table 4-3** and **Table 4-4**.

Table 4-2: Facility Requirements for Hangar and Transient Apron Space – 2036

GA Facility	Existing	2036 Requirement
Transient Apron	117,000 SF	141,600 SF
T-Hangars or Small Box Hangars	267,900 SF	357,200 SF
Large Hangars	0 SF	437,500 SF
GA East Rows D1, D2 and F	150,400 SF	(220,000 SF)
TOTAL Requirement (not including GA East Rows D1, D2 and F)	535,300 SF	716,300 SF
Source: Facility Requirements Chapter SF = Square feet		

Table 4-3: 2036 T-Hangars Inventory and Forecast

	Existing	2036	Change
T-Hangar Units (East)	57	89	+32
T-Hangars Units (West)	32*	0	-32
*Only 23 T-Hangars occupied			

Table 4-4: 2036 Box Hangars Inventory and Forecast

	Existing	2036	Change
Small Box Hangars (East)	0	20	+20
Large Box Hangars (East)	6	30	+24



Northeast Alternatives

The Northeast parcels A1 and A2 near the existing Dassault Facility can support a future expansion of the

Dassault operations or a separate new MRO facility. The Northeast Alternative A1 recommends the parcels be used for MRO development, either expansion of Dassault, a new MRO operator, or a combination of both. Alternative A1 also provides good landside access and can accommodate larger aircraft than the Central area alternatives. Northeast Alternative A2 is recommended for development of additional GA hangars. **Figure 4-36** depicts the Northeast Area.

Figure 4-36: GA East – Northeast

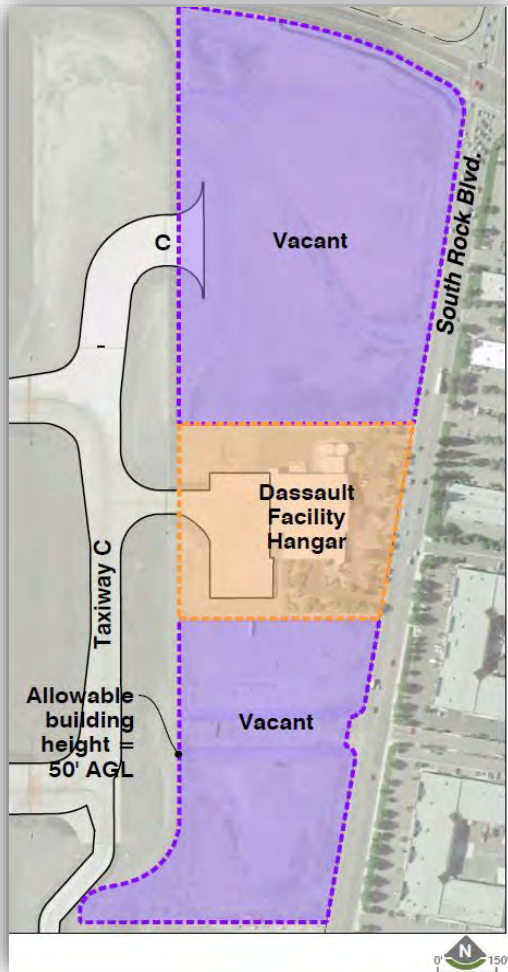


Figure 4-37: GA NE Evaluation Criteria Matrix

Evaluation Criteria	Alternatives	
	A1 – MRO Expansion	A2 - GA Hangar Devlp.
Addresses Forecast Demand	●	●
Provides Flexibility in Design	●	◐
Facilitates Safety and Security	◐	◐
Facilitates Efficiency / Operational Performance	●	◐
Reasonable Constructability and Implementation	⊕	●
Addresses Land Use Planning and Environmental Considerations	⊕	●
Preliminary Estimated Cost	Negligible Difference	
Financial Impact / Optimizes Economic Return	●	◐

RECOMMENDED ALTERNATIVE

LEGEND ○ Less than Desirable ◐ Moderate ● Good ⊕ Best

Northeast GA Evaluation Matrix and Recommendation

Alternatives A1 and A2 meet forecast demand and are cost effective based on preliminary cost estimates. A1 and A2 ranked moderate for meeting safety and security needs. As shown in **Figure 4-37**, Alternative A1 is the recommended alternative for Northeast development for these reasons:

- ❖ A1 rated best compared to A2 for constructability and implementation, and for land use planning and environmental considerations.
- ❖ A1 has the advantage for flexibility in design, facilitating efficiency/operational performance, and has favorable financial impacts.
- ❖ Other developments are closer to FBO facilities and therefore better suited to support GA hangar development.



Central GA Alternatives

Of the four areas being considered for GA development, the Central area provides the best landside access for both MRO/FBO development and GA hangar development. **Figure 4-38** provides an illustration of the Central area. However, the depth of the site is a constraint for commercial use of the parcel.

Central GA Matrix Evaluation and Recommendation

Alternative B1 proposes to redevelop the area as an MRO or FBO, which is attractive because it offers better street access and is in the center of the airfield. However, this type of development would require the relocation of the 63 hangars that currently occupy the space for individual and small business aircraft storage. That means that the existing leases would need to be resolved prior to development occurring. This

could be cost-prohibitive and time-consuming. Another challenge is that the existing parcel depth prevents larger aircraft from using Taxiway C. This would make it difficult to support a fully functioning FBO. Without breaking existing leases, implementing B1 requires

postponing development until after the leases expire.

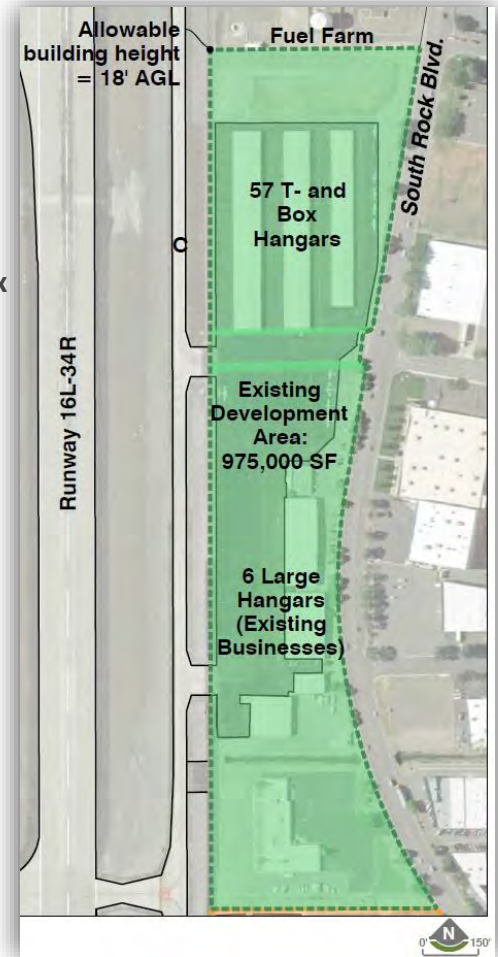
Figure 4-39: GA Central Evaluation Criteria Matrix

Evaluation Criteria	Alternatives	
	B1- MRO / FBO	B2- Existing Cond.
Addresses Forecast Demand	◐	●
Provides Flexibility in Design	●	◐
Facilitates Safety and Security	◐	●
Facilitates Efficiency / Operational Performance	◐	●
Reasonable Constructability and Implementation	●	+
Addresses Land Use Planning and Environmental Considerations	◐	●
Preliminary Estimated Cost	\$\$\$	--
Financial Impact / Optimizes Economic Return	◐	●

LEGEND ○ Less than Desirable ◐ Moderate ● Good + Best

**RECOMMENDED
ALTERNATIVE**

Figure 4-38: GA East – Central



Alternative B2 maintains the existing 63 hangars, which are needed to meet forecast demand. This option offers the benefit of negligible cost (the hangars are already in place) and requires no additional construction. Using hangars in place also means no changes to land use and no additional environmental considerations. However, the existing hangars are aging and may eventually need to be replaced. Current pavement condition is fair to below average. With hangars remaining in place, it is recommended that pavement be reconditioned, as necessary.



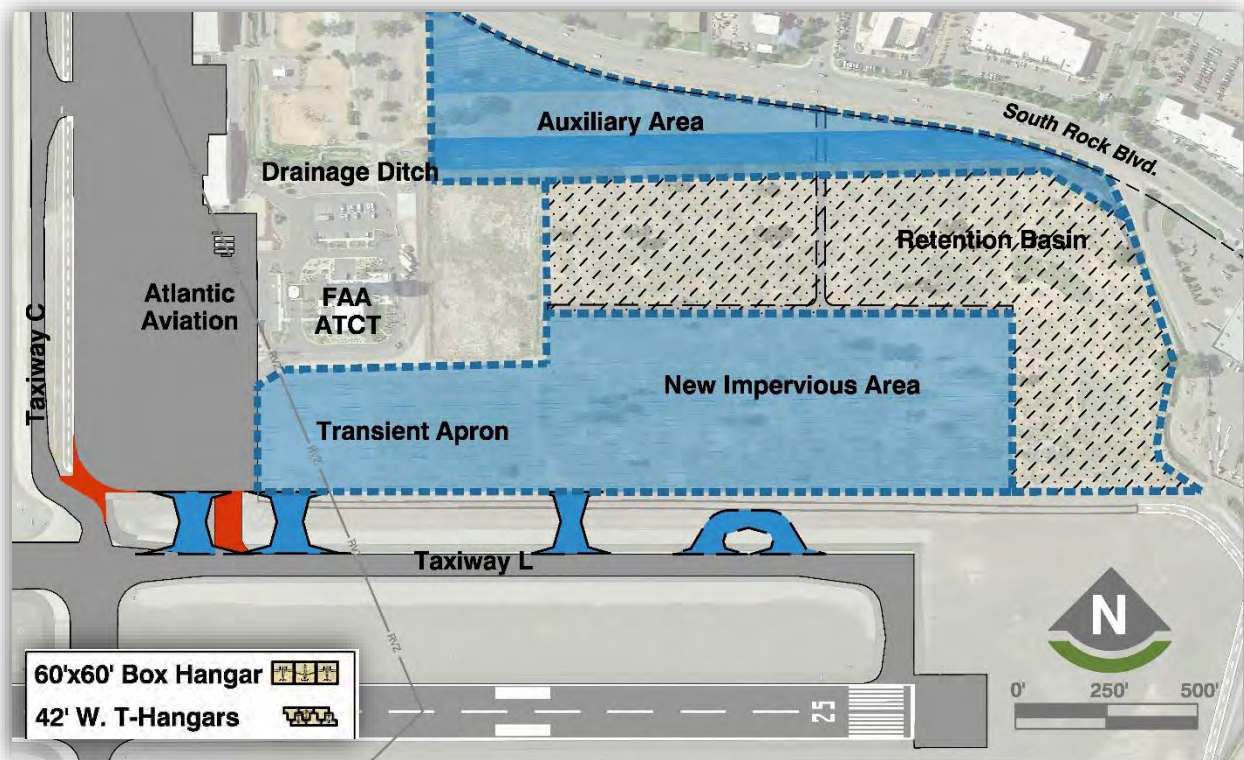
Although B1 offers flexibility in design, Alternative B2 is recommended for these reasons:

- ❖ B2 makes use of hangars already in place, which means no additional construction and negligible cost.
- ❖ The existing 63 hangars help to address forecast demand, facilitate safety and security, maintain efficiency/operations, and represent little or no changes in land use and environmental concerns and financial impacts.

Brookside GA Alternatives

Formerly a golf course, the Brookside area is a large undeveloped parcel bound by Taxiway L to the south, Southside drainage ditch (East Branch) to the north and east, the ATCT, and Atlantic Aviation to the west. Brookside is well-positioned for GA hangar development because the existing Atlantic apron could be expanded to provide direct access for new hangars. The Brookside area is approximately 1.7 million square feet. Brookside is in Critical Flood Zone 1 and requires a 1:1 ratio of retention basin to new impervious area. As a result, the actual area available for GA development is approximately 840,000 square feet. The Brookside area is shown in **Figure 4-40**.

Figure 4-40: GA East – Brookside



Two alternatives were identified for the Brookside area: Alternative C1 proposes development for hangars and apron, and Alternative C2 proposes development for an MRO or FBO facility. Alternatives C1 and C2 require a culvert over the East Drainage Ditch for landside access from South Rock Boulevard.

Alternative C1 assumes the full build out for GA hangars, and accommodates relocation of hangars displaced from the relocation of GA West. Alternative C1 meets the 2036 facility requirements for hangar and transient apron demand and allows hangar rows D1, D2, and F to remain on the north end of GA East. Alternative C1 also provides dual entrance taxiways for large aircraft such as the Boeing 747 and Boeing C-17 Globemaster. In addition, Alternative C1's dual entrance taxiways also correct the hot spot at the Taxiway C – Taxiway L intersection (discussed later in the airside section of this chapter).

Alternative C2 proposes FBO or MRO facilities in the Brookside area. This area is less suitable for MRO and FBO development due to visibility issues. Analysis in this section shows FBO and MRO development is better suited for other areas. The immediate need for hangar development also outweighs the need for a new FBO. The Brookside area is the largest area for greenfield development on GA East that has access to existing facilities and can be developed for immediate demand.

Brookside GA Evaluation Matrix and Recommendation

Brookside Alternatives C1 and C2 received a good rating for flexibility in design, reasonable in constructability and implementation, and financial impact and optimizes economic return. Both alternatives ranked moderate for safety and security as well as land use planning and environmental considerations. The preliminary estimated cost shows a negligible difference between the two alternatives. As shown in **Figure 4-41**, Alternative C1 is the recommended alternative for these reasons:

- ❖ Alternative C1 best addresses forecast demand compared with Alternative C2.
- ❖ The area is immediately developable, adjacent to existing development, and meets the need for hangar development.
- ❖ This alternative provides airside and landside access and complements development with the existing FBO and fuel services.
- ❖ 2036 hangar demand is achieved through additional development and the existing hangars in Central Area B.

Figure 4-41: GA Brookside Evaluation Criteria Matrix

**RECOMMENDED
ALTERNATIVE**

Evaluation Criteria	Alternatives	
	C1 - GA Hangars	C2 - MRO / FBO
Addresses Forecast Demand	+	○
Provides Flexibility in Design	●	●
Facilitates Safety and Security	○	○
Facilitates Efficiency / Operational Performance	●	○
Reasonable Constructability and Implementation	●	●
Addresses Land Use Planning and Environmental Considerations	○	○
Preliminary Estimated Cost	Negligible Difference	
Financial Impact / Optimizes Economic Return	●	●
LEGEND ○ Less than Desirable ○ Moderate ● Good + Best		

Southeast GA Alternatives

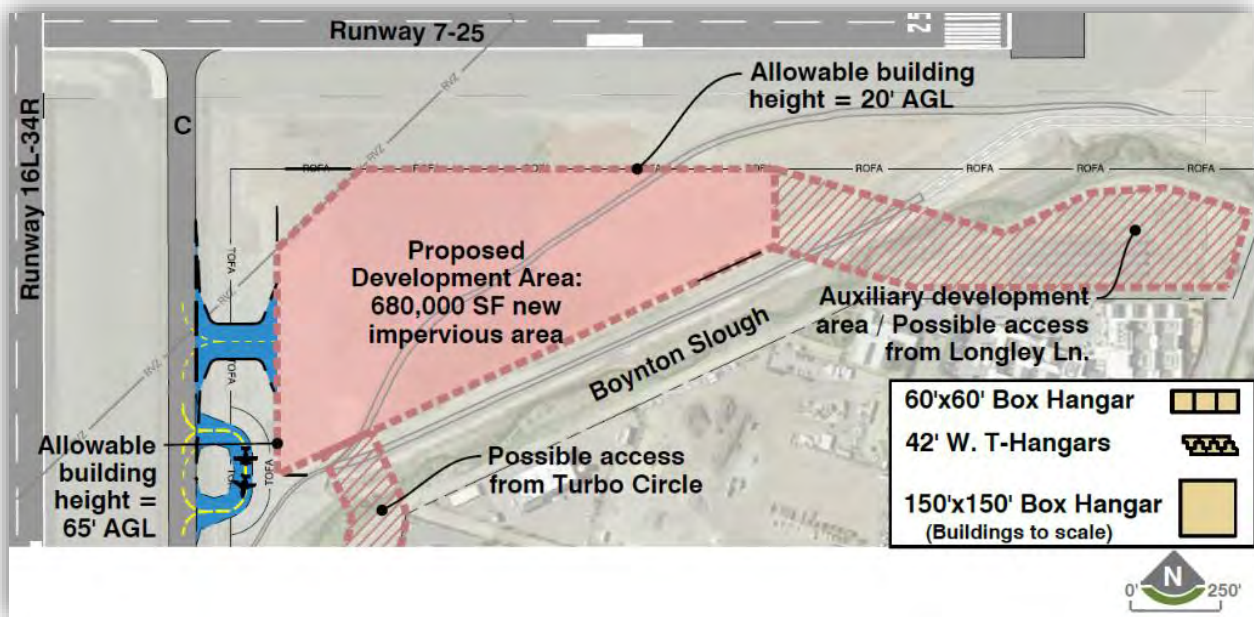
As shown in **Figure 4-42**, the Southeast GA area is in the southeast quadrant and bound by the Boynton Slough to the south and east, Runway 25 to the north, and Taxiway C to the west. The Southeast area is currently vacant and located in Flood Zone 2, which does not require a 1:1 drainage basin for new impervious surfaces. Development of the Southeast area includes two alternatives, one for new GA hangars and the supporting apron, and one for a new MRO or FBO facility.

Alternative D1 proposes future use as an auxiliary GA hangar and apron area should demand outpace the forecasts. The Southeast GA area has two challenges. It is difficult to access from the landside, and because of the layout, only a single taxiway connection can be implemented. Combined, these challenges make this site less suitable for hangar development.



Alternative D2 proposes to use the Southeast GA area for a new FBO or MRO facility. Based on analysis, this site is suitable for either of these facilities. Because GA hangar and apron development are better suited in the Northeast, Central, and Brookside areas, the Southeast GA area offers the best location for a new MRO or FBO facility because of its central location on the airfield and its visibility to potential customers. As with Alternative D1, landside access to this site would be a challenge.

Figure 4-42: GA East – Southeast



Southeast GA Evaluation Matrix and Recommendation

Both alternatives offer good flexibility in design. Both alternatives are moderate in terms of facilitating safety and security, efficiency and operational performance, constructability and implementation, and preliminary estimated cost. However, Alternative D2 is the recommended alternative:

- ❖ D2 presents the better option in forecast demand, land use planning/environmental, and financial impact/optimized return.

Long-term development of this Southeast GA area is less viable than the Northeast, Central, and Brookside areas previously presented. This is primarily due to challenges in providing landside access and utilities at the site. Southeast GA is better suited for long-term FBO or MRO development.

Figure 4-43: GA Southeast Evaluation Criteria Matrix

Evaluation Criteria	Alternatives	
	D1- GA Hangars	D2- MRO / FBO
Addresses Forecast Demand	●	●
Provides Flexibility in Design	●	●
Facilitates Safety and Security	●	●
Facilitates Efficiency / Operational Performance	●	●
Reasonable Constructability and Implementation	●	●
Addresses Land Use Planning and Environmental Considerations	●	●
Preliminary Estimated Cost	Negligible Difference	
Financial Impact / Optimizes Economic Return	●	●
LEGEND ○ Less than Desirable ● Moderate ● Good ⊕ Best		

RECOMMENDED ALTERNATIVE

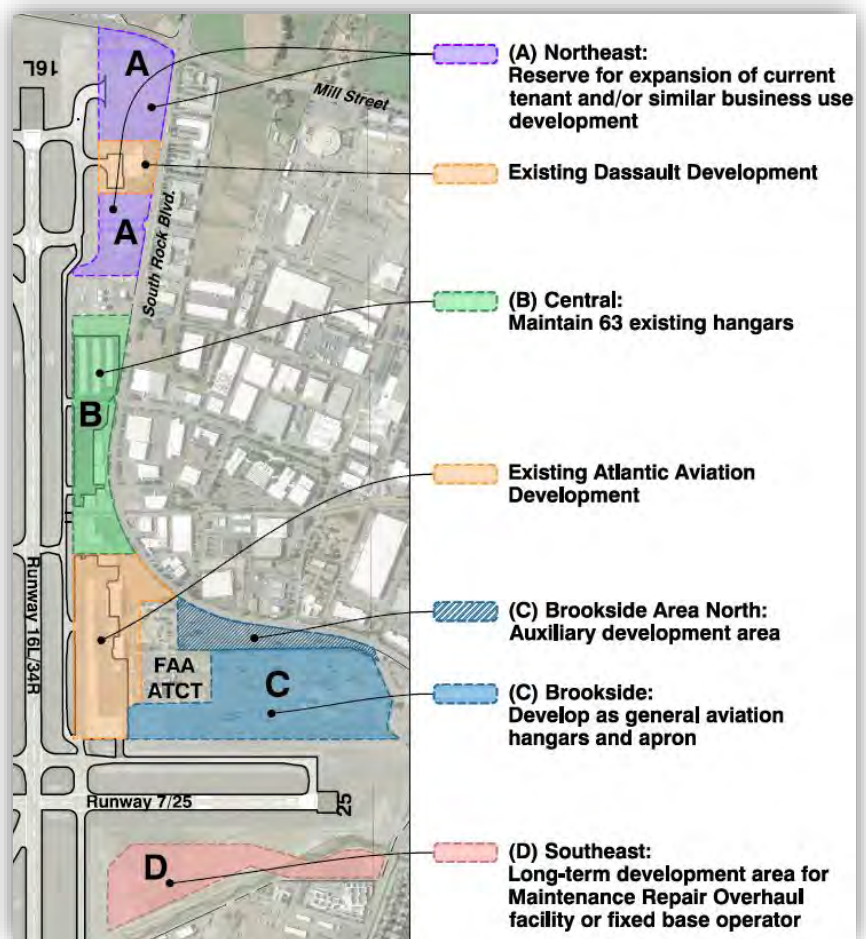


General Aviation Recommendations

Based on land use analysis, four areas hold potential for GA development: (A) Northeast, (B) Central, (C) Brookside, and (D) Southeast. The recommended alternative for each area is illustrated in **Figure 4-44** and summarized below:

- ❖ Northeast GA area: The recommendation is Alternative A1, which is to reserve this area for expansion of the current tenant and/or similar business use such as an MRO/FBO facility.
 - This alternative presented favorably for constructability and implementation and for land use planning and environmental considerations. A1 has the advantage for flexibility in design, facilitating efficiency/operational performance, and optimizing economic return.
- ❖ Central GA area: The recommendation is Alternative B2, which calls for maintaining the 63 existing hangars.
 - B2 provides the best option for constructability and implementation. The existing hangars are needed to accommodate forecast demand, facilitate safety and security, efficiency/operations, and promote land use/environmental compatibility and optimize economic return.
- ❖ Brookside GA area: The recommendation is Alternative C1 for development of GA hangars and apron area.
 - Hangar and apron development best addresses forecast demand. This area is also immediately developable and near existing GA facilities, such as the existing FBO and fuel services.
- ❖ Southeast GA area: The recommendation is Alternative D2, for long-term development of a new MRO or FBO facility.
 - This alternative ranked high for its ability to meet forecast demand, land use planning/environmental, and financial impact/optimized return.

