Chapter 4. Airport Facility Alternatives

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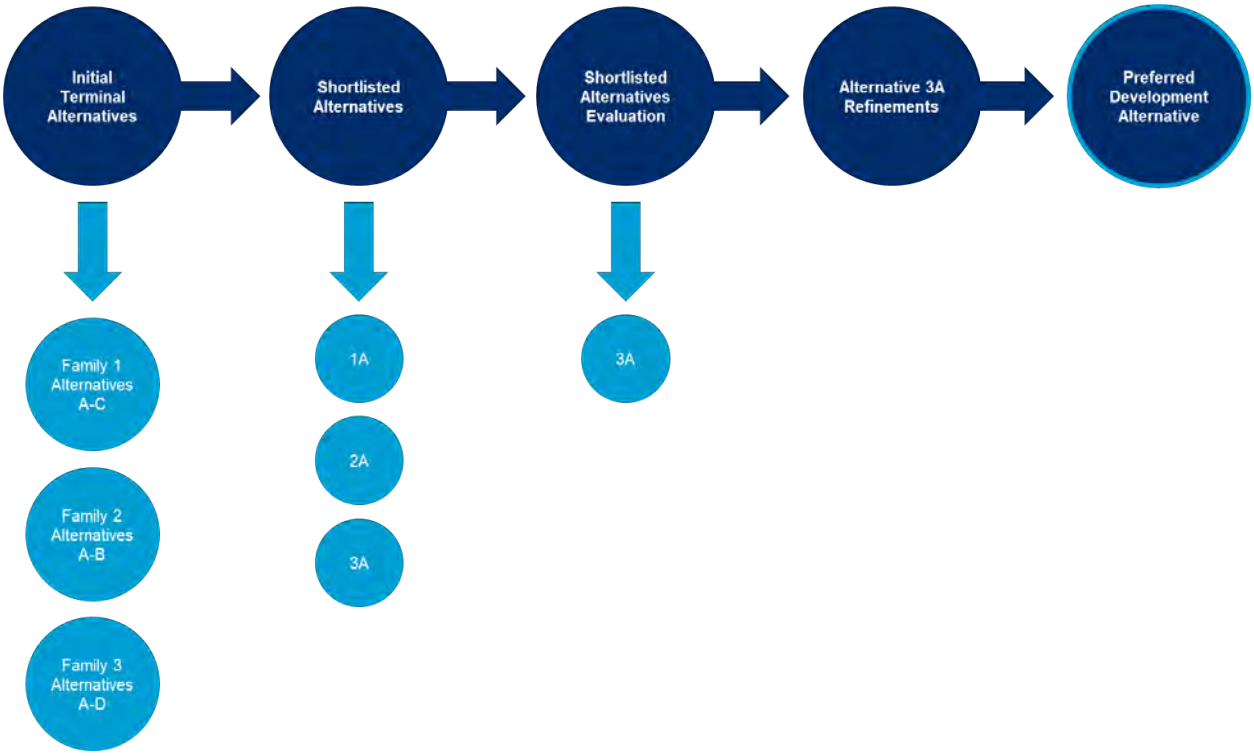
Chapter 4 Airport Facility Alternatives

This chapter describes the alternatives analysis for the 2040 LTP, which includes the initial terminal improvement alternatives and their refinement, airside improvement alternatives, landside alternatives, and support facilities alternatives. The preferred development alternative is a combination of these different elements. Using the facility requirements presented in Chapter 3, the development of alternatives was intended to generate a range of alternatives at a high level. Those alternatives were evaluated and refined through a systematic process, arriving at a preferred development alternative. **Exhibit 4-1** displays the process to select a preferred development alternative. This chapter summarizes the steps of the study and provides the preferred development alternative area layout plan.

Exhibit 4-1: Preferred Development Alternative Selection Process



SOURCE: Ricondo & Associates, Inc., February 2023.