Figure 4-44: GA Recommendations



Maintenance and Operations

Facility Requirement: Modernization

During the Phase 2 workshop, stakeholders indicated that having maintenance facilities within a centralized campus would increase efficiency among support functions. This feedback also noted that the condition of several maintenance facility buildings was below average, or the buildings were too small for their intended function. After discussing several potential locations for a centralized campus, two locations presented favorably for development, and another was eliminated.

Maintenance and Operations Goals and Objectives

These are the goals and objectives for maintenance and operations:

- ❖ Replace aging facilities within the existing campus;
- ❖ Centralize the maintenance and operations campus in the quadrant nearest terminal; and
- ❖ Center the new layout on the existing SRE facility, west electrical vault, and sand/salt storage facilities.

Considerations

Age of Facilities

As noted in **Chapter 1**, the Consultant team conducted an FCA to identify the condition of RTAA-owned facilities. RTAA selected the facilities examined and the assessment focused on structural condition, communication infrastructure, and mechanical, electrical, and plumbing (MEP) systems. A copy of the FCA is in Appendix A. Results of the FCA indicated that some of the buildings rated above-average or excellent condition; however, most of the maintenance facilities received a below-average rating for structure and MEP systems. **Table 4-5** lists the FCA ratings for maintenance facilities.

Table 4-5: FCA Maintenance & Storage Facility Ratings

Facility	Fac #	FCA Structure Rating	FCA MEP Rating
Airfield Maintenance	1012	Average	Poor
Decommissioned ATCT	1021	Below Average	Poor
Airfield Maintenance & Storage	1075	Below Average	Below Average
Airfield Maintenance & Storage	1084	Average	Average
Airfield Maintenance & Storage	1087	Poor	Average
Landscaping	1102	Below Average	Below Average
Brush Storage	1096	Poor	Average
Airport Equipment	1483	Poor	Poor
Operations/Shipping	1552	Average	Below Average

Source: Appendix A, Facility Condition Assessment
MEP: Mechanical, Electrical, and Plumbing systems



Facility Relocation

Most maintenance and support facilities at RNO are north of Taxiway L and south of the NVANG along the west side of the Airport. However, the large equipment storage building (1483) and the operation-communications-shipping and receiving building (1552) are north of existing cargo facilities. The centralization of maintenance facilities is important because many of the resources within these facilities are used by a wide variety maintenance staff and therefore it improves efficiency and helps reduce costs.

Centralized Campus

In the FCA, the sand and salt storage building (1069), the west electrical vault (1063), and the snow removal equipment building (SRE, 1039) are all relatively new or remodeled and as a result rated above-average or excellent condition. The location of these facilities and their current condition provided the starting point for the location of a centralized campus. A centralized location also provides better integration and exchange of assets by different maintenance departments.

Eliminated Alternative

A location proposed north of the existing cargo facilities provided adequate space to make development feasible; however, development in that location may inhibit terminal expansion to the north in the future. As a result, this location was eliminated from further consideration.

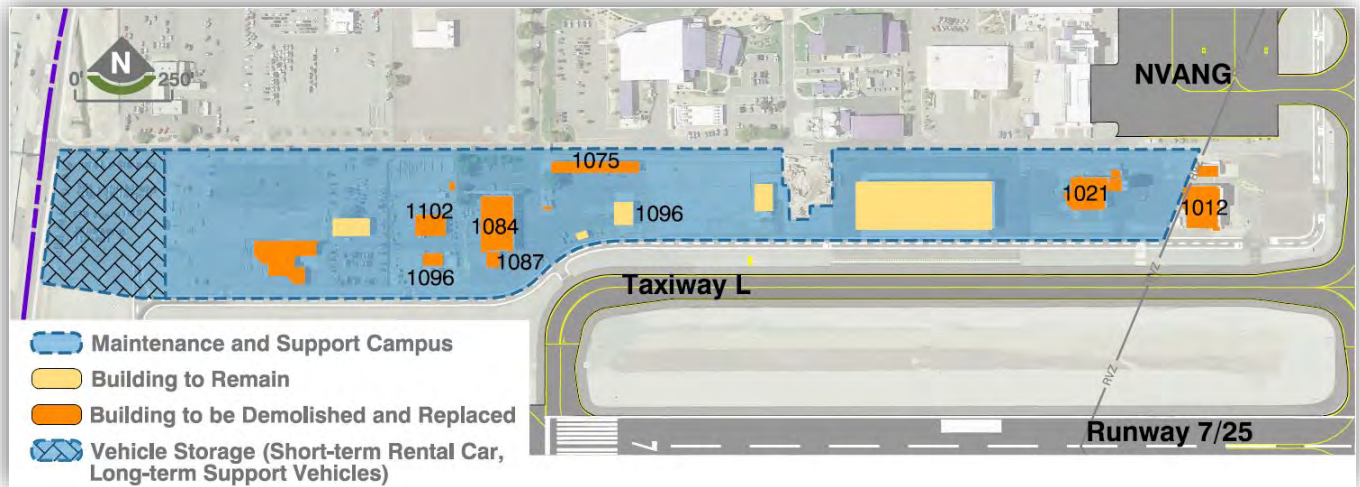
Consolidated Campus Alternative

This alternative proposes the SRE, west electrical vault, and sand/salt storage facilities anchor a consolidated maintenance and support campus (MSC) in the area south of the NVANG with expansion to the west beyond the Enterprise facility (1108). **Figure 4-45** illustrates a consolidated MSC alternative within the existing maintenance and support area, a potential expansion area to the west, and an area recommended to be abandoned because it is within the Runway Visibility Zone (RVZ). The total land area available for the MSC would accommodate the relocation of the north support facilities (1483 and 1552), which may facilitate terminal expansion to the north. North support facilities such as operations and communications may be relocated into future administration space in the expanded terminal.

A consolidated MSC in this location uses the existing facilities built within the last 10 years that are in very good condition. Centralizing operations also allows various maintenance departments to better integrate and exchange assets and allows RNO to re-position the layouts of maintenance facilities, if needed. This alternative also provides the opportunity to update facilities rated below average in the FCA in-place.

RTAA will pave the existing overflow lot and issue a new short-term lease (5 years) for rental car storage. After the lease expires, this area may be used by RTAA for employee and support vehicle storage as shown in **Figure 4-45**. Developing the MSC will displace this overflow lot and the Enterprise Car rental ready-return facility (1108). The Enterprise Car ready-return facility will be relocated to the consolidated rental facility near the terminal.



Figure 4-45: Consolidated Maintenance and Support Campus

Maintenance and Operations Recommendation

Several of the maintenance and support buildings are in very good condition and offer RTAA the opportunity to consolidate all the maintenance and operations facilities onto a single campus centered on those facilities. As a result, the recommendation is to consolidate the maintenance and support facilities on a campus south of NVANG and north of Taxiway L and to replace the maintenance and operations buildings, which are aging and in below-average or poor condition.

Aircraft Rescue and Firefighting (ARFF)

The ARFF facility is relatively new, its condition highly rated in the FCA, and the location adequate based on response times, as noted in **Chapter 3**. Analysis to identify a long-term replacement location for the ARFF was necessitated by two considerations. The facility would likely reach its useful lifespan within the 20-year period of the master plan. Second, the facility would impede full air cargo expansion in the southwest quadrant if the high growth forecast was met and if a fourth cargo carrier entered the market.

Considerations

Discussions with stakeholders indicated that the majority of ARFF calls are to the terminal building and require crossing Runway 7/25. Therefore, a location closer to the terminal may be beneficial. Additionally, when cargo expansion begins on the southwest quadrant and the consolidation of the support facility campus begins, then at least one area should be reserved for long-term ARFF relocation.

Proposed Areas for Relocation

Three areas were identified as potential sites for relocation: an east location, a west location, and a south location as described in **Figure 4-46**.

Relocation to the east would position the ARFF on the east end of the future MSC campus and south of the NVANG. This location minimizes response times to the terminal building. The east location also provides a clear view of runway intersections; however, the site's area for development is constrained by NVANG, SRE, Taxiway L, and the RVZ.

Relocation to the west would position the ARFF on the auxiliary rental car lot located at the west end of the MSC, near the intersection of Terminal Way and National Guard Way. This location requires the least amount of valuable land for development. However, the west location does not provide a view of runway intersections and increases response times from existing conditions.

Relocation to the south would position the ARFF in the GA West area at the north edge of the future cargo expansion. This location provides a clear view of runway intersections and yields good response times; however, it still requires crossing of Runway 7/25 to access the terminal building. This site also limits space for build out of the ultimate cargo area. **Table 4-6** shows the ARFF response times for each location.

The ARFF facility was not analyzed during preliminary alternatives because the building is relatively new, its condition rated highly in the FCA, and the location was deemed adequate based on response times to the runway ends noted in **Chapter 3**. Discussions with stakeholders indicated the majority of ARFF calls are to the terminal building and crossing Runway 7/25 to reach the terminal limits response time. If the cargo facilities are relocated to the southwest quadrant, that may eventually require the relocation of the ARFF. Cargo development is projected to grow over the next 20 years, by which time the existing ARFF facility, rated above average in the FCA, will be approximately 30 years old. That means the ARFF facility likely will have reached its life span at the same time a relocation is necessary for cargo expansion.

Table 4-6: Proposed ARFF Facility Response Times

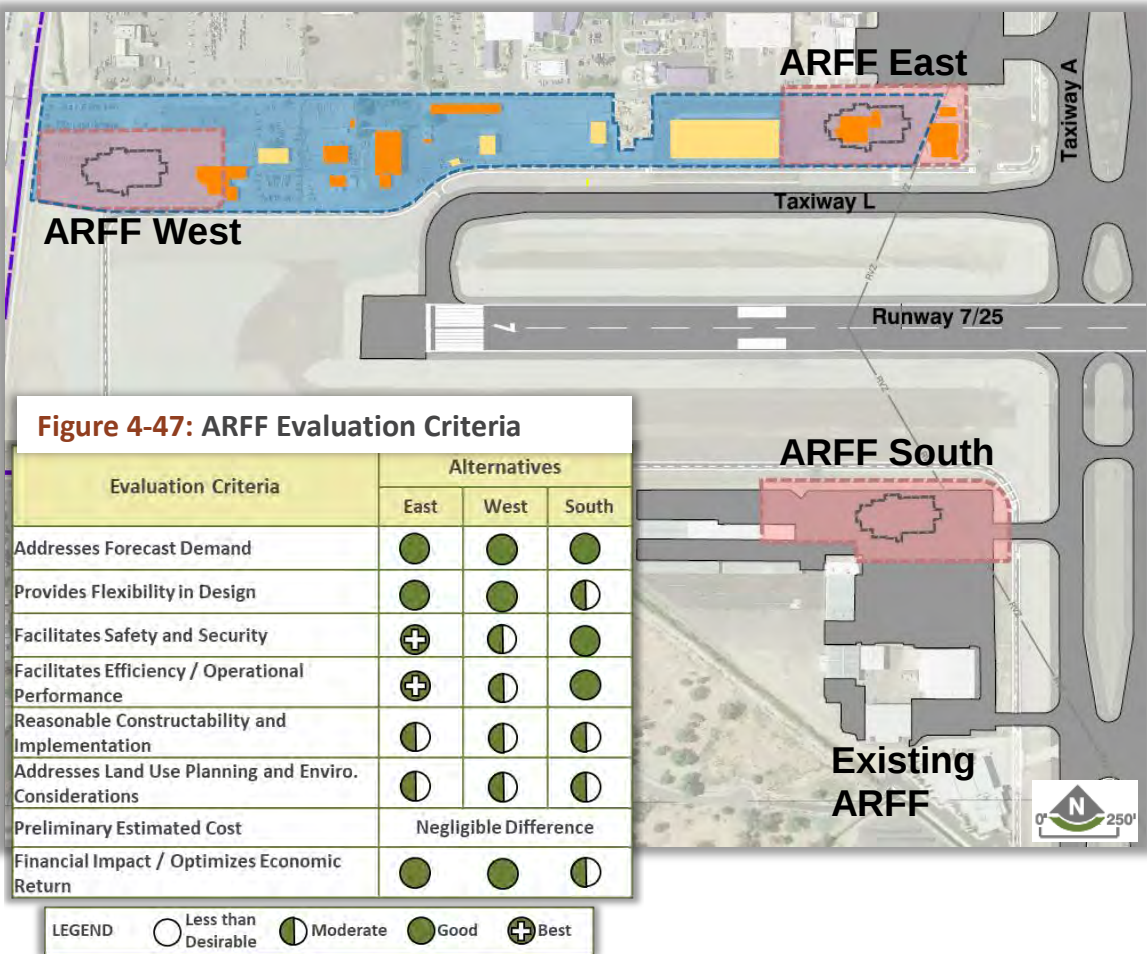
	Runway 16L/34R Midpoint ¹		Terminal		Furthest Point on Airfield ²	
	Distance to point	Speed to Reach in 3 Minutes	Distance to point	Speed to Reach in 3 Minutes	Distance to point	Speed to Reach in 3 Minutes
West	1.2 miles	23 MPH	1.3 miles	26 MPH	2.2 miles	44 MPH
South	0.8 miles	16 MPH	1.0 miles	20 MPH	1.9 miles	37 MPH
East	0.7 miles	13 MPH	0.8 miles	16 MPH	1.7 miles	34 MPH

Source: Mead & Hunt

1. Midpoint of Runway 16R/34L is farthest midpoint of air carrier runway from all three locations.

2. Farthest point on active airfield from all three locations is 1,000 feet prior to Runway 16L threshold.



Figure 4-46: ARFF Relocation

ARFF Evaluation Matrix and Recommendation

As shown in **Figure 4-47**, each ARFF alternative was rated using the evaluation criteria. However, because this evaluation is preliminary, no recommendation is made. The time to consider ARFF relocation will be at the same time cargo expansion begins in the southwest quadrant and the MSC consolidation begins.

As part of the site selection process, one of the three areas described above should be reserved for long-term ARFF relocation. If a quicker response time to terminal is the most desirable factor, the area north of Runway 7/25 should be considered. Siting the ARFF north of Runway 7/25 will also maximize land for cargo development on the southwest quadrant. However, that location depends on whether the MSC can accommodate space for the facility. Another option to improve response times to the terminal is the introduction of a medical substation and response team stationed in the expanded terminal. This may be introduced during terminal design programming.

Airside Facilities Development Alternatives

Facility Requirements Summary

Generally, the runway and taxiway system is in good condition and mostly meets FAA standards, except for some non-standard geometry that needs to be addressed. RSAs and all other protection surfaces are also appropriately graded and comply with obstruction clearance standards. **Chapter 3** recommended the evaluation of these facility improvements:

- ❖ **Runway 16R CAT II Approach:** Site the location of an additional RVR on Runway 16R to enhance instrument approach capabilities.
- ❖ **Deicing Aprons:** Examine dedicated deicing or anti-icing areas at ends of Runways 16R/L and 34L/R to help facilitate operations during winter storms.
- ❖ **Taxiway System:**
 - Address taxiway hot spots and intersections the FAA has designated as being areas of high potential for incursion.
 - Develop plans to address non-standard taxiway geometry and intersections that do not comply with current FAA taxiway design guidance.
 - Consider moving hold positions to 294 feet from runway centerlines. Coordination with the FAA Airports Regional & District/Development Office (ADO) may be necessary to clarify new standards.
- ❖ **Run Up Aprons:** Evaluate areas to locate pavement where propeller aircraft can perform checks prior to departure.

Runway Analysis

As part of the Master Plan alternatives development process, the consultant analyzed a runway extension specifically to address the possibility of accommodating larger aircraft, longer travel distances, and year-round daily service even during hot summer months. The analysis, detailed in **Appendix D**, indicated the primary challenges to aircraft performance at RNO are the surrounding mountainous terrain, high elevation of the airfield (4,415 feet above sea level), and high summer/daytime temperatures. The consultant concluded that a potential 2,500-foot extension to Runway 16R/34L did not provide enough benefits to justify including a runway extension in the Master Plan.

One key factor that led to this conclusion is that airlines currently serving RNO can operate with the existing runways. Within the current airport environment, airlines operate seasonally and/or at night when it's cooler, use fuel efficient aircraft with lighter payloads, use aircraft with higher performing engines that can climb faster, and create non-standard departure procedures to avoid terrain.



Another key factor is that a 2,500-foot runway extension, with the removal of terrain, would yield a maximum nautical mile (NM) range expansion of 110-330 NM for a 737MAX aircraft, which currently serves RNO. The same runway extension would yield a 1,300 NM expansion for an A350-900 aircraft, which currently does not serve RNO. In terms of travel destinations, the extension does not accommodate any new destinations for the current fleet mix.

Another key factor that led to this conclusion was that, to be considered for FAA Airport Improvement Program (AIP) funding, a runway extension requires the current or documented future need to be at least 500 annual operations. The runway extension cannot be used to attract speculative or new service and must pass an FAA Benefit-Cost Analysis. Even if deemed eligible for AIP funding, the project would then compete against all eligible projects at all airports nationwide. Based on this information, the Consultant team determined that RTAA would likely have to self-fund a runway extension. The Consultant team estimated total cost for runway construction at \$250 million for the runway and \$3.2 billion for the terrain mitigation necessary to realize the maximum NM range expansion benefit, resulting in a total cost of \$3.4 billion.

Runway 16R CAT-II Approach

Facility Requirement: Capacity

Requirements for future commercial operations and discussions with RTAA and ATCT staff indicated a need for lower approach minimums to the primary runway for commercial operations. Adding facilities to lower approach minimums would improve safety and help maintain commercial arrival and departure schedules. Adding required facilities will not guarantee CAT-II approach minimums, though, and terrain and obstruction studies would need to be performed.

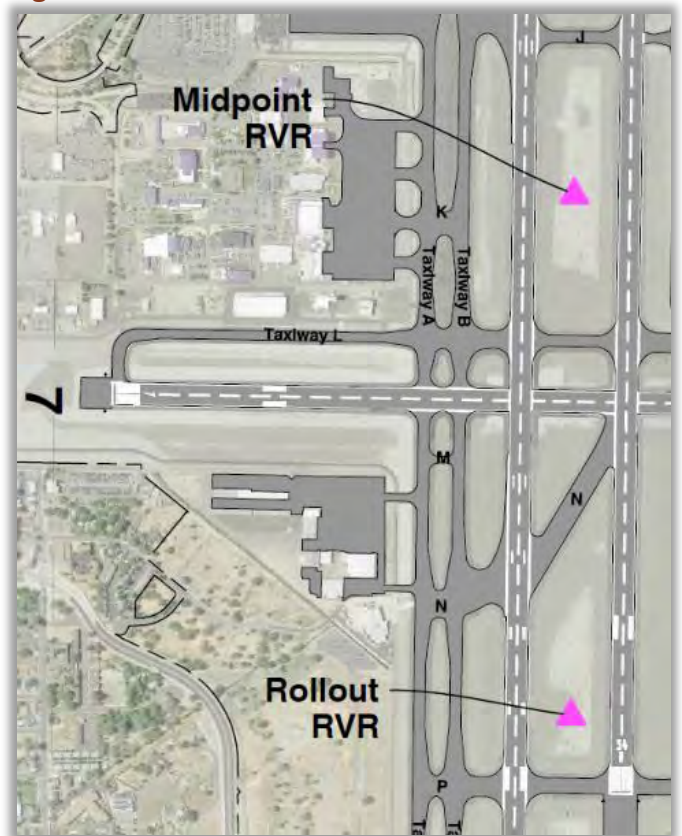
CAT-II Approach Goals and Objectives

- ❖ Enhance the instrument approach minimums to Runway 16R to CAT-II.

Considerations

Airside facilities needed for a CAT-II approach on Runway 16R require additional RVR visibility sensors. For approach minimums below 1,600 feet RVR (1/4 mile) on runways with a length greater than 8,000 feet, a touchdown, rollout, and midpoint RVR are required. Because the installation of RVR facilities does not ensure a CAT-II approach, additional airspace analysis would be required.

Figure 4-48: RVR Locations



Initial discussions during facility requirements and preliminary alternatives with RTAA and ATCT staff indicated a desire for a CAT-II approach, or an instrument landing system (ILS) on Runway 16L. An ILS on Runway 16L would create a redundant approach, which may be beneficial when the ILS to Runway 16R is inoperable. However, siting an ILS would require an increase in design surface dimensions, runway protection zone (RPZ) size, and property acquisition in the Steele Ranch area. Addition of RVRs for a CAT-II approach on Runway 16R will not require property acquisition, an increase in design surface dimensions, or an increase in RPZ area.

RVR Addition and Siting

Runway 16R is currently equipped with a touchdown RVR. The two additional RVR sensor locations are illustrated on **Figure 4-48**. These locations are based on preliminary siting, and exact locations should be confirmed during design. The midpoint RVR should be located within 1,000 feet of the center point of the runway, and the rollout RVR should be between 0 and 2,500 feet from the end threshold. The RVR sensors should be positioned horizontally at least 400 feet from runway centerline and 150 feet from taxiway centerlines.

Deicing Aprons

Facility Requirement: Capacity and Modernization

Chapter 3 recommended adding dedicated deicing aprons near the ends of the Runway 16R/34L aprons as a capacity and modernization improvement. Aircraft currently deice at the gate or on the RON apron south of Concourse B.

Discussions with stakeholders indicate dedicated deicing aprons will be needed at the north and south end of the airfield before the end of the planning period for improved efficiency during winter. For improved efficiency and to improve aircraft flow, these aprons should be located near the departure ends of Runway 16R and 34L to serve commercial and cargo operations.