At the beginning of the LTP, a Stakeholder Advisory Panel (SAP) was created and included community partners, airlines, passengers, agency partners, as well as business and travel groups. The intent of forming the panel was to present information about the planning process to major stakeholder groups and to ensure that those tasked with making planning decisions hear and consider public concerns and aspirations related to the process. The panel served in an advisory-level capacity. The MAC considered feedback through the process, but ultimately was responsible for all final planning decisions made. The following SAP meetings were completed throughout the LTP process:

- SAP Event #1: June 10, 2019 – Introduction to the MSP LTP
- SAP Event #2: August 27, 2019 – Forecast and Airfield Capacity
- SAP Event #3: January 30, 2020 – Public Survey Results, Forecast Update
- SAP Event #4: December 10, 2021 – Refresher on MSP LTP Process and Goals
- SAP Event #5: August 4, 2022 – Facility Requirements and Preliminary Alternatives
- SAP Event #6: April 13, 2023 – Preferred Alternative Overview

Additionally, public-facing meetings were held concurrently throughout the LTP process for community engagement and outreach efforts. “Experience MSP Event” meetings were held with Airport staff and the public to discuss and solicit feedback regarding the LTP process, facility requirements and preliminary alternatives, and selection of a preferred development alternative. Successive public events to discuss the process were held on:

- Public Event #1: October 2, 2019 – Introduction to the MSP LTP, Forecast & Capacity
- Public Event #2: April 12, 2022 – Refresher on MSP LTP Process and Goals
- Public Event #3: August 23, 2022 – Facility Requirements and Preliminary Alternatives
- Public Event #4: July 11, 2023 – Preferred Alternative Overview

4.1 AIRPORT FACILITY GOALS AND OBJECTIVES

It was determined through the LTP process that an emphasized need of additional aircraft gates and terminal space was the primary objective in future growth and demand at MSP. This conclusion came from the culmination of data obtained in the existing conditions analysis, forecast results, and a comprehensive facility gap standards review. The need for additional gates and terminal space did not preclude reviewing airside (taxiways, apron areas) or landside needs (vehicle parking, roadway accessibility), but did serve as the starting point when considering preliminary alternatives. The alternatives development process focused on fundamental needs at MSP, which included:

- prompt delivery of accessible contact gates;
- flexibility for different use scenarios and development changes;
- improvement of airfield movement and operations;
- flexibility for redevelopment and fixed points for strategic planning modifications;
- expansion of the FIS facilities for growing future demand; and
- landside improvements supporting terminal development.

It should be noted that, based on the airfield capacity study completed early in the LTP process, no runway modifications were proposed in the alternative analysis process. It is anticipated the existing runway configuration, quantity, and length of each runway will adequately serve MSP aircraft activity through the 2040 planning cycle.

4.2 TERMINAL ALTERNATIVES DEVELOPMENT

The following subsections review the terminal alternatives development, such as terminal considerations, initial terminal alternatives, and the alternatives that were short-listed for evaluation. The primary objective for the development of terminal alternatives was to maximize gate expansion in the shortest amount of time, while maintaining an acceptable airside connectivity between gates.

4.2.1 Terminal Considerations

The alternatives process began by identifying potential terminal development areas at the Airport. Each area was judged for available developable land, ease of access for both airside and landside, proximity to existing facilities, conflicting land uses, and approved project areas covered by the EA process. **Exhibit 4-2** identifies the existing Airport constraints and development areas identified as part of this study**.**

MSP contains seven distinct potential development areas divided by the runway configurations. Two separate passenger terminal complexes and associated facilities (e.g., terminal roadways, light rail, public and employee parking, and rental car facilities) occupy the Airport's southeast and east development envelopes. The T1 complex consists of terminal facilities and Concourses A through F. The T2 complex consists of terminal facilities and Concourse H. More information on the existing terminal facilities can be found in **Chapter 1**.