Further discussion during the workshops indicated some airlines would prefer to conduct deicing operations at the gate on the terminal apron. The airlines' concerns focused on the challenge of staffing operations in two different deicing locations.

Deicing Aprons Goals and Objectives

These are the goals and objectives for deicing aprons based on the facilities requirements analysis:

- ❖ Add dedicated deicing aprons near the departure ends of Runway 16R/34L for use by commercial aircraft.
- ❖ Improve aircraft flow and reduce terminal congestion during a winter storm by moving aircraft out of gate positions to a dedicated deicing area.
- ❖ Enhance safety by reducing the time between aircraft deicing and departure. Siting the deicing aprons near the runway departure ends also reduces the potential for deicing a second time before takeoff.



Considerations

Location

Facility requirements found that deicing aprons should be located near the departure ends of Runway 16R/34L. The additional deicing aprons would not replace the option for airlines to deice near the terminal. Instead, the aprons would provide a supplemental deicing area and help facilitate operational flow. The deicing aprons increase operational flexibility and can be used by aircraft other than airlines that need to deice at the terminal, such as cargo and GA aircraft.

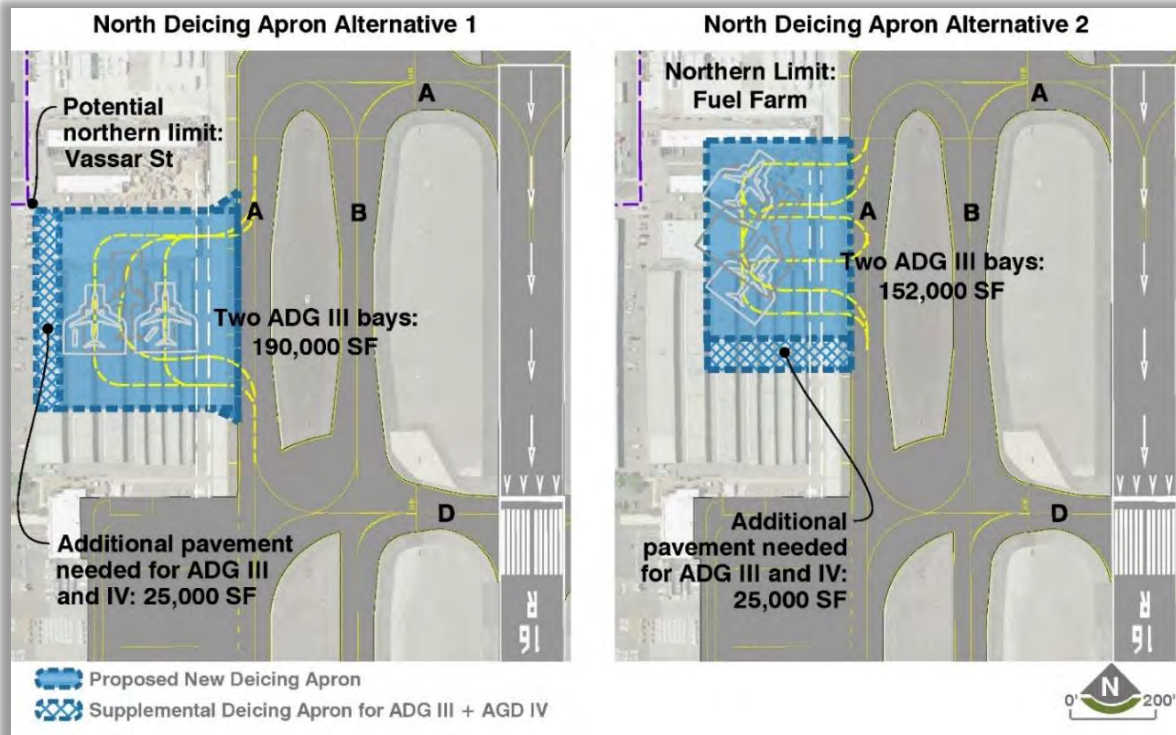
Size

For both north and south deicing aprons, two layout options are being considered. The deicing aprons are designed to accommodate two aircraft, either the same or different sizes, at the same time. The B737-8 is the most common commercial passenger aircraft anticipated to operate at RNO over the planning period. The first alternative for both north and south is designed for two B737-8 aircraft aligned north-south. The total area required for this apron is 190,000 square feet, which includes pavement for aircraft to taxi into position and free area for deicing trucks to maneuver around aircraft. The apron also provides ample space for one B767-3 to be deiced. The second alternative for north and south is designed for two deicing positions for B737-8 aircraft aligned at 45-degree angles. This alternative also provides a deice position for one B767-3.

North Deicing Apron Alternatives (Runway 16L)

The proposed location will require the demolition of the warehouse self-storage buildings, which rated below average on structure and MEP condition in the FCA. These buildings are north of the existing cargo facility. However, the space available at this location is limited by the fuel farm and Vassar Street. In the event of terminal expansion to the north, integration of this deicing apron into the terminal apron would help facilitate aircraft flow.

Figure 4-49 illustrates the North Deicing Apron Alternatives. Supplemental options allow for an additional 25,000 square feet of pavement. The additional area would be required for an apron to accommodate positions for a B737-8 and a B767-3 aircraft to use the apron at the same time.

Figure 4-49: North Deicing Aprons

North Deicing Apron Recommendation

The north apron should be designed when the terminal expansion occurs to the north. The area between the north edge of the future terminal apron and fuel farm is proposed to be reserved for a supplemental deicing apron. This area will allow space for at least two B767-3 aircraft to deice. The aprons should be designed with facilities to capture and store deicing fluids.

This area, where the small storage facilities are located now, may be paved for temporary use by cargo aircraft when Concourse C is expanded, as discussed in the terminal phasing plan. When Concourse C is expanded north, the four cargo hardstand positions east of the CBP facility will need to be relocated. If cargo facilities are not relocated to the southwest quadrant by that time, the four hardstands are proposed to be relocated to an area north of the FedEx facility at the storage facility locations.

After cargo facilities are relocated to the southwest quadrant, the temporary cargo hardstand area may be converted to a deicing apron. Drainage and environmental standards should be planned and designed prior to developing the area as a cargo apron. This will allow cargo aircraft to deice on site.

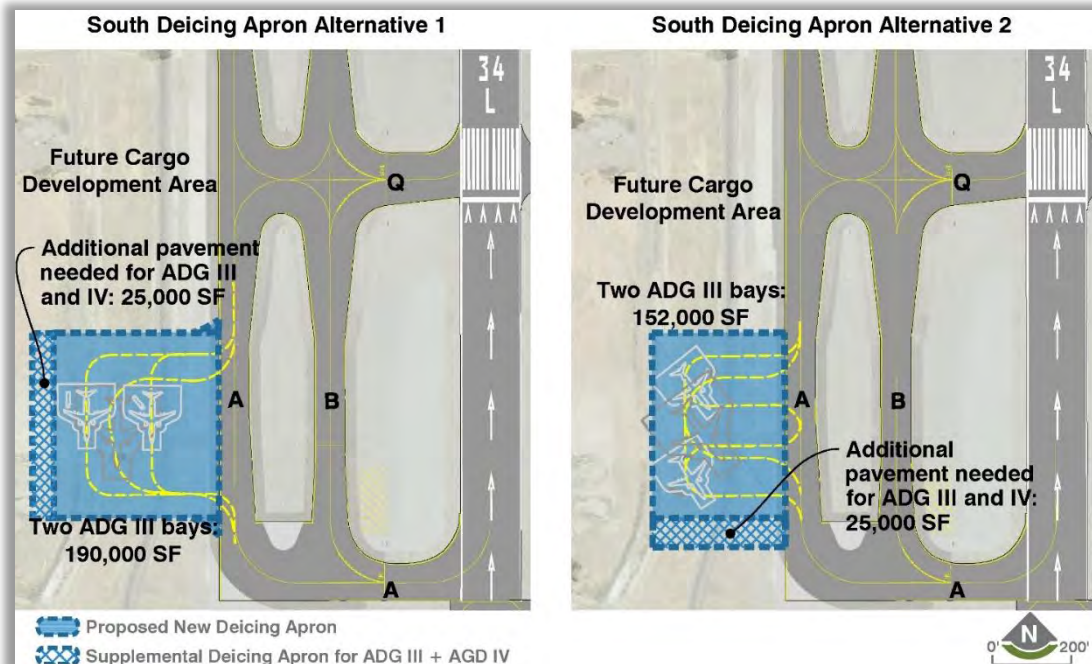
South Deicing Apron Alternatives (Runway 34R)

The south deicing apron alternatives are identical to the alternatives for the north aprons in size, function, and positive features. **Figure 4-50** shows both South Deicing Apron Alternatives with two B737-8 aircraft, plus the option to expand to two positions for B737-8 and B767-3 aircraft to use the apron at the same time.

The south deicing aprons are positioned at the farthest point south along Taxiway A. The potential constraint for the south alternatives is that any deicing apron located on the southwest quadrant may limit cargo expansion. If a south deicing apron is implemented, the recommendation is to integrate this apron with any future cargo apron development.

The south deicing apron is a considerable distance from the departure end of Runway 34R. It may be feasible for aircraft departing on Runway 34R to use this deicing apron, but using this apron would require extra taxiing and the need to cross Runway 16R/34L.

Figure 4-50: South Deicing Aprons



South Deicing Apron Recommendation

The south deicing apron should be designed at the same time as cargo expansion in the southwest quadrant. An area for two aircraft deicing positions will be reserved. The aprons should be designed with facilities to capture and store deicing fluids.

Taxiway System

Facility Requirement: Capacity and Modernization

The alternatives analysis for taxiway improvements were based on FAA design standards in AC-13A. The FAA last updated AC-13A in 2014 with a major emphasis put on correcting non-standard taxiways. Examples are provided in the analysis that follows, but generally the FAA may require redesign of the taxiways or may not approve grant funding improvements to non-standard taxiways.

Discussions with stakeholders indicated there are other improvement priorities to be completed before extensive taxiway realignments would occur. Priority was given to correcting FAA-designated hot spots where taxiway intersections may cause confusion and incursions have occurred in the past. Taxiway improvements are broken out into three phases, generally associated with improvements to adjacent facilities on the airfield. For instance, taxiway realignments on the south side (Taxiway N and Runway 16R/34L) should be associated with other capital improvements for cargo facilities nearby.

Most of the taxiway corrections and realignments shown in the analysis below are not given multiple alternatives: the option is either the corrected taxiway or choosing the “no-build” option and not realigning the taxiway. The reason for this is the FAA is rigid in design for corrections to non-standard taxiways. The options for correction are illustrated in the analysis that follows.

There are exceptions, however, and the high-speed acute-angle and taxiway connectors near the terminal are shown with three alternative options. The high-speed exit may be sited at varying distances from the landing threshold, each with consequences on the taxiway connectors to the terminal. It is advised that the terminal apron and connectors be finalized prior to selecting a preferred high-speed exit location.

Taxiway System Goals and Objectives

- ❖ Improve the geometry of the taxiway system, with emphasis on correcting FAA hot spots where there is higher potential for aircraft incursions. This will improve safety and operations efficiency on the airfield.

Considerations

Safety and Operations

The primary consideration for taxiway system design improvements is safety and efficiency of aircraft operations. These goals match the FAA rationale for revising design standards for taxiway layout. Taxiway improvements also follow recommendations provided by ATCT staff.

Constructability and Phasing

Correcting taxiway layout issues should coincide with the runway and taxiway rehabilitation schedule. Phasing of these projects to align with other development is advised. Realigning taxiways will require moving lights and utilities and potentially disrupting drainage systems. Coordinating taxiway improvements and construction with other pavement rehabilitation is recommended. This includes any future development of the passenger terminal, cargo on the southwest quadrant, and other GA development. Some taxiway realignments, such as hot spot corrections, should be accomplished as soon as feasible.



FAA Hot Spots

The FAA has designated two hot spots in the Airports Facility Directory for RNO. A hot spot is a location in an airport movement area with a history of higher potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary. Correcting the hot spots was recommended in **Chapter 3** as a modernization action that will increase airfield safety.

Square Ends: Taxiway A – Runway 34L

The first hot spot is the squared south end of Taxiway A and Runway 34L. Pilots land on Runway 34L, mistaking it for Runway 34R, while the square end of Taxiway A is mistaken for Runway 34L. The solution to correct the issue requires a curved end to reduce the possibility of Taxiway A being identified as a runway. The goal is to reduce the chance for potential incursion to increase safety and remove the hot spot designation by the FAA. Two alternatives are available for correcting the square ends:

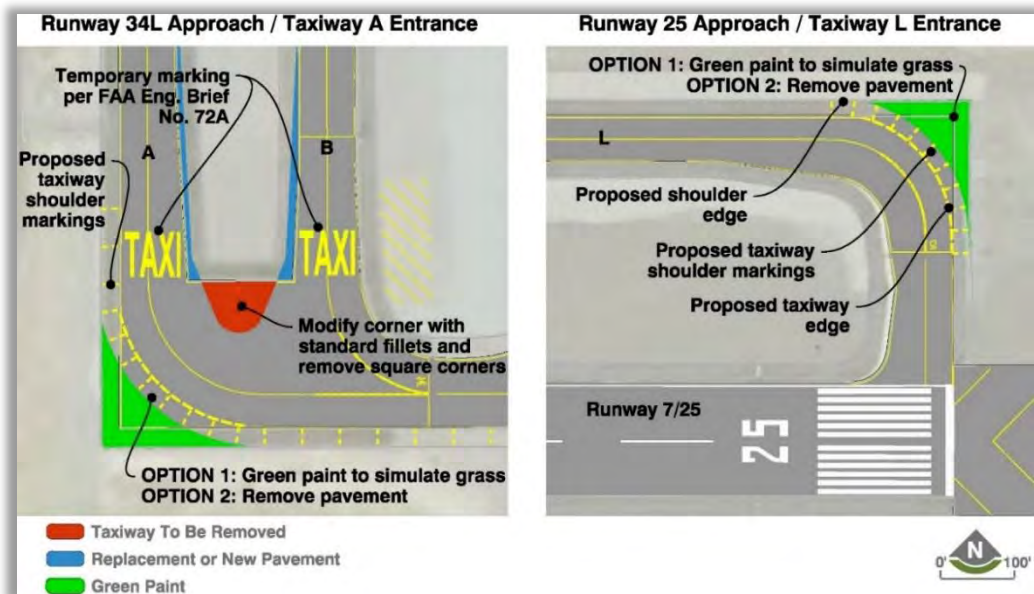
- ❖ Option 1: Paint the corners green and re-stripe the taxiway edge.
- ❖ Option 2: Remove the excess pavement and re-stripe the taxiway edge.

Option 1 may provide RNO an immediate fix to the hot spot on Taxiway A, although taxiway lights would need to be moved to match the new taxiway edge. Option 2 provides a permanent pavement fix. Option 1 may suffice until taxiway pavement maintenance is required.

Although not a designated hot spot, the entrance to Runway 25 from Taxiway L was also constructed with a square end. The recommendation is to correct this corner to a curved end to decrease the potential misidentification of Taxiway L for a runway.

Figure 4-51 illustrates the square-end taxiway entrances on Taxiway A and Taxiway L in detail.

Figure 4-51: Taxiway Square Ends



Taxiway C – Taxiway L Intersection

The intersection of Taxiway C, Taxiway L, and the Atlantic Aviation apron is also a designated FAA hot spot. Eliminating the entrance taxilane (Taxilane 2) will enhance safety at this complex intersection, detailed in **Figure 4-52**. Taxilane 3 will be realigned and widened, and a replacement taxilane will be added to the east of the realigned Taxilane 3. Both taxilanes will be designed for B747 and C-17 aircraft to access the Atlantic Apron to support their military and charter activities. The two taxilanes will provide better flow of aircraft on and off the Atlantic Apron, while avoiding the Taxiway C-L intersection.

FAA Design Standards

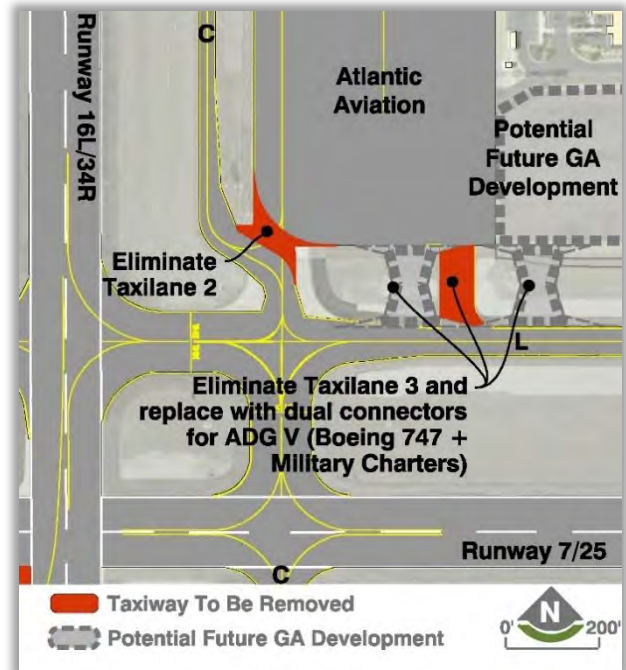
Design guidelines in AC-13A recommend taxiway layouts that enhance safety by discouraging runway incursions. Some taxiways at RNO were found in nonconformance with current design recommendations. The taxiway changes proposed below are aligned with FAA design standards detailed in AC-13A. This includes designing taxiways that:

- ❖ Conform to the three-node concept. Keep taxiway intersections simple by reducing the number of taxiways intersecting at a single location.
- ❖ Avoid complex intersections. Taxiways should never coincide with the intersection of two runways. Taxiways configured with multiple taxiway and runway intersections in a single area create large expanses of pavement. These expanses make it difficult to provide proper signs, marking, and lighting.
- ❖ Eliminate indirect access. Do not design taxiways to lead directly from an apron to a runway without requiring a turn.
- ❖ Limit runway crossings.
- ❖ Avoid “high energy” intersections. These are intersections in the middle third of the runways.
- ❖ Avoid wide expanses of pavement.

In response to these design guidelines, redesign of these taxiways is proposed and described in greater detail on the following pages:

- ❖ **Taxiway F:** Acute-angle and complex intersection (remove)
- ❖ **Taxiway J:** Direct apron to runway access and wide expanse of pavement (remove and redesign)
- ❖ **Taxiway N:** Acute-angle, complex intersection, and wide expanse of pavement (remove and redesign)
- ❖ **Taxiway A Hold Apron at Runway 16R:** Excess pavement (redesign)
- ❖ **Taxiway Q:** Unused pavement (remove)

Figure 4-52: Taxiway C-L Hot Spot

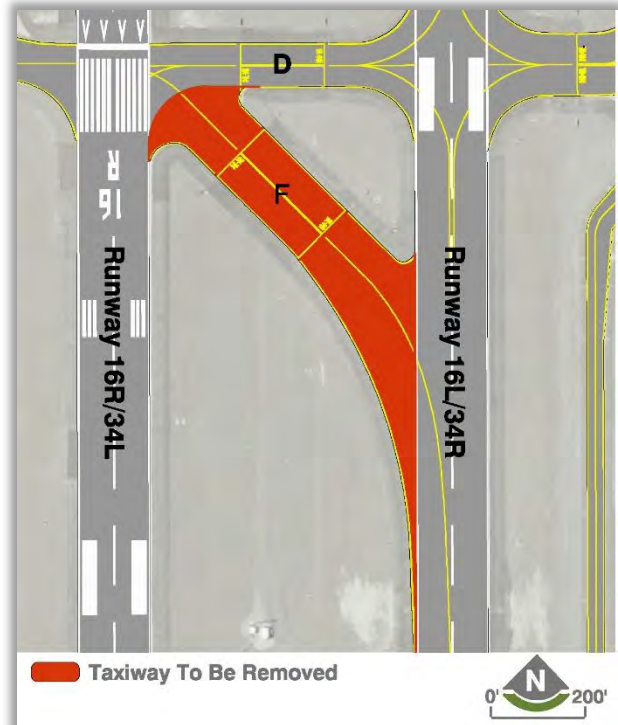


Taxiway F

Taxiway F, shown in **Figure 4-53**, is an acute-angled taxiway between Runways 16R/34L and 16L/34R at the north end of the airfield. Taxiway F does not meet recommended FAA design for taxiways because Taxiway F intersects Runway 16R/34L and Taxiway A at the landing threshold for Runway 16R. This creates a five-node intersection.

The Airport's 2015 Pavement Management Program (PMP) Update, prepared by Stantec, classified Taxiway F as "satisfactory." Previous discussions with ATCT staff indicated Taxiway F is rarely used. On Runway 16L/34R, the distance from Taxiway F to the right-angle exit Taxiway D is 600 feet. The recommendation is to eliminate Taxiway F and add a replacement right-angled taxiway farther south for aircraft arriving on Runway 34R to access the passenger terminal and cargo areas.

Figure 4-53: Taxiway F Detail



Taxiway J

Taxiway J is located south of Concourse B and crosses the parallel runways from the passenger terminal to GA East. Taxiway J serves as a high-speed exit for aircraft landing on Runway 34L. Taxiway J has two design standards issues.

- ❖ **High-energy intersection:** Taxiway J is in the middle third of Runways 16R/34L and Runway 16L/34R.
- ❖ **Wide expanse of pavement and direct apron to runway access:** Taxiway J is also an acute-angled exit for operations off Runway 34L to Taxiways A and B. This features direct runway to terminal apron access and is not recommended by FAA.

The section of Taxiway J between the terminal apron and Runway 16R/34L should be redesigned to meet standards. There are three options for redesigning Taxiway J and maintaining the acute angle high speed exit:

Option 1: 5,500 feet from landing threshold

This alternative shown in **Figure 4-54** reconfigures Taxiway J in its existing location with north and south exits to Taxiway B. Taxiway J between Taxiway A and B is relocated to the south, eliminating direct runway to apron access.

On dry runways, these aircraft can use the high-speed exit at 5,500 feet:

- ❖ 92 Percent Large (12,500 lbs. to 300,000 lbs.)
- ❖ 81 Percent Heavy (> 300,000 lbs.)

For wet runways, the calculations are the same for acute and right angle exits at 5,500 feet, and these aircraft can use the high-speed exit:

- ❖ 27 Percent Large
- ❖ 0 Percent Heavy

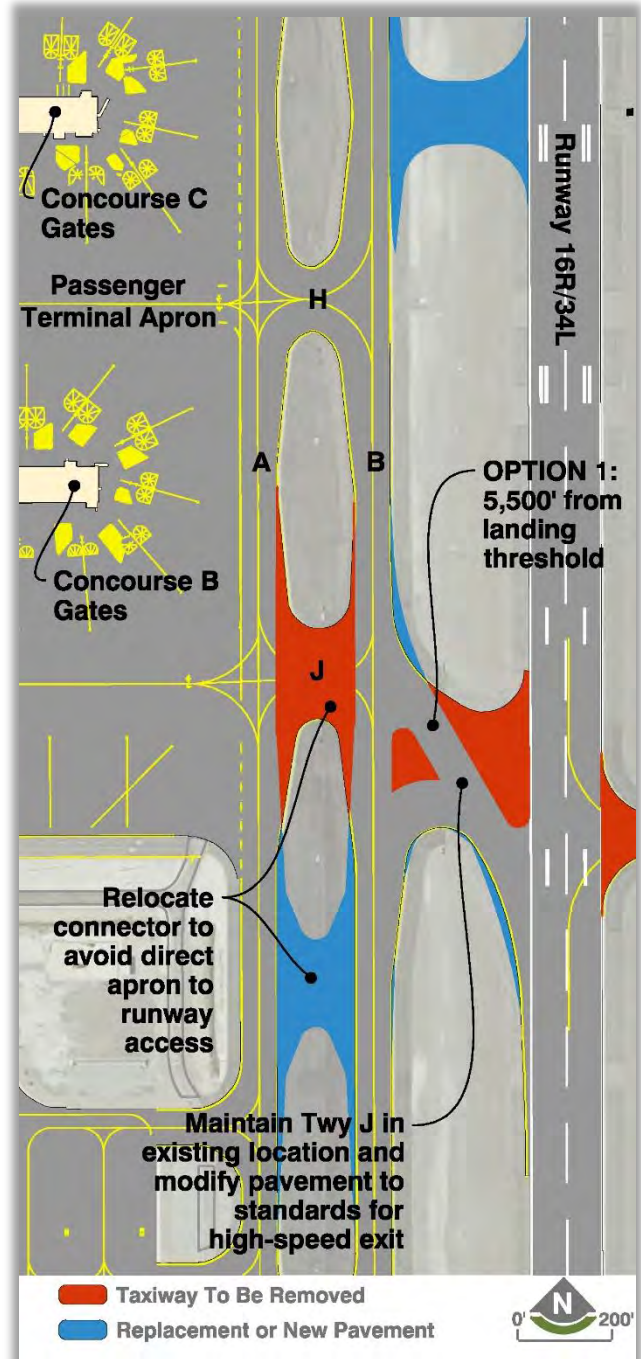
Positive Features of Option 1

- ❖ This option uses existing pavement between Runway 16R/34L.
- ❖ More aircraft can use this compared to Option 3, which is farther from landing threshold.

Negative Features of Option 1

- ❖ This option requires relocation of J between A and B to eliminate direct runway to apron access. This may cause circulation issues for aircraft accessing Concourse B.

Figure 4-54: Taxiway J High-Speed Option 1



Option 2: 6,000 feet from landing threshold

This alternative is detailed in **Figure 4-55** and relocates the acute-angle section between Taxiway B and Runway 16R/34L to the north while maintaining the connector between Taxiways A and B.

For dry runways, these aircraft can use the 6,000-foot option:

- ❖ 98 Percent Large (12,500 lbs. to 300,000 lbs.) able to use exit
- ❖ 95 Percent Heavy (> 300,000 lbs.)

For wet runways, the calculations are the same for acute- and right-angle exits at 6,000 feet, and these are the aircraft able to use the 6,000-foot option:

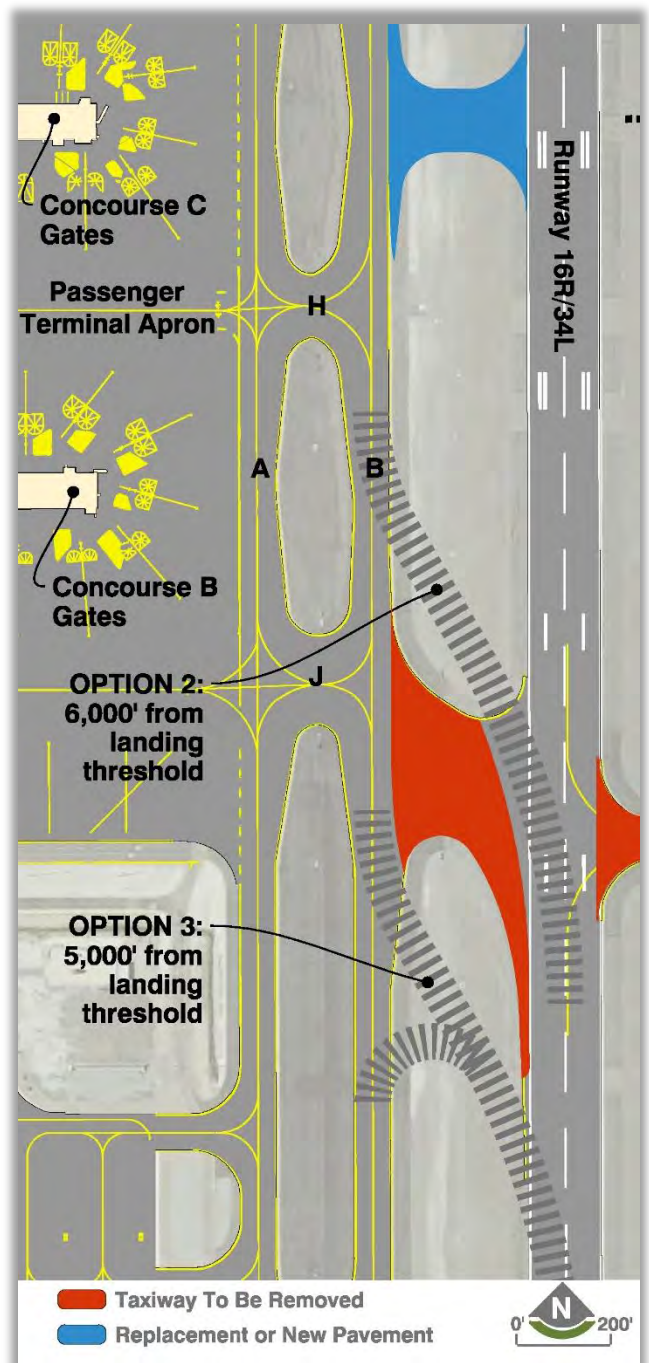
- ❖ 48 Percent Large
- ❖ 10 Percent Heavy

Positive Features of Option 2

- ❖ Option 2 enables the most aircraft to use this exit compared to Options 1 and 3. Option 2 is farther from the landing threshold.
- ❖ This option maintains Taxiway J between A and B (unlike Option 1).

Negative Features of Option 2

- ❖ This option only accommodates exit to the north to avoid direct access to Taxiway J and terminal apron.
- ❖ There is a potential circulation issue when the terminal area is busy—aircraft that need to access Concourse B would need to reverse course on Taxiway H/Taxiway A to the south. This may interfere with aircraft taxiing out from the center taxilane between Concourses B and C to Taxiway A.

Figure 4-55: Taxiway J High Speed Options 2&3

Option 3: 5,000 feet from landing threshold

This alternative also shown in **Figure 4-56** relocates the acute-angle section between Taxiway B and Runway 16R/34L to the south while maintaining the connector between Taxiways A and B.

For dry runways, these aircraft can use the 5,000-foot option:

- ❖ 76 Percent Large
- ❖ 55 Percent Heavy

For wet runways, the calculations are the same for acute- and right-angle exits at 5,000 feet, and these aircraft can use this option:

- ❖ 12 Percent Large
- ❖ 0 Percent Heavy

Positive Features of Option 3

- ❖ Allows for exits to the north and south.
- ❖ Presents less circulation issues (see negative features for Option 2). Aircraft may exit Option 3 and access Concourses B and C without need to reverse course on Taxiway A.
- ❖ Maintains Taxiway J between A and B (unlike Option 1).

Negative Features of Option 3

- ❖ Less aircraft able to use exit compared to Options 1 and 2.

Eliminating the section of Taxiway J between the parallel runways is proposed. This follows the AC-13A recommendation to limit runway crossings and high-energy intersections. The preferred crossing location is at the end of a runway or on Taxiway L.

Any improvements to Taxiway J should be coordinated with future terminal apron design. The design should consider aircraft taxiing near the terminal plus movement to and from Runway 16R/34L. Preferred design should also consider FAA standards in AC-13A so exit taxiways do not lead directly onto the terminal apron.

Taxiway N

Taxiway N is located between Runway 16L/34R and Taxiway A, south of Runway 7/25. Taxiway N presents various design standards issues.

- ❖ **Complex intersection:** Taxiway N intersects Runway 16L/34R and Runway 7/25 at the same point, creating a five-node intersection.
- ❖ **High-energy intersection:** Taxiway N is in the middle third of Runway 16R/34L and Runway 16L/34R.
- ❖ **Wide expanse of pavement and direct apron to runway access:** Taxiway N is also an acute-angled exit for operations off Runway 16R to Taxiways A and B with direct apron to runway access. This exit is used by most commercial operators when landing on Runway 16R to taxi to the terminal area.

Based on current FAA design standards, the section of Taxiway N between Runway 16R/34L and 16L/34R should be eliminated and redesigned to meet FAA taxiway design standards.



A high-speed exit for landings on Runway 16R is essential for commercial operations. Most aircraft that land on Runway 16R use the existing acute-angle Taxiway N to exit Runway 16R after landing, make a 180-degree turn onto Taxiway A or B, and taxi north to the terminal or cargo aprons. Taxiway N helps aircraft exit Runway 16R/34L in less time after landing and clears this runway for other aircraft.

Initial analysis shows the existing location of Taxiway N as a high-speed exit for landings on Runway 16R to be in an adequate location. The exit is approximately 6,500 feet from the landing threshold. At this distance, these are the percentages of aircraft that may exit a dry runway:

- ❖ 100 Percent Large (12,500 lbs. to 300,000 lbs.)
- ❖ 99 Percent Heavy (> 300,000 lbs.)

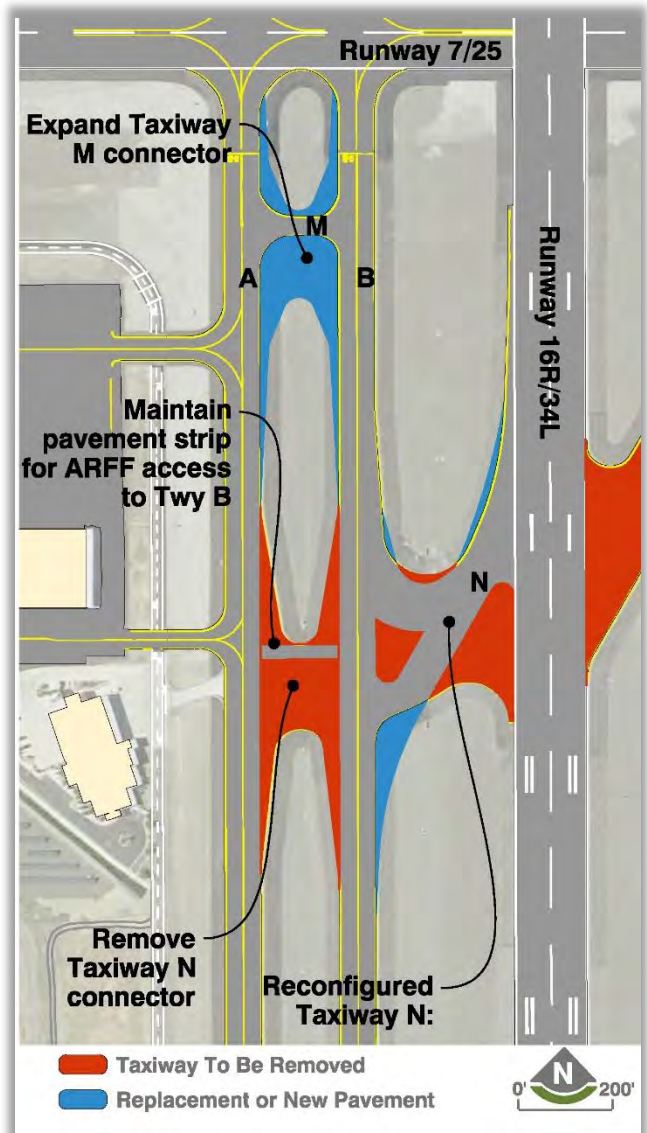
These are the percentages of aircraft that may exit wet runways at 6,500 feet:

- ❖ 71 Percent Large (12,500 lbs. to 300,000 lbs.)
- ❖ 35 Percent Heavy (12,500 lbs. to 300,000 lbs.)

This alternative, illustrated in **Figure 4-56**, proposes that Taxiway N, between Runway 16R/34L and Taxiway B, be redesigned for high speed exits in both directions (exits to north and south) based on current FAA standards. Taxiway N between Taxiway B and A is proposed to be eliminated, because the existing location would no longer be usable from the reconfigured high-speed exit.

Aircraft may land on Runway 16R, exit the new high-speed Taxiway N, and continue south on Taxiway B, or make a 180-degree turn on Taxiway B and taxi north. Taxiway M is proposed to be expanded to accommodate B757 aircraft to replace the section of Taxiway N proposed to be removed. This may help movement between Taxiways A and B, particularly if cargo operations are relocated to the southwest quadrant.

Figure 4-56: Taxiway N High-Speed Exit



Taxiway A Hold Apron at Runway 16R

The hold apron at the north end of Taxiway A, near the approach end of Runway 16R is an example of a wide expanse of pavement and does not meet the taxiway OFA requirements a deicing apron (explained in more detail above) would require in a hold position for aircraft departing on Runway 16R. An additional recommendation is to modify the section of Taxiway D between Taxiway A and B with standard turning fillets, so aircraft may use this segment to reverse direction. This is detailed in Figure 4-57.

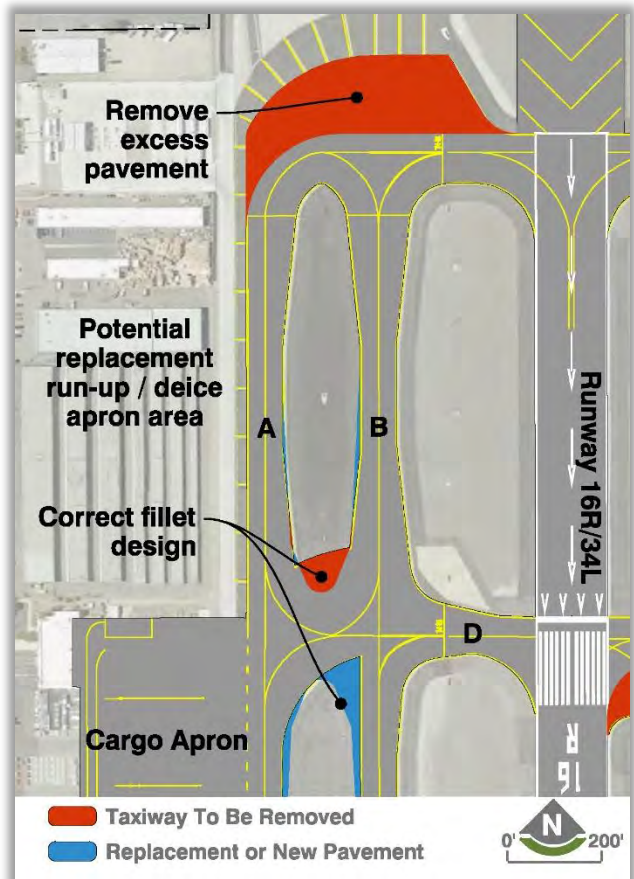
Taxiway Q

Taxiway Q east of Runway 16L/34R leads to a former through-the-fence facility. This section of Taxiway Q is closed and proposed to be eliminated.

Runway 34L Blast Pad

The blast pad at the end of Runway 34L is 1,000 feet long. The design standards indicate the length for a blast pad based on runway design code of D-IV is 200 feet. Reducing the blast pad to this dimension is recommended.

Figure 4-57: Taxiway A Detail



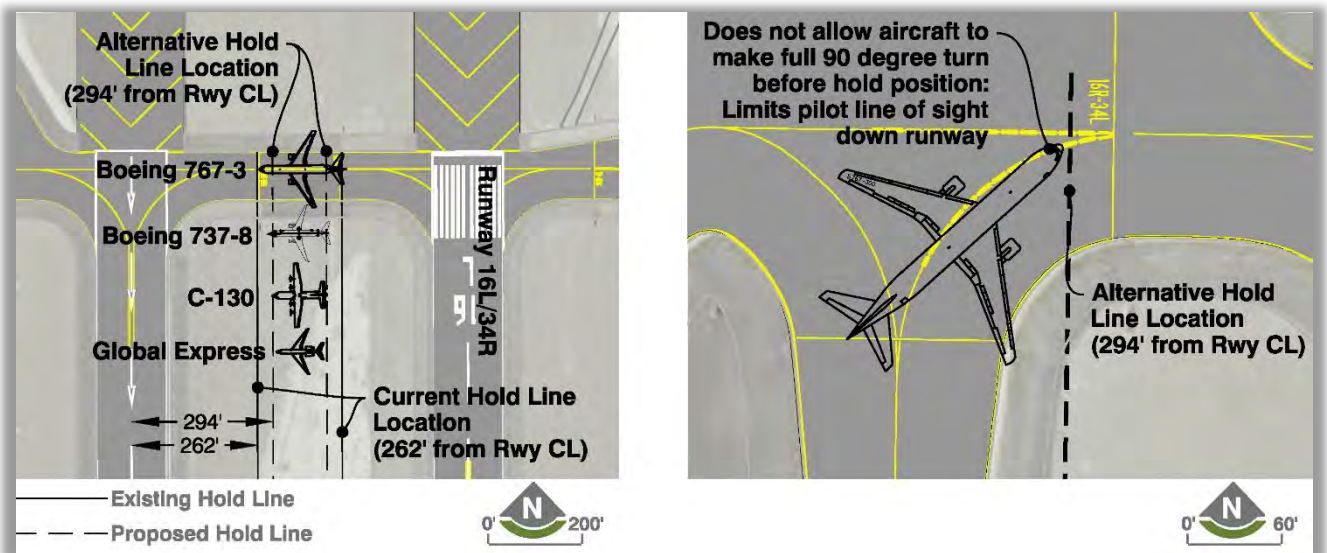
Hold Positions

As noted in **Chapter 3**, the runway design code determines the hold position distance on each connector taxiway from the runway centerline. Currently, the hold lines for Runways 16R/34L and 16L/34R are located 262 feet from the runway centerline, and for Runway 7/25, the distance is 250 feet from centerline. RNO updated the holding position (and associated signs and marking) based on prior FAA AC-13A standards. Based on the Airport's evaluation above mean sea level (MSL) (4,400 MSL), hold distances must increase to 294 feet for all runways to meet current FAA AC-13A standards. **Figure 4-58** identifies the impacts of moving the hold lines.

Positive and Negative Features of Expanded Hold Lines

- ❖ Meets current FAA 13A standards.
- ❖ Reduces the width between runways for aircraft to hold.
- ❖ Does not allow aircraft to make full 90-degree turn before hold position.
- ❖ Limits pilot line of sight down runway.

Figure 4-58: Hold Positions Detail



Hold Line Recommendations

RTAA should coordinate with the FAA on current hold line standards prior to the next sign and marking plan update. The FAA has revised hold line marking setback standards for airports at elevations exceeding 1,000 feet MSL. Hold positions should conform to safety standards and provide for functional and efficient aircraft operations.

Run-Up Aprons

Facility Requirement: Modernization

Run-up aprons were first proposed by the GA pilots during the analysis of facility requirements and preliminary alternatives. A run-up apron allows pilots to perform last-minute checks on engines prior to take-off. During facility requirement workshops, tenants and RNO staff indicated a demand for run-up aprons near the departure ends of runways for departing GA aircraft.

Run-up aprons are proposed near four runway ends on runways primarily used by GA aircraft: Runways 16L, 34R, 7, and 25. The run-up aprons are designed for use by airplane design group II aircraft with wingspans up to 79 feet. The apron is 35 feet wide and over 100 feet long—long enough to hold two airplane design group II aircraft at once.

Further discussion with staff showed the locations of run-up aprons near Runways 16L and 25 could be at multiple locations. The run-up apron for Runway 16L may impact the Dassault facility. Alternative locations for these are analyzed below.

Run-Up Apron Goals and Objectives

- ❖ Provide dedicated areas near the departure end of runways for GA aircraft to perform engine checks prior to departure.

Considerations

Safety and Operations

Dedicated run-up aprons for GA aircraft to perform pre-departure run-up checks offer several benefits. Creating an area just for the GA aircraft increases the safety factor by allowing pilots to perform engine checks prior to departure. The separation from other aprons places run-ups a safe distance away from other facilities, reducing the potential for scattering debris during the engine check.

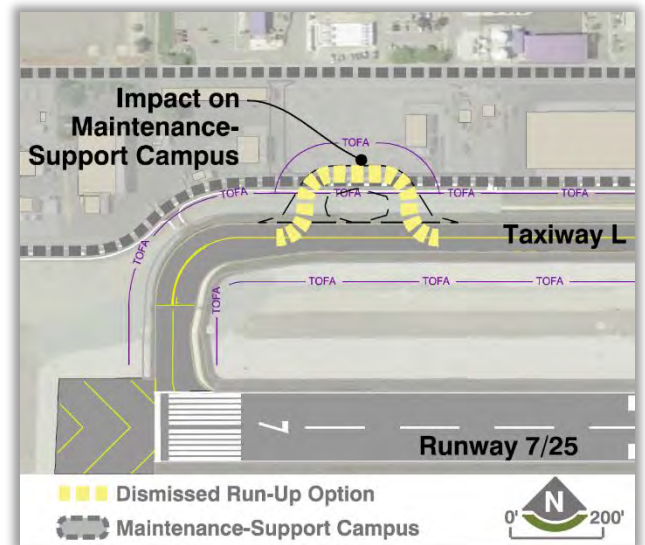
Location

Run-up aprons should be located as close as possible to the departure end of runways. This gives aircraft a short taxiing distance to departure after performing the run-up.