The other envelopes have less direct landside access to Highway 5, the primary landside access corridor to the Airport. The two northeast envelopes adjacent to Runway 30L-12R are occupied by the U.S. Air Force and Minnesota Army National Guard (MNANG), with limited future development potential. The north envelope between Runways 12R-30L and 12L-30R is limited in potential development with dieicing facilities, Federal Aviation Administration (FAA) offices, ATCT, Aircraft Rescue and Fire Fighting (ARFF) Station 2, and MAC offices and support, as well as areas allocated for currently developed Capital Improvement Plan (CIP) projects. The two western envelopes adjacent to the north end of Runway 17-35 are primarily cargo areas with limited pockets of developable area, which may provide higher and better use with the adjacent facilities.

The areas identified for the best future expansion opportunities were limited to the north of T2, south of T2, and T1 Concourse G extension. This study assessed the existing Airport configuration with the airline allocation, total gate numbers, and major elements, as well as the terminal development areas.

Exhibit 4-2: Existing Airport Constraints and Terminal Development Areas

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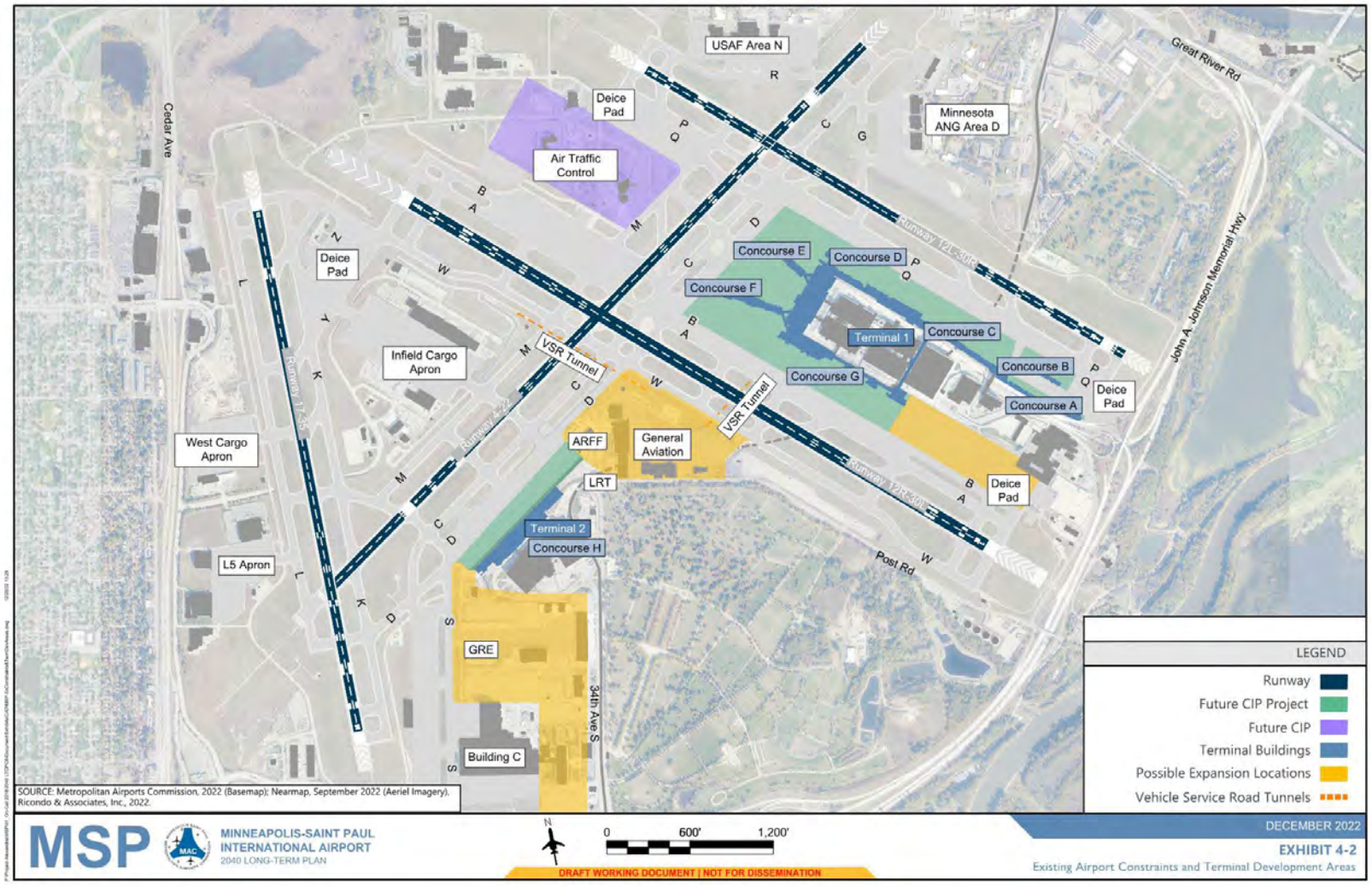