Eliminated Alternative: Runway 7 – Taxiway L

A run-up apron was proposed near the departure end of Runway 7 on Taxiway L. The proposed location with impacts is shown in **Figure 4-59**. Departures on Runway 7 are rare, with less than one percent of piston and light aircraft using this runway. The impact of the run-up apron on the existing and proposed maintenance facility area would also be significant, with potential relocation of the electrical vault or SRE buildings. With the lack of departures on this runway plus the impact to proposed facilities, this run-up apron was removed from consideration.

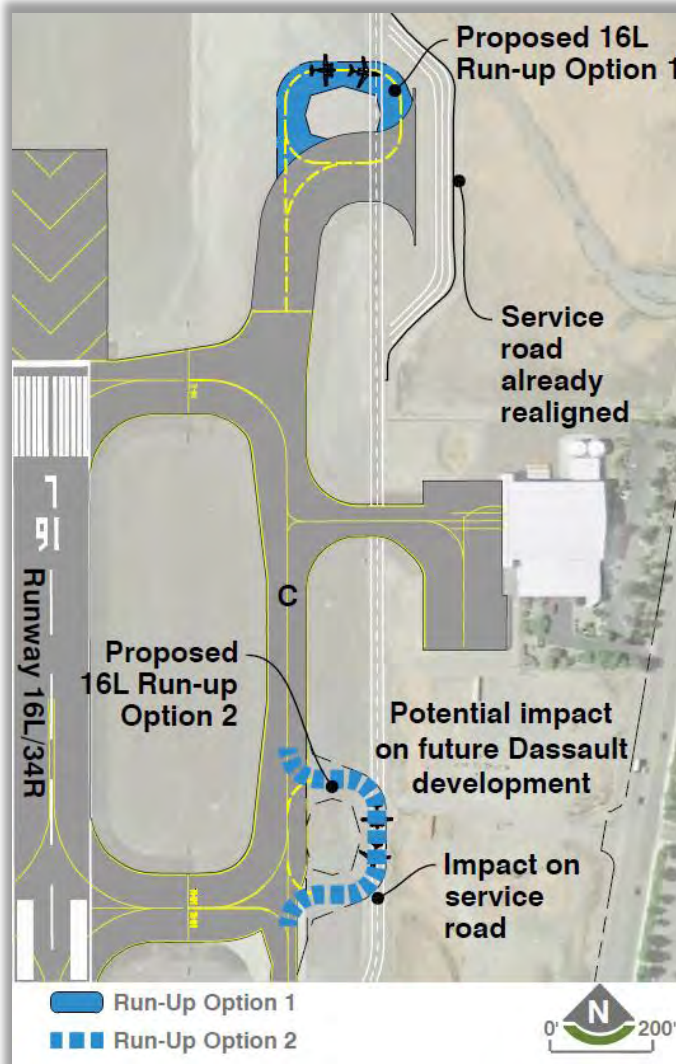
Figure 4-59: Runway 7 – Taxiway L Run-Up Apron



Runway 16L – Taxiway C

With FBO service, more than 60 hangars, and the transient apron on the east side of RNO, most GA aircraft use Runway 16L/34R and Taxiway C. Two locations for a run-up apron, shown in **Figure 4-60**, are proposed on Taxiway C at the departure end of Runway 16L.

Figure 4-60: Runway 16L– Taxiway C Run-Up Apron



Option 1 is at the north end of Taxiway C. The run-up apron is outside of runway design surfaces and RPZ and clear of approach surfaces. Option 1 requires greater taxiing distance over Option 2.

Option 2 is near the intersection of Taxiway C and D. This proposed location is closer to the runway end, but it is also located within a potential parcel that may be used for Dassault facility expansion.

Runway 16L Run-Up Apron Recommendation

The recommended location for the Runway 16L apron is Option 2. This location is functional and does not encroach on potential GA East development in the northeast area analyzed previously in this section.

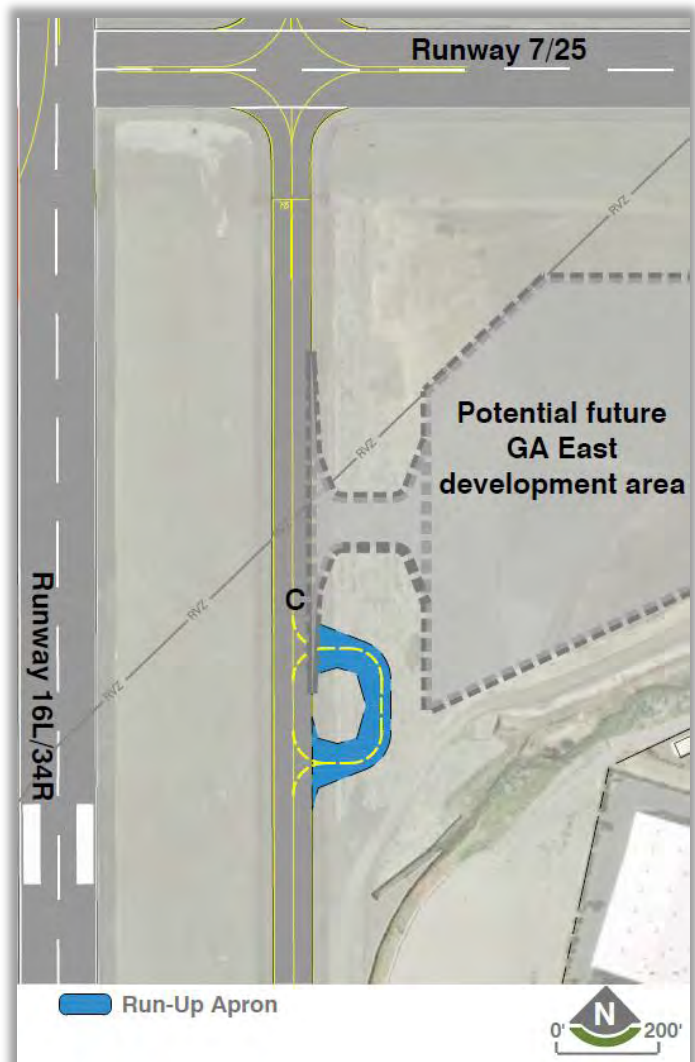
Runway 34R – Taxiway C

A run-up apron is proposed at the south end of Taxiway C near the departure end of Runway 34R (**Figure 4-61**) below. This apron would have minimal impact on the existing airfield and any proposed GA development in the southeast quadrant, which is described in more detail in the GA section.

When operational flow is south-to-north, GA aircraft departing on Runway 34R taxi more than 4,000 feet from the transient FBO apron. A run-up apron is proposed near the departure end of Runway 34R.

The only suitable location available for run-ups in this area was between the RVZ and the drainage ditch to the south. This position for the run-up apron will still allow for development in the southeast quadrant, as described in the Support Section above.

Figure 4-61: Runway 34R - Taxiway C Run-Up Apron



Runway 25 – Taxiway L

The team considered two run-up apron location options, shown in **Figure 4-62**, at the east end of Taxiway L, near the departure end of Runway 25. Option 1 is near the runway end, and Option 2 is near the intersection of Taxiways C and L.

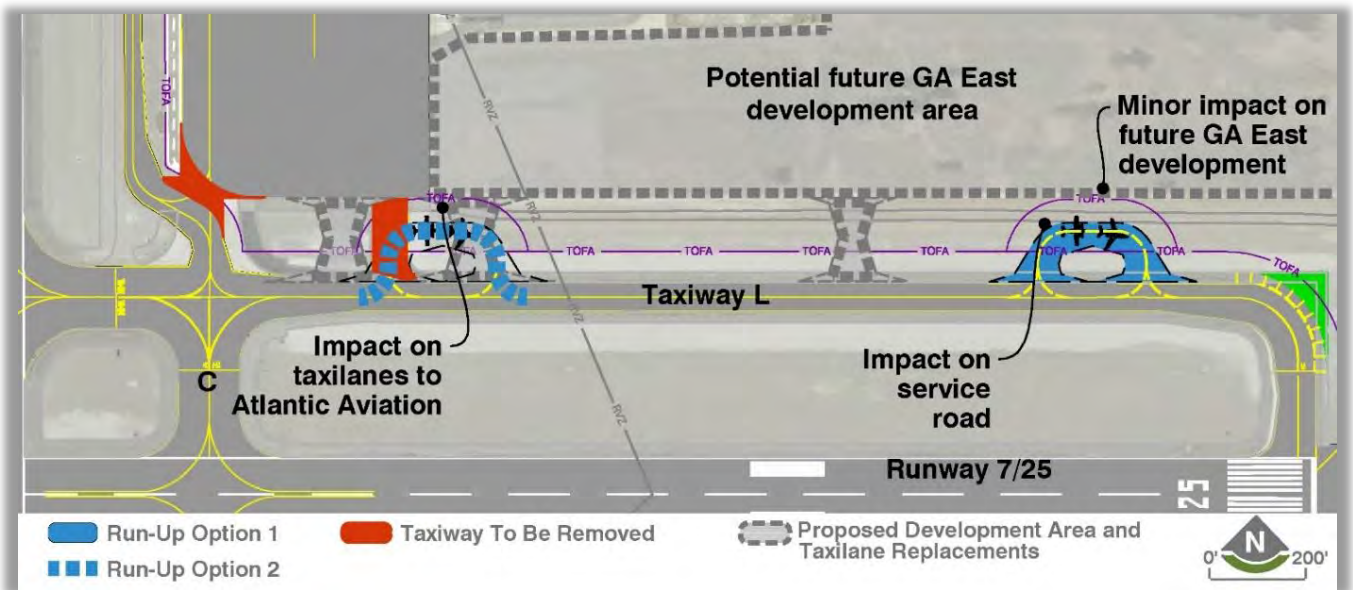
Option 1 would have minor impact on the existing service road and any future GA development in this area. This option is closer to the departure end of Runway 25 and reduces taxiing time for aircraft from run-up to departure.

Option 2 is proposed for aircraft prior to departures on Runway 7 or 25. Option 2 would require the elimination of the existing and proposed taxilanes into the Atlantic Aviation apron. This configuration may create a confusing pavement layout with the nearby Taxiway C, L, and Runway 7/25 intersections. A proposal to eliminate confusion, excess pavement, and the hot spot in this area is discussed previously under Taxiway C – Taxiway L Intersection.

Runway 25 – Taxiway L Run-Up Apron Recommendation

The recommended location for the Runway 25 apron is Option 1. This location does not encroach on the potential correction of the Taxiway C-L hot spot.

Figure 4-62: Runway 25 Run-Up Apron



Continued Maintenance and Operation of Existing Infrastructure and Facilities

In addition to the recommended improvements for the terminal, landside, support, and airside functional areas described in previous sections, it is equally important that RTAA continue maintaining its existing infrastructure and facilities. Many of these facilities will have to remain operational during the construction of terminal and landside improvements recommended earlier in this chapter. The continued maintenance and operation of current facilities is critical in maintaining day-to-day airport activities and public safety.

As noted in **Chapters 1 and 4**, an FCA was conducted early in the master plan process to determine the general condition of many RTAA selected facilities. The purpose of the FCA was to help RTAA prioritize their operational and maintenance needs through the planning period. The FCA analyzed the condition of MEP and communication infrastructure and the physical condition of each selected structure's roof, walls, and site work. The FCA focused on MEP systems within the terminal building and landside support facilities such as hangars, air cargo, maintenance buildings. A summary of each facility's remaining useful life, recommended improvements, and general estimate of future improvement costs are included in **Appendix A**.

Airside Improvement Phasing Plan and Summary

Figures 4-63, 4-64, 4-65 illustrate three proposed airside improvement phases, in this order of priority:

Phase 1

Correct FAA Hot Spots

- ❖ Taxiway A square corner on entrance taxiway to Runway 34L
- ❖ Taxiway C – L intersection with Atlantic Aviation
- ❖ Run-up aprons

North Deicing Apron

- ❖ Convert temporary storage facilities to relocated cargo hardstands with terminal expansion north. Reserve this pavement for future deicing apron.

Runway 16R CAT-II Approach

- ❖ Install midpoint and rollout RVRs on airfield for Runway 16R for instrument approach enhancement if the airspace analysis demonstrates that lower approach minimums can be achieved.



Phase 2

Correct Non-Standard FAA Design Taxiways for South Operational Flow

- ❖ Taxiway N removal and high-speed realignment
- ❖ Expansion of Taxiway M for cargo aircraft operations
- ❖ Taxiway L square corner on entrance to Runway 25

South Deicing Apron

- ❖ Develop south deicing apron with establishment of cargo facilities in southwest quadrant.

Excess Pavement Removal

- ❖ Taxiway F removal
- ❖ Taxiway Q removal
- ❖ Blast pad on runway 34L
- ❖ Taxiway A / Runway 16R and Taxiway D

Phase 3

Correct Non-Standard FAA Design Taxiways for North Operational Flow

- ❖ Taxiway J high speed realignment. This should be coordinated with any future terminal apron expansion, so aircraft exiting Taxiway J are not led directly onto the apron. This improvement facilitates flow for aircraft maneuvering near the terminal.



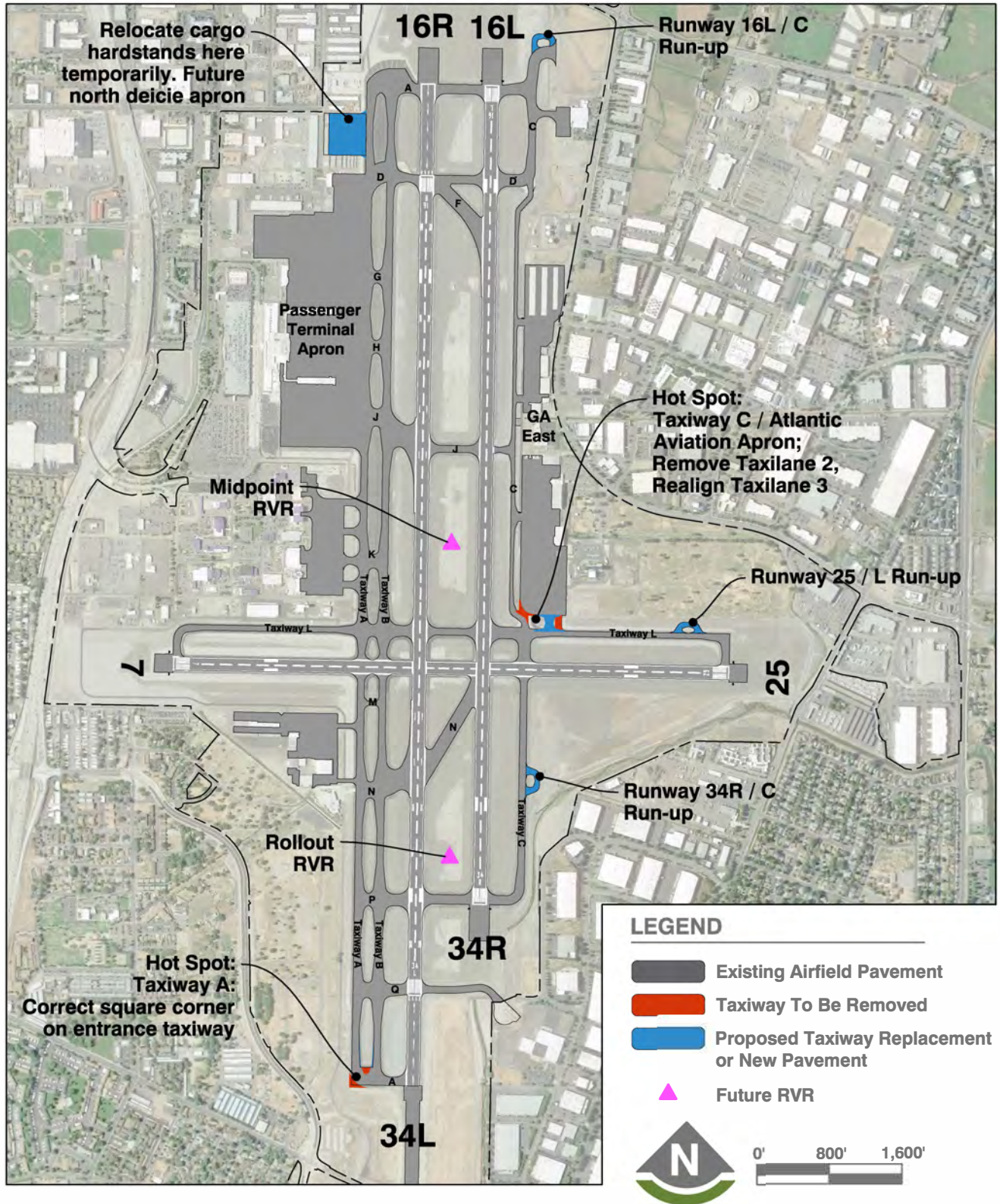


Figure 4-63
Airside Alternatives: Taxiways
Phase 1



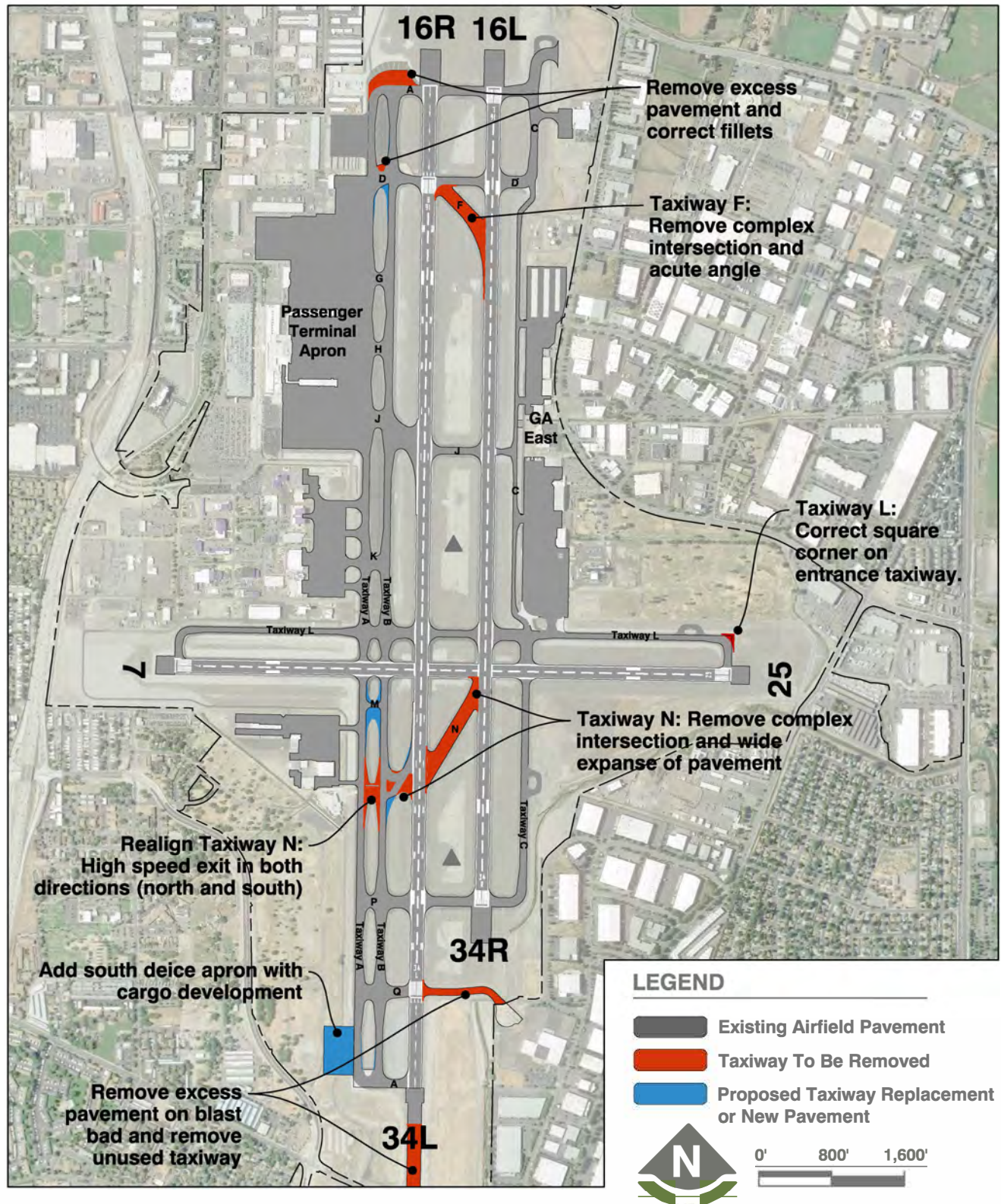


Figure 4-64
Airside Alternatives: Taxiways
Phase 2

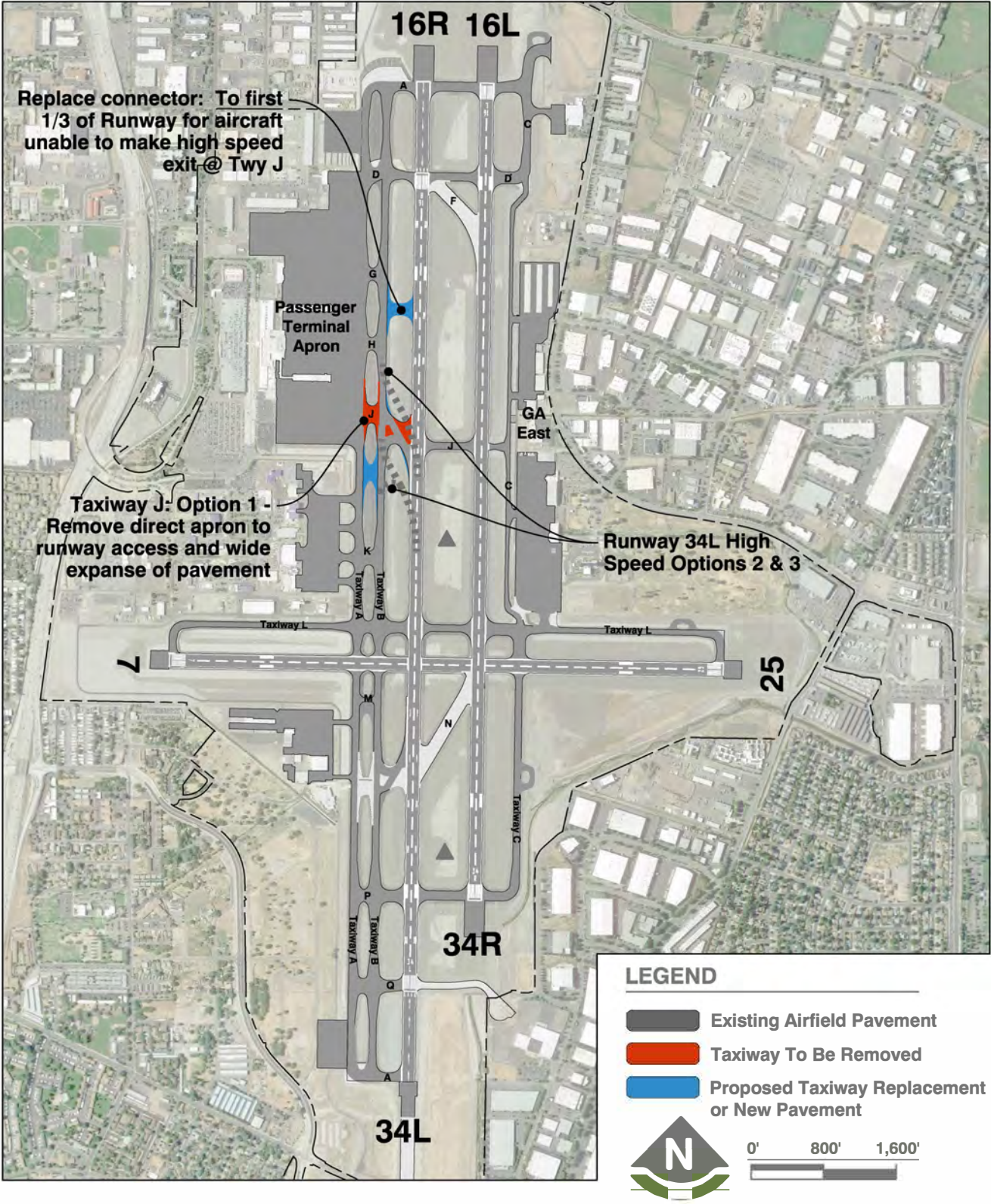


Figure 4-65
Airside Alternatives: Taxiways
Phase 3

Environmental Analysis

The consultant team performed a phased environmental analysis to identify the potential environmental effects associated with the proposed master plan alternatives.

- ❖ **Phase I - Comparative Analysis Among Alternatives:** The Consultant team performed the initial environmental analysis to identify the potential environmental effect of each proposed alternative based on the presence of known resources described in **Chapter 1**, the Environmental Overview section. The team considered the results of the comparative analysis while formulating a preferred alternative.
- ❖ **Phase II - Analysis of the Preferred Alternative:** The team performed a qualitative environmental analysis specifically for the preferred alternative that considered all environmental issues that the FAA would consider in a subsequent National Environmental Policy Act of 1969 (NEPA) analysis. The team used known resources described in **Chapter 1**, available data from other resources, and FAA guidance set forth in Order 1050.1F, *Environmental Impacts: Policies and Procedures*. The purpose of the Phase II analysis was to identify which components of the preferred alternative were likely to create impacts pursuant to NEPA. The identified impacts could then be considered in terms of subsequent project phasing, planning, budgeting, and scheduling.

Comparative Analysis Among Alternatives

The Consultant team performed a qualitative environmental analysis to compare the potential environmental effects associated with the Master Plan improvement projects proposed in each of the four functional areas: terminal, landside, support, and airside alternatives.

Table 4-7 provides a comparative summary of effects by alternative. As the table shows, many of the individual alternatives associated with a specific functional area are likely to lead to similar environmental effects.

Terminal Alternatives

As described earlier, the terminal alternatives consisted of three concourse alternatives, one ticket hall alternative, one CBP facility, and two SSCP alternatives.

The comparative analysis indicates the environmental effects are similar among the alternatives, as the construction of each alternative would be in a previously disturbed area and within the same general footprint as the existing terminal building and concourses. Construction of the new or reconfigured concourses would be on areas currently developed for landside or airside use. As a result, many of their potential environmental effects would be similar.



These environmental effects and the recommended mitigation measures would be associated with all terminal alternatives:

- ❖ **Noise:** Both permanent and temporary noise impacts are possible. Surface traffic associated with new or expanded landside facilities (additional curbside, parking, and rental car facilities), ground support vehicles, and other infrastructure are likely to lead to permanent increases in ambient noise levels. Temporary noise impacts associated with construction will occur, but construction noise can be reduced or minimized by using mufflers on some construction equipment and by adhering to local noise ordinances.
- ❖ **Air quality:** Construction and demolition typically create temporary air quality impacts. Best Management Practices (BMPs) can be applied to reduce these temporary impacts.
- ❖ **Cultural Resources:** The potential exists for discovery of unknown cultural resources during construction.
- ❖ **Hazardous and Solid Waste:** Building demolition can have potential effects from the presence, transport, and disposal of asbestos-containing material (ACM), lead paint, and other hazardous materials. Soil and groundwater located in or near previously disturbed areas have the potential to include contamination from aircraft or vehicle fuels. When discovered, hazardous materials must be transported and disposed of appropriately. The increased activity associated with proposed terminal facilities may also generate additional solid waste streams.

Concourse Alternatives

The environmental effects associated with concourse construction and operation would be similar among all three alternatives, as all three alternatives would require demolition and construction in previously disturbed areas associated with the curbside and aircraft apron.

Alternative A – Compact

Alternative A includes replacing the existing concourses with two new 12-gate concourses and allows for the future addition of a third concourse. The air cargo building would be displaced in the future when the third concourse is added.

Alternative B – Centralized

Alternative B includes replacing the existing concourses with two new 12-gate concourses and allows for the future addition of a third concourse. Like Alternative A, construction of the third concourse would displace the air cargo building. Unlike Alternative A, the concourses in Alternative B would be located farther apart to allow for two-way taxilanes between concourses.



Alternative C – 3-Pier

Alternative C includes replacing the existing concourses with two new 12-gate concourses and adding a third concourse in the near term. Deicing aprons would be added at the north and south ends of the terminal aprons. This alternative is the largest footprint and would displace additional air cargo facilities and other facilities to the north. Although the same temporary and permanent environmental impacts would be associated with the construction and operation of Alternative C, the extent would be comparatively greater based on the need to demolish and relocate additional cargo facilities.

All three concourse alternatives have similar layouts, footprint areas, and number of gates, resulting in no appreciable environmental differences among the construction and operation of the alternatives. However, the potential impacts associated with the construction of Alternative C would be greater based on its larger footprint and the need to relocate/construct additional cargo facilities.

Ticket Hall Alternative

The single ticketing hall alternative includes new vestibules and restrooms that would extend the building footprint into the existing curbside area. Because this alternative would be constructed in a previously developed area, only temporary construction impacts would be anticipated.

Customs and Border Protection Facility Alternative

The single CBP facility alternative relocates the CBP facility to level 1 of the middle concourse. Because this relocation is to an existing building, it has no environmental effects.

Security Screening Check Point Alternatives

The team identified two security screening check point alternatives. Both alternatives expand the overall size of the SSCP to accommodate an increase in passenger activity and TSA screening equipment.

Alternative A – Expansion to East

Alternative A aligns the TSA lanes east-west, expanding the terminal building to the east into the existing apron.

Alternative B – Expansion to West

This alternative aligns the TSA lanes north-south, expanding the SSCP to the west into the existing terminal building.

The environmental effects of each alternative appear to be equivalent. Each would affect previously disturbed areas and create temporary construction impacts.



Landside Alternatives

Landside alternatives consider improvements to the terminal roadway, curbside, public parking facilities, and the public portion of the rental car facilities. Five parking area alternatives and four rental car alternatives are proposed. However, given the interdependence among the various landside components, the selection of one parking alternative could exclude the selection of one or more of the rental car alternatives. Despite these individual alternatives having some differing effects, the environmental effects of all the landside alternatives are similar, as all would be developed in previously disturbed areas within airport boundaries and build upon existing facilities.

These are the anticipated environmental effects and the recommended mitigation measures for landside alternatives:

- ❖ **Noise:** Both temporary and permanent increases in ambient noise levels are possible. Additional surface traffic associated with the operation of new parking facilities and other infrastructure would likely cause increases in ambient noise, but these increases would likely not exceed regulatory thresholds. Temporary noise impacts would be associated with the use of construction vehicles and equipment. These temporary impacts can be minimized using mufflers on some equipment and by adhering to local noise ordinances.
- ❖ **Air quality:** Increased vehicle use may create potentially permanent air quality effects, and construction would lead to temporary air quality impacts. Applying available BMPs can reduce these temporary impacts.
- ❖ **Hazardous Materials and Solid waste:** It is possible that petroleum-contaminated pavements and subsurface soils will be encountered during demolition and construction. Increased operations have the potential to generate more solid waste.
- ❖ **Water quality:** It is possible that petroleum-contaminated groundwater will be encountered during demolition and construction. Additional parking and the relocation of the QTA would create potential effects to water quality. The Stormwater Pollution Prevention Plan and the Spill Prevention Control and Countermeasure Plan (SPCC) should be revised to accommodate any changes from the new parking area and from vehicle washing and stormwater runoff.

Parking Alternatives

All parking alternatives would be constructed in previously disturbed areas near the existing parking and rental car areas. All would affect previously disturbed areas.

Alternative A – Fourth Level Addition

Alternative A includes the construction of a fourth level on the existing parking garage for a net gain of 800+ spaces.

Alternative B – South Addition

Alternative B includes a southward expansion of the parking garage to include a second and third level addition over the existing south lot for a net gain of 900+ spaces.



Alternative C – North Addition

Alternative C includes a northward expansion of the parking garage to include a second and third level addition over the existing rental car area for a net gain of 500+ spaces.

Alternative D – Expanded North Addition

Alternative D includes a northward expansion of the parking garage to include a second and third level addition. In addition, the terminal loop roadway would be extended farther to the north to allow for a larger expansion of the garage, which would yield a net gain of 900+ spaces.

Alternative E – Lot Near Air Cargo

Alternative E includes the construction of a new parking surface lot in the existing air cargo area north of the ring road.

Although all options would result in temporary construction impacts, Alternatives A and B would result in comparatively minor construction impacts based on the limited demolition associated with the garage expansion. Alternatives C and D would require relocation of the car rental facility, which would involve more extensive construction and result in comparatively greater air quality, noise, and vehicle traffic. Water quality effects also would be associated with the stormwater management for the new rental car operation, which may include contamination from vehicle washing and fueling. Alternative E could affect air quality and noise resulting from traffic congestion and circulation, since the parking would be bisected by the terminal loop roadway.

Alternative D could result in relative greater temporary traffic impacts compared to the other alternatives, as it would require the relocation of the terminal loop roadway and additional construction and congestion in the airport vicinity.

Rental Car Alternatives

All rental car alternatives would be constructed within previously disturbed areas associated with the existing parking and rental car pavement areas, and all would create temporary construction impacts.

Alternative A – Parking Structure

Alternative A includes locating the rental car counter in the parking garage and the QTA to the north.

Alternative B – South Surface Lot

Alternative B relocates the rental car facility to the existing south surface lot.

Alternative C – Split Operations

Alternative C relocates the drop-off and QTA facilities to the existing south surface lot but keeps the counter and rental ready cars at the north end of the parking lot.



Alternative D – Air Cargo

Alternative D relocates the rental car facility to the north of the terminal loop roadway in the existing air cargo area.

Alternative A would likely result in the fewest temporary and permanent environmental impacts, as QTA activities (vehicle cleaning, fueling, etc.) would not be relocated.

Alternative C has the potential to create the greatest operational impacts because it separates the rental ready facilities from the rental return facilities. Additional air quality and ambient noise effects may occur as the cars must be moved from one area to another, which may also increase surface traffic and congestion in the terminal area, especially during peak travel times. In comparison, Alternative D would separate the parking area from the rental car facility to improve circulation in the busy terminal area. Additional stormwater management and water quality facilities would be needed to address water quality for the new rental car facility.

Airside Alternatives

Generally, the runway and taxiway system is in good condition; however, some taxiways do not comply with current FAA taxiway geometry standards, specifically FAA designated hot spots, intersections, and hold lines. Additional deicing areas are recommended to accommodate increased aircraft operations forecasted during the 20-year planning period.

The anticipated environmental effects and the recommended mitigation measures for airside alternatives are identified below:

- ❖ **Noise:** Both permanent and temporary noise impacts are possible. Additional aircraft and vehicle traffic may create permanent noise impacts, and construction noise would cause temporary impacts. Temporary construction impacts can be minimized using mufflers on some equipment and by adhering to local noise ordinances.
- ❖ **Air quality:** Increased vehicle use could create potentially permanent air quality effects, and construction could create temporary air quality impacts. Applying available BMPs can reduce these temporary impacts.
- ❖ **Cultural:** The potential exists for discovery of unknown cultural resources during construction.
- ❖ **Water quality:** There will be potential impacts to water quality from the additional deicing aprons and storage of deicing fluids. Capture rates are expected to increase over what is collected at the time of the report once deicing pads are added. The Stormwater Pollution Prevention Plan and the SPCC should be revised to accommodate any changes due to the support facilities.
- ❖ **Hazardous materials:** Soils and pavements associated with aircraft movement areas have the potential to include contamination from aviation and vehicle fuels. If fuel-contaminated soils or pavements are encountered during construction or demolition for new airside facilities, it would require removal, transport, and disposal as a hazardous material in accordance with applicable federal and state regulations.



Deicing Aprons

The north deicing apron is located at the northwest end of the airport in the existing air cargo area. The north apron creates a potential need to relocate and demolish existing buildings and pavement, which could cause additional construction and cumulative environmental impacts. The south deicing apron is at the southwest end of the airport adjacent to Taxiway A. The south apron would be located partially on existing impervious area, which could potentially increase drainage effects.

Taxiways and Run-up Aprons

Changes to taxiways and run-up aprons address all identified non-standard geometry and include demolition, construction, and pavement relocation. Although there will be changes in pavement, there is no appreciable difference in environmental effects.

Support Facility Alternatives

The expansion of the terminal building and its concourses, the relocation of the GA west area, and the relocation of air cargo will affect several existing support facilities. This master plan describes two air cargo alternatives, two alternatives for each of four GA areas, one maintenance and support alternative, and three ARFF alternatives.

These are the anticipated environmental effects and the recommended mitigation measures for support facility alternatives:

- ❖ **Noise:** Both permanent and temporary impacts are possible. Traffic from new facilities and infrastructure may cause permanent noise impacts, and construction is likely to cause temporary impacts. Temporary construction impacts can be minimized using mufflers on some equipment and by adhering to local noise ordinances.
- ❖ **Air quality:** Construction activities and increased aviation and vehicle traffic have the potential to increase emissions of priority pollutants. Operational changes in vehicle-related emissions can be reduced through the application of BMPs (for example, electrified gates, use of emissions-free or hybrid vehicle fleet, etc.).
- ❖ **Biological issues:** Construction of new facilities in previously undeveloped areas could lead to effects to biological resources. GA Area D includes the development of an 840,000-square-foot retention basin that could potentially attract hazardous wildlife species. Designs for all project-related structures, landscaping, and stormwater management facilities will require the review of a qualified airport wildlife biologist to prevent the development of potential hazards.
- ❖ **Cultural:** There is the potential to discover unknown cultural resources during construction.
- ❖ **Solid and Hazardous Waste:** Building demolition can have potential effects from the presence, transport, and disposal of ACM, lead paint, and other hazardous materials. When these materials are discovered, they must be transported and disposed of appropriately. Some of the proposed facilities also would likely include the use, transport, disposal and storage of potentially hazardous materials, such as fuels, solvents, and firefighting chemicals. Increased activity would be likely to generate additional solid waste streams.



- ❖ **Drainage and floodplain issues** – Much of the airport is within the 500-year floodplain, which means the Airport has a one in five hundred chance of experiencing a catastrophic flood event each year. A portion of the airport is also within Critical Flood Zone 1 as defined by the City of Reno’s Land Development Code. To prevent adverse effects on flood protection facilities such as detention basins, spillways, and /or underground storage areas, all project components associated with the preferred alternative must comply with the City of Reno’s Land Development Code.
- ❖ **Water quality** – There will be potential impacts to water quality from the additional impervious surfaces and construction of new facilities, maintenance and repair areas, and transport, handling, and storage of fuels and solvents. The Stormwater Pollution Prevention Plan and the SPCC should be revised to accommodate any changes due to the support facilities.
- ❖ **Wetlands** – The GA facilities could impact Dry Creek/Boynton Slough, an onsite jurisdictional wetland tributary to the Truckee River. The additional impervious surfaces have the potential to increase flows to Boynton Slough and degrade water quality within jurisdictional waters including Steamboat Creek and the Truckee River. In addition, temporary construction activities could result in siltation and other impacts to jurisdictional waters. Steps RTAA can take to avoid or minimize these potential impacts are to consult with the Army Corps of Engineers, as required by NEPA, to construct additional water quality facilities, and to use construction BMPs.

Air Cargo Alternatives

There are two air cargo alternatives that have different building configurations within an almost identical 75-acre footprint at the southwest end of the airport.

Alternative A – North-South Linear Alignment

Alternative A places the landside facilities, warehouse, and apron in a north-south alignment such that the entire apron area is adjacent to the taxiway and the warehouses align end to end in a single row. This alignment includes 2,255,000 square feet of apron, five individual 96,000-square foot warehouses, and 937,000 square feet of landside facilities.

Alternative B – East-West Pier Alignment

Alternative B places the landside facilities and warehouses in a pier configuration with apron areas between the buildings. This alignment includes 2,436,000 square feet of apron, five individual 96,000-square foot warehouses, and 771,000 square feet of landside facilities.

There is no appreciable difference between the two air cargo alternatives since they occupy the same overall footprint.



General Aviation Alternatives

Four areas are identified for GA services. Areas A – Northeast, B – Central, and C – Brookside are at the northeast end of the airport adjacent to Runway 16L and 25. Area D – Southeast is immediately south of Runway 25. Each of the four areas has two development alternatives as described below.

Area A – Northeast

Area A is located between South Rock Boulevard and Taxiway C at the northeast corner of the airport. It currently contains a single facility hangar with vacant land to the north and south. These are the two development alternatives for Area A: A1 – Expansion of the site for maintenance repair overhaul, or A2 – GA hangars.

Area B – Central

Area B is immediately south of Area A and currently houses 975,000 square feet of development including 63 hangars. These are the two development alternatives for Area B: B1 – Conversion of the area to maintenance repair overhaul/FBO, and B2 – No change.

Area C – Brookside

Area C is currently undeveloped land south of Areas A and B and immediately north of Runway 25. These are the two development alternatives for Area C: C1 – Development of general aviation hangars, or C2 – Development of maintenance repair overhaul/FBO.

Area D – Southeast

Area D is currently undeveloped land immediately south of Runway 25 and east of Taxiway C. These are the two development alternatives for Area D: D1 – Development of general aviation hangars, or D2 – Conversion of the area to maintenance repair overhaul/FBO.

The only difference between the two alternatives within each GA area is associated with the land use for Alternative B2. B2 proposes no change to existing conditions, and therefore, would result in no environmental effects. Areas A, B, and C are within the 500-year floodplain, but Area D is located within the 100-year floodplain, which means there is a one percent chance each year that a flood event exceeding the limits of the 100-year floodplain may occur.

Area C would create the greatest footprint of the options proposed, and it has the potential to pose risks to aircraft operations. Area C development would include an 840,000-square-foot retention basin in addition to the 840,000 square feet of impervious development area. GA operations can include the use of hazardous materials, such as fuels and solvents, which could affect water quality. The approximately 19-acre retention basin that would be associated with Alternative C has the potential to attract hazardous wildlife species to the aircraft movement area. To prevent the creation of a wildlife attractant, the pond will be developed to be consistent with FAA guidelines in Advisory Circular 150/5200-33B, *Wildlife Hazard Attractants on or near Airports* (AC-33B).



GA area D would be constructed adjacent to a jurisdictional wetland, Boynton Slough. The operation of a GA facility could create ongoing water quality impacts to the slough. In addition, the proposed access crossing over Boynton Slough could cause direct and permanent impacts to jurisdictional wetlands and waters of the U.S.

Maintenance and Support Alternative

The single maintenance and support alternative consolidates and modernizes the existing maintenance and support facility adjacent and to the north of Runway 7. This includes the demolition and replacement of several existing buildings within the campus. Assuming the uses and overall footprint of the campus facilities remain substantially unchanged, any potential impacts would be temporary.

Aircraft Rescue and Firefighting Alternatives

There are three alternatives for the relocation of the ARFF facility. The existing ARFF is adjacent to Taxiway A south of Runway 7/25.

- ❖ ARFF east would relocate the ARFF north of Runway 7/25 adjacent to Taxiways A and L.
- ❖ ARFF west would relocate the ARFF west and north of Runway 7/25 at the west end of the maintenance and support campus.
- ❖ ARFF south would relocate the ARFF north of its existing location adjacent to Runway 7/25.

There is no appreciable difference in environmental impacts among the three ARFF relocation alternatives. Each would be developed in a previously disturbed area of the airport, and each would create temporary air quality and noise impacts. In addition, it is possible that hazardous materials may be encountered in the form of contaminated soils during the demolition of existing structures, in relation to the use of petroleum-based fuels and the use and storage of firefighting materials.

Permanent or operational impacts associated with ARFF construction and operation are likely to be similar to those associated with current operations: ARFF operations are likely to require the on-site transport, use and storage of hazardous materials associated with firefighting operations and the disposal of hazardous materials in accordance with federal and state regulations.

Summary of Potential Functional Area Environmental Impacts

Overall, the potential impacts resulting from the proposed improvements for each functional area include noise, air and water quality, biological resources, drainage, floodplains, and wetlands, and the variation of effects between alternatives by each functional area is minimal. **Table 4-7** summarizes potential environmental effects of each alternative within the four functional areas.