SOURCE: Metropolitan Airports Commission, 2022 (Basemap); Nearmap, September 2022 (aerial imagery), Ricondo & Associates, Inc., 2022.

4.2.1.1 Potential Project Challenges

During the initial alternatives development process, a list of challenges was indentified for the project. The project constraints are numbered as follows and referenced on **Exhibit 4-3**.

1. Northern runway convergence between Runways 17-35 and 12R-30L
2. Possible ATCT line-of-sight issues with an extension of Concourse G to the southeast
3. Taxiway congestion, primarily in:
    - Taxiways adjacent to Runway 4-22 within the bounds of Runways 12R-30L and 12L-30R
    - Widebody aircraft restrictions and gate pushback issues along Taxiways Q and P
    - Runway ends 30L and 30R and the adjacent deicing facilities
4. Extensive enabling projects in several locations to relocate existing facilities:
    - Deicing reconfiguration/relocation for T1 expansion in the east terminal complex
    - Possible FBO relocation for the T2 adjacent expansion in the north
    - Relocation of airside facilities, such as the flight kitchen and ground runup enclosure (GRE) for the T2 expansion in the south
5. Age of existing facilities:
    - Concourses E and F – over 40 years old
    - Green/Gold Ramp with limited useful life without extensive remodeling
    - 10-year life limit on the Concourse C tram system due to obsolescence
6. Suboptimal Federal Inspection Services (FIS) facilities in both functionality and capacity for future international arrivals demand:
    - Limited FIS facility expansion/modernization options in current locations due to constraints in location, adjacent facilities, and existing geometry
7. Suboptimal landside facilities in both functionality and capacity due to existing geometries limiting expansion capabilities:
    - Limited expansion capabilities for T1 and T2 curbsides with the existing configurations
        - T1 terminal complex enclosed by the airside on three sides
        - Landside expansion in T2 limited by Fort Snelling National Cemetery to the east and airside to the west
8. T1 passenger convenience:
    - Limited to no capability for the airside tram system (along Concourse C) to expand beyond its current configuration
    - Hub Tram system (landside) located away from the terminal cores with outdoor platforms; reconfiguration not possible without extensive infrastructure projects
    - Long walking distances for connecting passengers
        - Approximately 1.1 miles for transfer between Concourse F and Concourse A
    - Potential confusion related to wayfinding between areas
        - Efficient Concourse G to Concourse A/B pathways not easily evident
        - Circuitous routes to curbsides and parking via lower-level tunnels