Table 4-7: Comparative Summary of Environmental Effects by Alternative

Improvement Area	Alternatives				
Terminal Alternatives					
Concourse	Compact	Centralized	3-Pier*		
	- All alternatives constructed within existing terminal area and apron. - No appreciable environmental difference among alternatives. - Noise effects from surface traffic, new facilities and construction. - Air quality effects from traffic from new facilities and construction. - Potential cultural effects from discovery of unknown resources during construction. - Potential solid and hazardous waste effects from presence, transport, and disposal of asbestos-containing material (ACM), lead paint, and other hazardous materials associated with building demolition, as well transport and disposal of potentially hazardous materials. - Potential fuel contamination in soils and groundwater discovered during demolition and construction.				
			Higher air quality effects from more demolition.		
Ticketing Hall	- Construction within existing curbside. - No appreciable environmental effects.				
Customs and Border Patrol Facility	- Located within existing building. - No appreciable environmental effects.				
Security Expansion	Large Expansion (East)*	Small Expansion (North)			
	- Both alternatives constructed within existing apron. - No appreciable environmental difference between alternatives.				
	Greater expansion footprint, but all on existing apron.				
Landside Alternatives					
Parking	Level 4 Addition (+800)	Level 2 and 3 Addition to South (+900)	Level 2 and 3 Addition to North (+500)*	Level 2 and 3 Addition to North and Extend loop road (+900)	Surface Lot near Air Cargo (+600)
	- All alternatives constructed within in existing impervious areas. - Noise effects from construction and additional vehicle use. - Air quality effects from construction and additional vehicle use. - Potential effects to water quality from larger parking areas.				
	No demolition - decreased noise and air effects.	No demolition - decreased noise and air effects.	Relocation of Consolidated Rental Car Facility – increased noise, air, water quality.	- Temporary roadway impacts – increased traffic effects. - Relocation of Consolidated Rental Car Facility.	Bisects parking areas. May increase local circulation traffic.
Rental Car	Parking Structure	South Surface Lot	Split Operations	Air Cargo*	
	- All alternatives constructed within existing impervious areas. - Noise effects from construction and additional vehicle use. - Air quality effects from construction and additional vehicle use. - Potential effects to water quality from relocated QTA area.				
	No increased footprint.	Potentially greater water quality impacts associated with relocated QTA.	- Potentially greater congestion in terminal area with split services. - Potentially greater water quality impacts associated with relocated QTA.	- Potentially greater water quality impacts associated with relocated QTA. - Potentially less terminal area congestion as alternative location is segregated from parking and drop off.	
Airside Alternatives					
Deicing Aprons	- Noise effects from vehicle traffic and construction. - Air quality effects additional aircraft and vehicle traffic and construction. - Potential cultural effects from discovery of unknown resources during construction. - Potential water quality effects from use and storage of deicing fluids.				
Taxiways	- Noise effects from vehicle traffic and construction. - Air quality effects additional aircraft and vehicle traffic and construction. - Potential cultural effects from discovery of unknown resources during construction.				

Support Facility Alternatives					
Cargo Alternatives	North-South Linear Alignment*		East-West Pier Alignment		
	- No appreciable environmental difference between alternatives; same overall footprint. - Noise effects from new facilities and construction. - Air quality effects from new facilities and construction. - Potential cultural effects from discovery of unknown resources during construction. - Developing vacant land - Biological issues - Water quality issues - Drainage issues - Potential solid and hazardous waste effects from presence, transport, and disposal of asbestos-containing material (ACM), lead paint, and other hazardous materials associated with building demolition, as well transport and disposal of potentially hazardous materials. Additional solid waste streams would be associated with increased activity.				
General Aviation	Effects common to all areas: - Noise effects from new facilities and construction. - Air quality effects from new facilities and construction. - Potential cultural effects from discovery of unknown resources during construction. - Potential solid and hazardous waste effects from use, transport, disposal and storage of potentially hazardous materials, such as fuels and solvents. Additional solid waste streams would be associated with increased activity.				
	Area A1 and A2 - Developing vacant land - Biological issues - Water quality issues - Drainage - located within 500-year floodplain				
	Area B1 - Developing vacant land - Biological issues - Water quality issues - Drainage - located within 500-year floodplain	Area B2 - Maintain existing - No environmental effects			
	Area C1 and C2 - Developing vacant land - Biological issues - Water quality issues - Drainage - located within 500-year floodplain - Additional impervious (840,000 SF) is adjacent to non-jurisdiction ditch; don't want to create wetlands with basin 840,000 SF retention basin is potential wildlife attractant				
	Area D - Developing vacant land - Biological issues - Water quality issues - Drainage issues – located within 100-year floodplain - Potential crossing of jurisdictional Boynton Slough and adjacent impervious development (680,000 sf).				
Maintenance and Support Campus	- Temporary construction noise effects. - Temporary construction air quality effects. - Potential solid and hazardous waste effects from presence, transport, and disposal of asbestos-containing material (ACM), lead paint, and other hazardous materials associated with building demolition, as well transport and disposal of potentially hazardous materials. Additional solid waste streams would be associated with increased activity.				
ARFF	East	West	South		
	- All alternatives constructed within existing impervious areas. - No appreciable environmental difference between alternatives. - Noise effects from construction. - Temporary construction air quality effects. - Potential solid and hazardous waste effects from use, transport, disposal and storage of potentially hazardous materials, such as fuels, solvents, and firefighting chemicals. Additional solid waste streams would be associated with increased activity.				

Key: * Preferred alternative

Preferred Alternative

Airport Layout Plan Review and Approval

The preferred alternative improvements will be illustrated on a proposed Airport Layout Plan (ALP) and submitted to FAA for review and approval. The projects or features shown on the ALP will be presented in three categories: near-term projects, which may be developed within five years of ALP completion; mid-term projects, which may be within 6 to 10 years; and long-term projects, which may not be needed for 11 to 20 years. For each project or feature that RTAA decides to implement associated with the preferred alternative, a separate stand-alone analysis that complies with NEPA and other state and local environmental laws must occur prior to FAA approval, construction, or federal funding (if requested).

According to FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Procedures for Airport Projects*, and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, FAA can issue three types of ALP approvals:

- ❖ **Conditional ALP approval:** Indicates the proposed features and facilities are safe and efficient for airport operations and use, but the features or facilities may not be necessary at this time or are not ripe for federal decision. Conditionally approved features or facilities may be depicted on an ALP, but conditional approval does not authorize the airport sponsor or project proponent to construct the facilities shown on the conditionally approved ALP. A conditional ALP approval normally qualifies as a categorical exclusion FAA Order 1050.1F.
- ❖ **Unconditional ALP approval:** Indicates the features and facilities are safe and efficient for airport operations and use and that the features are ripe for federal decision. To provide an unconditional approval, FAA must have already completed the environmental review process for the near-term and immediate-term development. Upon the receipt of an unconditional approval, the airport sponsor or project proponent may be eligible for federal funding and begin to construct the facilities depicted on the unconditionally approved ALP.
- ❖ **A Mixed Approval:** Provides both unconditionally and conditionally approved projects on the same ALP. FAA often provides mixed approvals on ALPs associated with master plans that present various airport development projects over a long period of time. In such cases, mixed ALP approval would require NEPA analysis to support an unconditional approval for the near-term and immediate-term development projects that are ripe for decision. However, a mixed ALP approval would not require an environmental review for long-term development projects that are not yet ripe for decision. The long-term components of the ALP would receive unconditional approval only after NEPA review.



Analysis of the Preferred Alternative

This master plan effort did not include the preparation of a stand-alone environmental evaluation pursuant to NEPA. However, the potential environmental effects associated with the implementation of the preferred alternative have been considered in accordance with FAA Orders 5050.4B, 1050.1F, subsequent executive orders, and/or other applicable laws and guidance.

The Consultant team performed a qualitative analysis to identify the potential environmental impacts associated with both construction and operation of the improvements included as part of the preferred alternative. The team performed the analysis using the data presented in the environmental overview section of **Chapter 1**, and the alternative recommendations identified for the terminal, landside, airside, and support facilities. As described, a standalone quantitative environmental analysis will be required to obtain unconditional ALP approval and approval to construct many of the individual improvement projects identified. (Some projects may be eligible for a categorical exclusion.) Since environmental analyses are valid for a limited period (usually three to five years), RTAA should conduct a detailed NEPA analysis for specific projects or groups of projects as they are needed, such as those associated with near-term development. This process will provide RTAA with flexibility to consider the need for proposed improvements considering potential operational changes, demand, or other factors and eliminate the need for repeated or supplemental environmental studies.

Project Components

Table 4-8 shows the terminal, landside, airside, and support facility projects that comprise the preferred alternative.

Table 4-8: Preferred Alternative Components

Terminal Area Projects	Improve terminal concourses, including: • Replace Concourses B and C. • Construct a third concourse (Concourse C).
	Construct a new CBP facility in Concourse C (level 1).
	Improve and expand the airport terminal (ticketing hall, passenger flow, and security).
Landside	Expand the parking garage to include approximately 500 additional spaces.
	Relocate and improve the rental car ready/return and QTA areas.
Airside	Improve the taxiway system to include hot spot mitigation, compliance with design standards, and run-up aprons.
	Establish dedicated deicing aprons.
Support Facilities	Relocate air cargo facilities to the southwestern quadrant between Airway Drive and Taxiway A.
	Construct new GA facilities and infrastructure on the east side.
	Consolidate existing maintenance and support facilities at a centralized campus.
	Relocate the ARFF.



The following qualitative analysis considers how compatible proposed facilities are with existing environmental features, identifies potential strategies or general measures to avoid or minimize potential impacts, and how the preferred alternative coincides with RTAA's sustainability programs and goals. Based on the results of the analysis, project timelines and order-of-magnitude cost estimates can be developed for subsequent NEPA analysis, mitigation, and environmental permitting. The analysis addressed all environmental issue areas identified in FAA Order 1050.1F.

Summary of Likely Environmental Effects

As described in the following paragraphs, the proposed project is not likely to lead to increased aircraft operations that would cause permanent impacts to air quality or noise. Moreover, all proposed improvements would occur within previously developed areas on Airport-owned property; therefore, permanent adverse impacts to sensitive receptors, such as nearby residents, are not anticipated. Social impacts are likely to be positive, as many of the proposed Master Plan projects have the potential to create temporary and permanent jobs and provide indirect, positive effects on the local economy.

Water quality issues, potential floodplain encroachment, and potential impacts to jurisdictional wetlands and waters of the U.S. may occur in association with the creation of new deicing facilities and proposed development near Boynton Slough. Close coordination with regulatory agencies will be required so that acceptable project designs and mitigation measures can be developed to avoid and reduce potential impacts to less than significant.

Noise

Aircraft Noise Exposure

Title 14 of the Code of Regulations (CFR) Part 150, "Airport Noise Compatibility Program," is the primary regulation that guides planning for aviation noise compatibility near airports. The RTAA initiated its first FAR Part 150 Noise Compatibility Study in 1989. RTAA updated the FAR Part 150 study in 2000, and the final study was approved by the FAA in 2004. Forecasts used to develop the Part 150 study anticipated that RNO would support a total of nearly 152,000 operations in 2020, which would include approximately 133,000 airline operations and 18,700 cargo operations (RTAA 2002). The forecasts used to prepare the Part 150 study reflected the actual operations from 1990 to 1997, when RNO experienced an unprecedented growth in passenger enplanements following the expansion of low-fare service from Reno Air, Southwest airlines, and U.S. economic expansion.



Chapter 2 identifies anticipated aircraft activity for the 20-year period from 2016 to 2036. Calculations for the forecast use the actual number of aircraft operations at RNO in 2016. That number fell far short of the number of operations forecasted for 2016 in the 2002 Part 150 study for a variety of reasons:

- ❖ Nationwide decreases in air travel following the terrorist attacks of September 11, 2001;
- ❖ Financial pressures, such as increased fuel prices and an economic recession in 2001, which led to the downfall of low-fare carrier Reno Air; and
- ❖ The Great Recession of 2008.

Although airline and air cargo operations are anticipated to increase over the 20-year planning period, the overall increase is unlikely to exceed the number of operations identified in the 2004 Part 150 Study. In addition, the component projects associated with the preferred alternative would not cause the number of aircraft operations at RNO to increase but would increase operational efficiency for existing and forecasted operations. No permanent increases in aircraft noise exposure is anticipated.

Non-aviation Noise

Although aviation forecasts are unlikely to exceed those identified in the 2004 Part 150 study, enplanements are anticipated to increase over current levels throughout the 20-year planning period (2015 to 2036). The anticipated increase in enplanements will increase the number of passengers traveling to and from the airport and increase surface traffic on interior and adjacent roadways at and near the terminal and in other landside areas. Non-aviation noise would be associated with these increases. Additional noise could also be associated with the operation of new support facilities (expanded cargo facilities, maintenance and support facilities, and additional GSE). However, the noise effects associated with these activities are likely to remain entirely within the airport property boundaries. Increases in vehicle traffic on nearby streets may occur, but this effect could be reduced through vehicle travel routes to and from the airport that will avoid residential neighborhoods.

Temporary construction noise impacts will occur on the airport and nearby streets as construction vehicles travel to and from a project site. These temporary impacts could be minimized using mufflers on some equipment and by adhering to local noise ordinances. That may mean limiting the hours during which construction is performed. When the NEPA analysis is performed to support ALP or project approvals, additional measures to avoid and minimize temporary noise impacts will be identified.



Air Quality

Pursuant to the Clean Air Act, the Environmental Protection Agency has established National Ambient Air Quality (NAAQS) standards for specific pollutants known as priority pollutants. Constructing and operating the preferred alternative has the potential to increase air emissions due to:

- ❖ Additional terminal facilities and their operation (HVAC, etc.);
- ❖ Additional passenger vehicle trips and rental car trips associated with forecasted changes in aircraft operation;
- ❖ Additional aircraft and ground service vehicle emissions associated with forecasted aircraft operations and new facilities;
- ❖ The operation of new support facilities, such as additional GA hangars, aircraft maintenance facilities, cargo facilities and operations, and a relocated and enhanced ARFF facility;
- ❖ Project-related demolition; and
- ❖ Temporary emissions associated with construction equipment and vehicles.

As identified in **Chapter 1**, RNO is in an attainment or maintenance area for criteria pollutants. Construction activities have the potential to increase emissions of priority pollutants but use of available BMPs can reduce these temporary impacts. For example, BMPs that address operational changes in aircraft and vehicle-related emissions are electrified gates, use of an emissions-free or hybrid vehicle fleet, etc. Subsequent NEPA analysis required to support ALP or individual project approvals will identify additional measures or recommendations to minimize impacts to air quality.

Historical, Architectural, Archaeological, and Cultural Resources

In accordance with NEPA and Section 106 of the National Historic Preservation Act (NHPA), the FAA is responsible for analyzing the potential impacts of a proposed project on historical, architectural, and cultural resources.

A total of 23 cultural resources have been recorded within RNO boundaries, and the former Steele Ranch was determined to be eligible for the National Register of Historic Places (NRHP). None of the components of the preferred alternative will be constructed at the former Steele Ranch, and many components will be constructed on previously disturbed areas. However, it is possible that previously unknown resources can be discovered during construction activities. BMPs may be implemented before and during construction to avoid and reduce potential impacts to previously unknown cultural resources.



Biological Resources

Section 7 of the Endangered Species Act of 1973, as amended, requires federal agencies to ensure that a proposed action does not jeopardize the continued existence of any endangered or threatened species or adversely affect its habitat.

Federally Listed Species

Four federally listed threatened species and one endangered species are known to occur in Washoe County:

- ❖ Warner sucker (*Catostomus warnerensis*) – threatened
- ❖ Lahontan cutthroat trout (*Oncorhynchus clarkia henshawi*) – threatened
- ❖ Cui (*chasmistes cujus*) – endangered
- ❖ Sierra Nevada yellow-legged frog (*Rana sierra*) – threatened
- ❖ Yellow-billed cuckoo (*Coccyzus americanus*) – threatened

All components associated with the preferred alternative would be constructed in previously disturbed areas, and many would occur on previously paved areas that do not provide wildlife habitat (terminal area projects, landside projects, and airside projects). In addition, none of these species were identified in proximity to the airport during previous wildlife surveys at RNO. Some aviation support facilities will be constructed in previously unpaved areas (air cargo facilities, MRO/FBO facilities, and GA facilities) in which biological resources may be. For example, the southeast GA area (Area D) is adjacent to a jurisdictional waterway, which means biological resources may be present.

Subsequent field studies required by federal and state authorities will be performed to comply with NEPA, and the results will be used to identify whether listed species or their habitat are likely to be present on or near the airport, including the adjacent Truckee River. The results will also be used to determine whether the construction or operation of the preferred alternative could cause adverse effects. If potential effects to listed species are identified, this will require coordination with other federal resource agencies. Subsequent project designs will also be necessary to avoid and minimize potential impacts such as water quality.

Wildlife Hazards to Aircraft

FAA warns against the presence or creation of hazardous wildlife attractants within 10,000 feet of aircraft movement areas at airports that support turbine-powered aircraft. The proposed Brookside GA area (Area C) would include developing an approximately 19-acre detention basin that could attract hazardous wildlife species. To prevent the creation of a wildlife attractant, the pond will be developed to be consistent with FAA guidelines set forth in AC-33B. In addition, designs for all project-related structures, landscaping and stormwater management facilities will require the review of a qualified airport wildlife biologist to prevent the development of potential wildlife hazards.



Land Use

In some instances, recommended aviation projects have the potential to conflict with existing land use designations identified in other planning documents, such as a local city Master Plan. These conflicts may occur if the result of the recommended airport project creates an impact that would be incompatible with an existing or future planned land uses. Conversely, the compatibility of land uses near an airport must also be considered to determine whether those uses could have an adverse effect on the safety of aircraft operations.

The preferred alternative would be constructed entirely on airport property. The airport is located within the city limits of the City of Reno and designated as a Regional Center in the City's Master Plan. The airport property is designated as a Special Planning Area. All proposed projects associated with the preferred alternative are consistent with the City's general plan designation, which means no land use or zoning changes would be required to accommodate the preferred alternative. Although all RPZs associated with RNO extend off-site to include areas not owned by RTAA, the FAA discourages development with RPZs and encourages airport sponsors to own land within RPZs. Implementing the preferred alternative would not change the size or configuration of current RPZs nor would it create additional incompatible land uses within the RPZs.

RTAA develops and maintains the RNO Airport Land Use Plan, which provides a map upon which to base future development decisions. All components of the preferred alternative comply with the designated land uses presented in RTAA's Airport Land Use Map as amended in July 2016 (shown previously in **Figure 4-2**).

Hazardous Materials, Solid Waste, and Pollution Prevention

Hazardous materials, solid waste, and pollution prevention address how airports manage waste related to project development: the waste streams generated by a project; potential hazardous materials due to demolition, construction and operation; and a project's potential to interfere with ongoing remediation of contaminated sites at the project site or in its vicinity. A review of EPA databases did not identify any federal Superfund or remediation sites within 1 mile of RNO.

All projects associated with the preferred alternative will produce solid waste streams, such as refuse, scrap metal, spent materials, and chemical by-products. Two solid waste landfills in the City of Reno could accept this waste. In addition, RTAA's Environmental Management Program includes a targeted program to help achieve its sustainability goals. This program, known as Program 08-01, Recycling, identifies recommendations to separate waste streams, recycle specific materials, and reduce the amount of waste sent to local landfills. The capacity of nearby disposal facilities and specific waste streams would be examined during the preparation of a stand-alone NEPA analysis prior to project approvals.



Several projects associated with the preferred alternative have the potential to use, store, or transport hazardous materials, such as the proposed MRO/FBO (fuel, paints, and solvents), ongoing ARFF operations (fuel, firefighting chemicals, and solvents), and deicing operations (glycol). Increased aircraft operations during the planning period may require increased fuel use, transport, and storage. If the proposed action or alternative(s) would generate hazardous waste, project operators will have to obtain a Resource Conservation and Recovery Act (RCRA) hazardous waste generator identification number from EPA and comply with the state and local statutes and regulations that apply (for example, fuel storage tank operating permits).

Because the operations of specific tenants are unknown in some cases, such as MRO/FBO facilities, the types and quantities of hazardous waste that specific projects would generate will be determined prior to starting a project. At that time, RTAA will identify special precautions needed to use, transport, or store hazardous materials and other administrative controls. Similarly, RTAA will revise the applicable permits, documents, and management plans, such as its National Pollution Discharge Elimination System (NPDES) Permit and SPCC Plan, to address changes in the use and extent of hazardous materials used, stored, or transported at RNO.

Construction and demolition also have the potential to generate solid waste and expose site workers to hazardous materials, such as lead paint and ACMs. Prior to demolition, RTAA will evaluate structures to locate and document the presence and extent of hazardous materials and to identify any mitigation as part of its NEPA analysis. RTAA's Environmental Management Program 08-06, Asphalt/Concrete Deconstruction and Reuse, would be used to reduce the amount of construction debris sent to local landfills.

Socioeconomics Children's Environmental Health and Safety Risks, and Environmental Justice

Socioeconomic Impacts

The potential effects of airport projects can extend beyond airport boundaries to nearby neighborhoods and communities to cause direct or indirect socioeconomic impacts. The principal social impacts that should be considered include those associated with relocation or other community disruption, transportation, planned development, and employment. All components associated with the preferred alternative would occur on airport property. As a result none of the projects would cause the relocation of residents or businesses, disrupt an established community, affect transportation patterns, or conflict with off-site development plans or land uses. The implementation of the preferred alternative will not eliminate jobs but has the potential to create positive effects on local employment through the creation of temporary construction jobs and additional permanent jobs at the airport.



Children’s Environmental Health and Safety Risk

NEPA requires project sponsors and agencies to consider potential project-related impacts to children separately, because the intensity of the impact to the children’s experience may be different compared to the experience of an adult exposed to the same event. Environmental health and safety risks include risks attributable to products or substances a child is likely to encounter or ingest, such as air, food, drinking water, recreational waters, soil, or products that they might use or to which they might be exposed.

The implementation of the preferred alternative would be constructed entirely on airport property and would not affect food, drinking water, recreational waters, soils, or products that would be encountered by children. Children living in the airport vicinity may be exposed to temporary construction-related air quality and noise impacts caused by construction vehicles and equipment, but these effects would be temporary and off-set through construction routes that avoid residential neighborhoods.

Environmental Justice

Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people should bear a disproportionate share of the negative environmental consequences resulting from a project, and meaningful involvement means that all people are provided with an opportunity to participate in decisions about activities that may affect their health and environment.

Pursuant to NEPA, FAA will require the performance of a standalone environmental evaluation prior to issuing unconditional approval specific projects shown on the ALP and the construction of specific projects associated with the preferred alternative that are not eligible for a Categorical Exclusion. When a NEPA document and public review are necessary, RTAA and FAA will give regulatory agencies and the public opportunities to participate in project scoping and to review environmental documents. As part of its public outreach process, RTAA will identify potential low-income and minority communities, perform outreach to those communities, and provide them with an opportunity to offer meaningful input regarding proposed projects and their alternatives.

Pursuant to Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, and FAA guidance for implementing NEPA, project sponsors must consider whether a proposed action could cause disproportionately high and adverse effects on low-income or minority populations. The presence of low-income or minority populations will be considered during the forthcoming NEPA analysis. If potential impacts are identified in association with the preferred alternative, further analysis will be performed to determine whether they have the potential to disproportionately affect minority or low-income populations.



Visual Effects (Light Emissions and Visual Resources and Visual Character)

Visual effects refer to the extent to which a proposed project would emit light that creates annoyance or interferes with other activities, contrasts with or detracts from the visual resources, or affects the visual character of the existing environment.

Lighting Emissions

Light emissions include any light that originates from a light source into the surrounding environment. Airport light emissions include airfield and apron flood lighting, NAVAIDs, and terminal, parking facility, and roadway lighting. The implementation of the preferred alternative would add new or more lighting to the interior and exterior of structures, parking facilities, aprons, and interior roads. Although new navigational aids are not proposed, airfield lighting would be provided to identify new or relocated taxiways. Many lights associated with structures, roads, or parking areas would be equipped with downward shielding to prevent interference with air navigation.

Proposed terminal area components, landside development components, and aviation support facilities are unlikely to cause visual effects associated with light emissions, because the adjacent land uses are commercial and industrial, which are not considered sensitive uses. Although light emissions would likely extend beyond airport boundaries on the east side of the airport, visual impacts would not be anticipated.

Proposed aviation support facilities would be constructed adjacent to existing industrial development, away from potentially sensitive receptors, such as residents. Only the future MRO/FBO at the corner of Mill Street and South Rock Boulevard and its associated lighting would be visible to off-site receptors. Proposed cargo facilities in the airport's southwest quadrant have the potential to expose residents adjacent to Airway Drive to project-related light emissions associated with new structures, vehicle parking areas, and aircraft aprons. Many of these lights could be equipped with downward shields to prevent lighting from spilling over into adjacent residential neighborhoods.

Visual Resources and Character

Visual resources include buildings, sites, traditional cultural properties, and other natural or manmade landscape features that are visually important or have unique characteristics. RNO is in an urban area, characterized by commercial and industrial development and adjacent to an interstate highway. The implementation of the preferred alternative is unlikely to create visual contrast with existing development. Visual character refers to the overall visual makeup of the existing environment where the proposed project would be constructed. The preferred alternative includes a suite of proposed aviation projects that would be constructed within the boundaries of an existing airport, thereby blending with the airport's existing visual character.



Water Quality

The Clean Water Act (CWA), as amended, establishes the basic structure for regulating pollutant discharges into waters of the U.S. and defining water quality standards for surface waters. All facilities at RNO are managed in accordance with the CWA through a NPDES Permit. EPA regulations on Pollution Prevention (Title 40 CFR, Part 122) strive to contain discharges and prevent oil from reaching navigable waters.

The construction and operation of all components of the preferred alternative have the potential to affect water quality through these activities:

- ❖ The creation of approximately 140 to 160 acres of new impervious surface;
- ❖ Additional sewage disposal;
- ❖ Increased aircraft and vehicle maintenance and cleaning during the planning period;
- ❖ Potential to increase transport, handling, and storage of fuels and solvents; and
- ❖ Construction and operation of new deicing pads.

Detailed water quality analyses will be performed as part of a stand-alone NEPA compliance study to identify the specific quantities of stormwater runoff and potential water quality effects of the preferred alternative. At a minimum, RTAA will perform these activities to avoid or reduce potential water quality impacts:

- ❖ Provide for additional stormwater management facilities to accommodate the increased impervious surface;
- ❖ Revise the Stormwater Pollution Prevention Plan in accordance with the requirements of the Nevada General Industrial Permit;
- ❖ Revise the SPCC Plan to address the increased use and storage of petroleum products;
- ❖ Provide for additional storage to accommodate the use of deicing chemicals at the new deicing aprons until they can be transported off site for treatment; and
- ❖ Evaluate and implement applicable recommendations developed as part of the Truckee River Flood Project.



Wetlands

The evaluation of wetland impacts is based on data obtained from approved jurisdictional determinations made by the U.S. Army Corps of Engineers in 2014 and 2017. The 2014 delineation identified 7.7 acres of jurisdictional wetlands and waters associated with Boynton Slough and 5.6 acres associated with Dry Creek. The 2017 delineation identified 7.1 acres of jurisdictional wetlands and waters associated with Boynton Slough and attributed the difference in area to changing vegetation. Boynton Slough, the channelized portion of Dry Creek, is a major on-site drainage feature that receives runoff from the central and southern portions of the airport. Boynton Slough flows off site and contributes flow into Steamboat Creek, and then into the Truckee River.

The new impervious surface proposed for new GA facilities in the central and southern portions of the airport has the potential to increase flows to Boynton Slough and affect water quality within jurisdictional waters including Steamboat Creek and the Truckee River. In addition, temporary construction activities could result in siltation and other impacts to these same waters. Strategies to avoid or minimize these potential impacts are required by NEPA and occur through consultation with the U.S. Army Corps of Engineers to identify the need for construction of additional water quality facilities, and construction BMPs.

Floodplains

Executive Order 11988 requires federal agencies “to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of 100-year floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.” In addition, City of Reno Land Development Code requires that project related stormwater that discharges to the area designated as Critical Flood Zone 1 (see **Figure 1-44** in **Chapter 1**) be limited to pre-development conditions relative to peak flows. Since RNO is primarily located upstream of Critical Flood Zone 1, the requirements would likely apply to all development activities on the airport.

Available data from Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) indicate that nearly all components associated with the preferred alternative are located within the 500-year floodplain (FEMA Flood Zone X). The single exception is the GA development area (Area D) located within the 100-year floodplain (FEMA Zone AE). According to City of Reno Codes, non-residential structures in Zone AE must be constructed so that the basement floor is elevated at least 1 foot above flood elevation or includes flood proofing measures. The preferred alternative includes the recommendation for the construction of new aviation support facilities in Area D. The preparation of a standalone NEPA analysis would identify the required elevations and flood proofing measures.



The City of Reno’s Land Development Code, Section 18.12.605, addresses flood storage. The code requires new development in areas that contribute discharge to Critical Flood Zone 1 to meet these requirements:

- ❖ Limit stormwater discharges to pre-development conditions relative to peak flows; and
- ❖ Provide new flood control structures elsewhere at a ratio of 1:1 (that is, create one unit of flood storage for every unit of existing storage that is displaced).

Since RNO is located primarily upstream of Critical Flood Zone 1, proposed master plan development projects will be designed and constructed in accordance with Section 18.12.605. In addition, new flood storage must be created in the same area and at the same elevation levels as the displaced storage as defined by Truckee River Flood Management Project maps.

Resources Not Considered in the Environmental Analysis

FAA Order 1050.1F identifies environmental resources areas and issues that must be considered in a NEPA analysis. Some resources identified in section 1050.1F are not present at RNO or in its vicinity. Other resources may be present but are unlikely to be affected by the implementation of the preferred alternative. The type of significant resource present, or not, at RNO and whether it will be affected follows here:

- ❖ **Coastal zones/Coastal barriers:** RNO is more than 200 miles from the nearest coastal zone/barrier on the Pacific Coast. The master plan projects do not have the potential to affect coastal resources.
- ❖ **Department of Transportation Section 4(f):** Section 4(f) resources include public parks, recreational areas, wildlife, or waterfowl refuges historic sites. No parks, recreational areas, wildlife or waterfowl refuges are present at RNO. None of the proposed projects associated with the preferred alternative would be located at or affect the Steele Ranch site. Therefore, none of the projects associated with the preferred alternative would affect or require the constructive use of a Section 4(f) resource.
- ❖ **Farmlands:** Direct impacts to farmlands typically involve the conversion of farmlands to non-agricultural use. All projects would occur in previously disturbed airport property; therefore, no agricultural lands would be converted for other use.
- ❖ **Wild and Scenic Rivers:** Because no federally designated wild or scenic rivers are within the State of Nevada, this is not a resource that RNO needs to have studied in the NEPA analysis.



Table 4-9: Summary of Potential Environmental Effects Associated with the Preferred Alternative

Project/Components	Anticipated Environmental Impact
Terminal Area	
Improve terminal concourses, including: • Replace Concourses B and C • Construct a third concourse (Concourse D)	Noise. Increased ambient noise associated with additional passenger processing and operations.
	Air Quality. Increased emissions associated with increased terminal operations (Passenger pick up and drop off, HVAC, etc.).
	Cultural Resources. Discovery of previously unknown resources during construction activities.
	Hazardous Materials and Solid Waste. Increased generation of solid waste, construction, and demolition debris.
	Water Quality. Reduced stormwater water quality associated with increased impervious surfaces.
Construct a new Customs and Border Protection facility in Concourse C (Level 1)	Construction Impacts. Temporary impacts to air quality, noise, and water quality.
	Noise. Increased noise associated with additional operations.
	Air Quality. Increased emissions associated with increased terminal operations (Passenger pick up and drop off, HVAC, etc.).
	Cultural Resources. Discovery of previously unknown resources during construction activities.
	Hazardous Materials and Solid Waste. Generation of solid waste; potential use, storage or transport of hazardous material; and generation of construction and demolition debris. Potential to encounter petroleum-contaminated pavements and subsurface soils during demolition and construction.
Improve and expand the airport terminal (ticketing hall, passenger flow, and security)	Construction Impacts. Temporary impacts to air quality, noise, and water quality.
	Noise. Increased ambient noise associated with additional passenger processing.
	Air Quality. Increased emissions associated with increased facility and operation (HVAC system, etc.).
	Cultural Resources. Discovery of previously unknown resources during construction activities.
	Hazardous Materials and Solid Waste. Generation of solid waste; and generation of construction and demolition debris.
Landside	
Expand the parking garage to include approximately 500 additional spaces.	Noise. Increased ambient noise associated with passenger processing and surface traffic.
	Air Quality. Increased vehicle emissions.
	Cultural Resources. Discovery of previously unknown resources during construction activities.
	Hazardous Materials and Solid Waste. Generation of solid waste; generation of construction and demolition debris. Potential to encounter petroleum-contaminated pavements and subsurface soils during demolition and construction.
	Water Quality. Reduced stormwater water quality associated with increased impervious surfaces and runoff from additional parking areas. Potential to encounter contaminated groundwater during demolition and construction.
Relocate and improve the rental car drop off and quick turnaround (QTA) areas	Construction Impacts. Temporary impacts to air quality, noise, and water quality.
	Noise. Increased ambient noise associated with passenger processing and surface traffic. .
	Air Quality. Increased vehicle and operational emissions.
	Cultural Resources. Discovery of previously unknown resources during construction activities.

Table 4-9: Summary of Potential Environmental Effects Associated with the Preferred Alternative

Project/Components	Anticipated Environmental Impact
	Hazardous Materials and Solid Waste. Generation of solid waste; potential use, storage or transport of hazardous material during daily operations (fuels, solvents, etc.); and generation of construction of demolition debris. Water Quality. Reduced stormwater water quality associated with increased impervious surfaces and runoff from vehicle parking areas. Potential to encounter petroleum-contaminated pavements and subsurface soils during demolition and construction. Construction Impacts. Temporary impacts to air quality, noise, and water quality.
Airside	
Improve the taxiway system to include Hot Spot mitigation, compliance with design standards, and run-up aprons.	Air Quality. Air quality improvements resulting from Hot Spot mitigation. Cultural Resources. Discovery of previously unknown resources during construction activities. Hazardous Materials and Solid Waste. Potential presence, excavation, and disposal of fuel-contaminated soils during construction activities. Water Quality. Reduced stormwater water quality associated with increased impervious surfaces. Construction Impacts. Temporary impacts to air quality, noise, and water quality.
Establish dedicated deicing aprons	Air quality. Increased emissions associated with vehicle use. Cultural Resources. Discovery of previously unknown resources during construction activities. Hazardous Materials and Solid Waste. Use, storage, and transport of deicing/anti-icing fluids in accordance with EMP 80-03, Glycol Aircraft Recovery. Water Quality. Reduced stormwater water quality associated with potentially uncaptured deicing fluids in runoff. Construction Impacts. Temporary impacts to air quality, noise, and water quality.
Support Facilities	
Relocate Air Cargo facilities to the southwestern quadrant between Airway Drive and Taxiway A.	Air Quality. Increased aircraft and vehicle emissions. Biological Resources. Previously unpaved areas will be disturbed, which could include potential habitat for biological resources. Cultural Resources. Discovery of previously unknown resources during construction activities. Hazardous Materials and Solid Waste. Generation of solid waste; potential use, storage or transport of hazardous materials. Lighting and Visual Impacts. Residents living near Airway Drive could be exposed to project-related light emissions. Water Quality. Reduced stormwater quality associated with increased impervious surfaces, potential fueling facilities, and aircraft and vehicle parking areas. Wetlands. Potential impacts to Boynton Slough. Floodplains. Construction in 100-year floodplain.



Table 4-9: Summary of Potential Environmental Effects Associated with the Preferred Alternative

Project/Components	Anticipated Environmental Impact
Construct new general aviation (GA) facilities and infrastructure on the east side	Construction Impacts. Temporary impacts to air quality, noise, and water quality.
	Noise. Increased ambient noise levels associated with surface vehicle traffic and cargo operations.
	Air Quality. Increased aircraft and vehicle emissions.
	Biological Resources. Previously unpaved areas will be disturbed, which could include potential habitat for biological resources, especially in the southeast quadrant.
	Cultural Resources. Discovery of previously unknown resources during construction activities.
	Hazardous Materials and Solid Waste. Generation of solid waste; potential use, storage, or transport of hazardous material associated with aircraft operations and repair.
	Water Quality. Reduced stormwater quality associated with increased impervious surfaces, potential fuel facilities, and aircraft and vehicle parking areas.
Consolidate existing maintenance and support facilities at a dedicated campus.	Construction Impacts. Temporary impacts to air quality, noise, and water quality.
	Noise. Increased ambient noise associated with vehicle traffic and maintenance operations including engine runups.
	Air Quality. Increased emissions associated with expanded operations and facilities.
	Cultural Resources. Discovery of previously unknown resources during construction activities.
	Hazardous Materials and Solid Waste. Generation of solid waste; potential use, storage, or transport of hazardous material during operations; and generation of construction or demolition debris.
	Lighting and Visual Impacts. Travelers on Mill Street near the intersection of South Rock Boulevard could be exposed to project-related lighting associated with a future MRO/FBO.
	Water Quality. Reduced stormwater quality associated with increased impervious surfaces, potential fuel facilities, use of solvents, and aircraft and vehicle parking areas.
Relocation of the Aircraft Rescue and Firefighting Facility (ARFF)	Air Quality. Potentially increased vehicle and operational air quality emissions.
	Cultural Resources. Discovery of previously unknown resources during construction activities.
	Hazardous Materials and Solid Waste. Generation of solid waste; potential use, storage, or transport of hazardous material during training exercises operations; and generation of construction and demolition debris.
	Water quality. Reduced stormwater quality associated with increased impervious surfaces; use, transport, and storage of firefighting chemicals; and new vehicle parking areas.
	Construction Impacts. Temporary impacts to air quality, noise, and water quality.

Preferred Alternative Summary

Preferred Alternative Recommendations

As shown in **Figure 4-66**, the preferred alternative includes these terminal, landside, support, and airside recommendations.

Terminal Recommendations

- ❖ Build third concourse pier, replace Concourse B and C piers to accommodate 10-11 gates each.
- ❖ Reserve interim option to modernize existing Concourse B and equip it to appropriately support 5-6 gates using existing space.
- ❖ Construct two-way taxilanes between concourses, allowing for simultaneous aircraft operations with one-way taxilanes to the north and south.
- ❖ Reserve apron space east of the SSCP at level 1 to allow for future SSCP expansion.
- ❖ Relocate existing RON parking spaces and de-icing pads as far south as possible to establish the southern edge of development.
- ❖ Build new CBP facility within level 1 of the proposed new central concourse pier.
- ❖ Construct new administrative office space on level 3 at the northeast corner of the terminal building.
- ❖ Reserve option for a new arriving passenger experience at the north end of the existing baggage claim area.
- ❖ Relocate belly cargo to the north near new third concourse pier.
- ❖ Reserve option to install moving walkways to minimize passenger travel distances.
- ❖ Relocate existing entry vestibules located in the ticket hall outboard of existing terminal building envelope to improve queuing and circulation.
- ❖ Build new men's and women's restrooms near ticket hall area outboard of existing terminal building envelope.
- ❖ Improve passenger wayfinding (signage) near the SSCP via changes in location, size, clarity, and consolidation of messaging.
- ❖ Establish height and organization guidelines for art and gaming machines.



Landside Recommendations

- ❖ Reserve the option for improving vehicular and pedestrian wayfinding by installing new signage, maintaining pedestrian lines of sight, and locating curb cuts according to ADA standards.
- ❖ Construct a two-level addition on the north end of the existing parking garage to add up to 500 public parking spaces.
- ❖ Relocate existing rental car QTA facilities from the existing parking garage into a new CONRAC facility located north of the terminal roadway.
- ❖ Continue to work with the NDOT to develop a Spaghetti Bowl project alternative that meets the purpose and need of NDOT's project but also maintains airport ground access connectivity to I-580. As shown in **Figure 4-67**, a potential solution has been created by Kittelson & Associates, a transportation engineering and planning firm, which would allow airport users the same level of ground access available today.

Support Recommendations

- ❖ Reserve Northeast GA development area for expansion of current tenant and/or similar business use such as an MRO/FBO facility.
- ❖ Maintain Central GA development area for hangar development.
- ❖ Develop Brookside GA area for additional GA hangars and apron area.
- ❖ Reserve Southeast GA development area for long-term development of MRO or FBO facility.
- ❖ Relocate cargo to southwest quadrant to enable terminal and concourse expansion.
- ❖ Consolidate GA facilities on east side of airfield.
- ❖ Consolidate maintenance and operations facilities into a centralized campus.

Airside Recommendations

- ❖ Correct FAA hot spots.
- ❖ Construct north and south deicing aprons.
- ❖ Install RVR to support Runway 16R CAT-II approach (subject to airspace study).
- ❖ Correct non-standard FAA design taxiways for north and south operational flow.
- ❖ Remove excess taxiway pavement.
- ❖ Construct run-up aprons for GA activities.



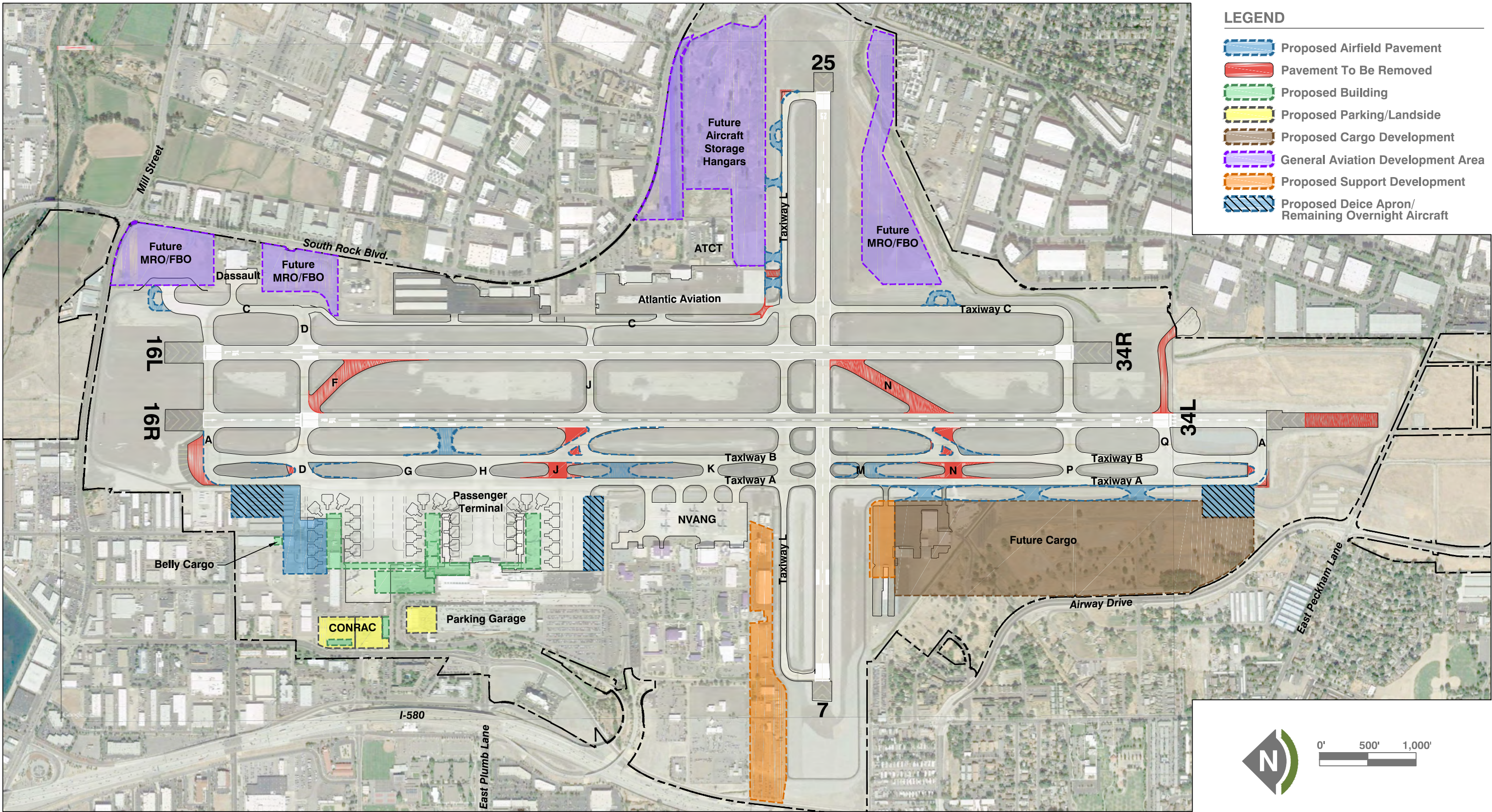


Figure 4-66
Preferred Alternative Development Plan