Exhibit 4-3: Potential Project Challenges

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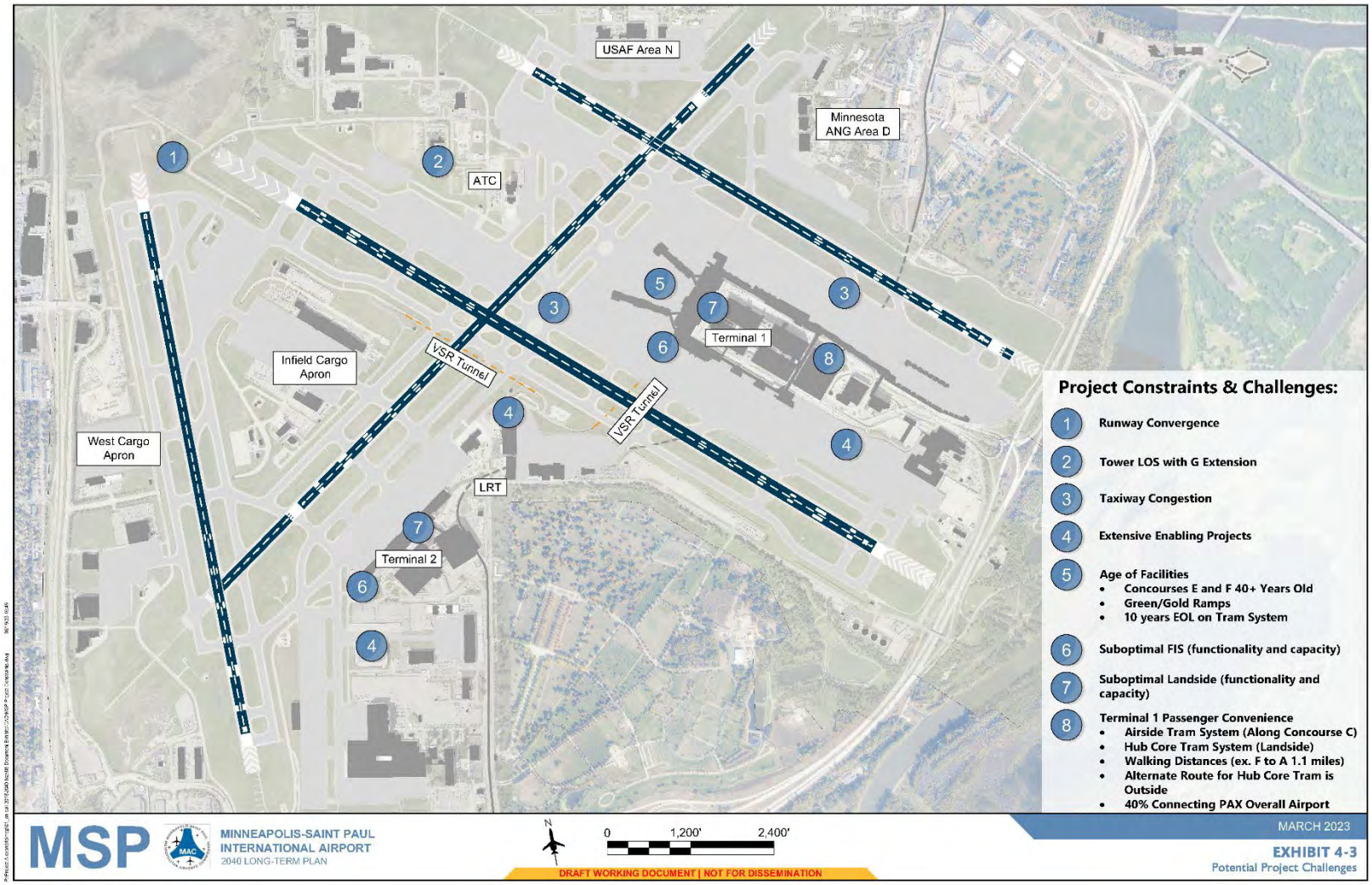


4.2.1.2 2030 Long-Term Plan Preferred Alternative

The 2030 LTP preferred alternative was used as a guide to ensure the planning, development, and operation of the Airport is compatible with current CIP projects and their surrounding environment. Completed in 2009, the 2030 LTP has been used as the basis for development at the Airport during the past decade. The plan was used as the source for the EA conducted in 2013 that includes most of the major environmentally approved projects at the Airport. With the understanding that most of the projects covered by the 2030 LTP have a faster implementation schedule than the non-environmentally approved projects, MAC used the 2030 LTP as the initial starting point for the 2040 LTP alternatives development process.

The 2030 LTP included the following project elements:

- Expand T2 terminal and gates to aid in relocation of airlines.
- Modernize and expand T1, balancing passenger loads between the two terminals.
- Develop a new International Arrivals Hall in the expanded Concourse G.
- Develop new contact gates along the Runway 30L corridor.
- Construct crossover taxiways and access road improvements at T1.
- Simplify and expand landside access to the two terminals.

Exhibit 4-4 shows the major elements from the 2030 LTP.

4.2.1.3 Planning Parameters for the Terminal Alternatives

The 2040 LTP used Planning Activity Levels PALs to represent future passenger volumes and aircraft operations. PALs are an important consideration in the development, as they help to determine the infrastructure and facilities that will be needed to support the anticipated level of activity at the Airport. Using PALs instead of years allows the MAC to adjust plans accordingly, based on when those passenger volumes reach their potential. The following PALs were used to represent demand at MSP (in million annual passengers [MAP]):

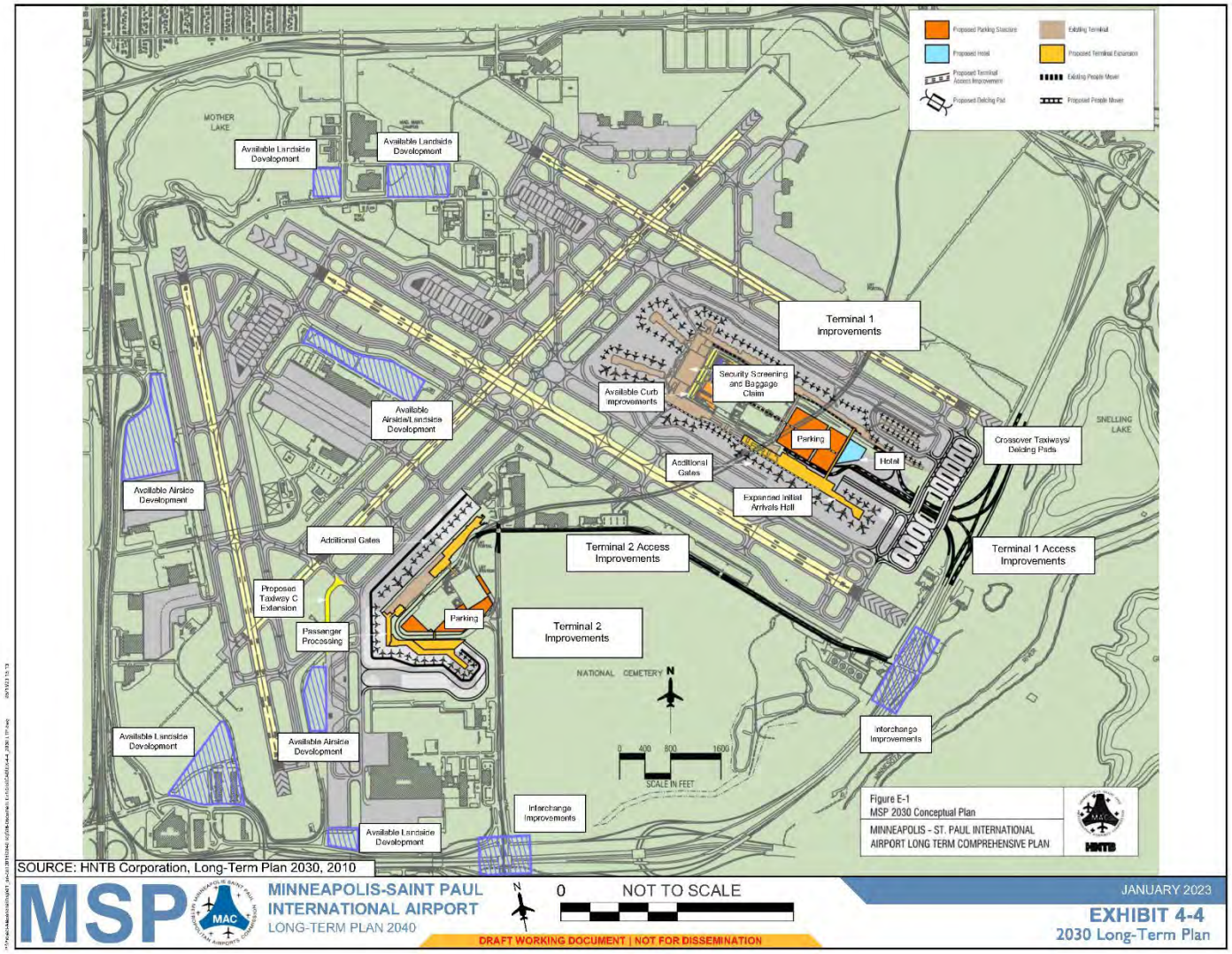
- PAL 1 – 45.0 MAP (forecast to occur by 2026 per the revised forecast)
- PAL 2 – 48.8 MAP (forecast to occur by 2031 per the revised forecast)
- PAL 3 – 56.2 MAP (forecast to occur by 2040 per the revised forecast)

One of the goals of this alternatives analysis was to plan for future facilities that ultimately meet the PAL 3 demand level, while achieving benchmark goals during PAL 2 phasing for each terminal alternative.

4.2.2 Initial Terminal Alternatives

This section describes the initial terminal alternatives developed as part of the terminal alternatives process. The focus of the terminal alternatives effort was the identification of long-range terminal alternatives that would remedy existing facility deficiencies and accommodate demand through PAL 3. The alternatives were developed in a manner that complements the capacity of existing and planned facilities and integrates efficiently with the landside and airfield.

Exhibit 4-4: Major Elements of 2030 Long-Term Plan



SOURCE: HNTB Corporation, *Long-Term Plan 2030*, DATE.

The facility requirements defined in **Chapter 3** provided the quantitative basis for formulating development alternatives to accommodate forecast demand. The ultimate objective was to define a preferred alternative that allows for logical and incremental development of facilities, while protecting long-term future Airport development. The process was intended to capture a broad range of alternatives at a high level and evaluate and refine them through a systematic progression to arrive at a preferred alternative. After an analysis of past studies, the 2030 LTP preferred alternative, and the existing conditions, three families of initial alternatives were developed. Each family was based on an alternative strategy that allowed for development in the key areas of gate expansion, international arrivals capacity, and improvement of passenger convenience. The three families were:

- **Alternative Family 1** – Using the framework of the 2030 LTP preferred alternative, the alternatives expanded the gates' capabilities at both terminals. Updates to the original preferred alternative included consolidating all international arrival operations to T1, while replacing Concourses E, D, and F. These alternatives also eliminated the proposed Runway 30L-30R east crossfield taxiway due to the impacts to the apron and the landside entryway for T1, as well as constructability issues.
- **Alternative Family 2** – Developed as a unified terminal operation, T1 and T2 would be connected on the airside by underground tunnel/Automated People Mover (APM) system, allowing for secure passenger movement between terminals. Gate expansion would occur at both terminals by extending existing Concourses G and H. Concourses E, D, and F would be replaced as well.
- **Alternative Family 3** – Based on the 2030 LTP preferred alternative, the alternatives expanded the gates capabilities at both terminals by extending existing Concourses G and H, with international arrival operations at both T1 and T2. These alternatives also eliminated the proposed Runway 30L-30R east crossfield taxiway due to the impacts to the apron and the landside entryway for T1, as well as constructability issues.

Exhibit 4-5 depicts the initial terminal alternatives based on the three families.

4.2.3 Short-Listed Terminal Alternatives

The MAC and Airport stakeholders vetted the initial alternatives to identify alternatives that fulfilled the Airport's fundamental needs, while best supporting the primary goals for accommodating growth at the Airport. An alternative that best achieved these objectives was picked from each family and refined with stakeholder input.

Three short-listed terminal alternatives were carried forward in the analysis and labeled as 1A, 2A, and 3A. At this stage of the analysis, landside and airside components were refined to accompany the terminal alternatives. Common elements among all three terminal alternatives included:

- Redevelopment of Concourses D, E, and F
- Concourse G expansion
- Sharing of contact gates among carriers in PAL 3
- Redeveloped multi-purpose ramps
- T2 expansion to the south

Exhibit 4-5: Initial Terminal Alternatives Based on Families

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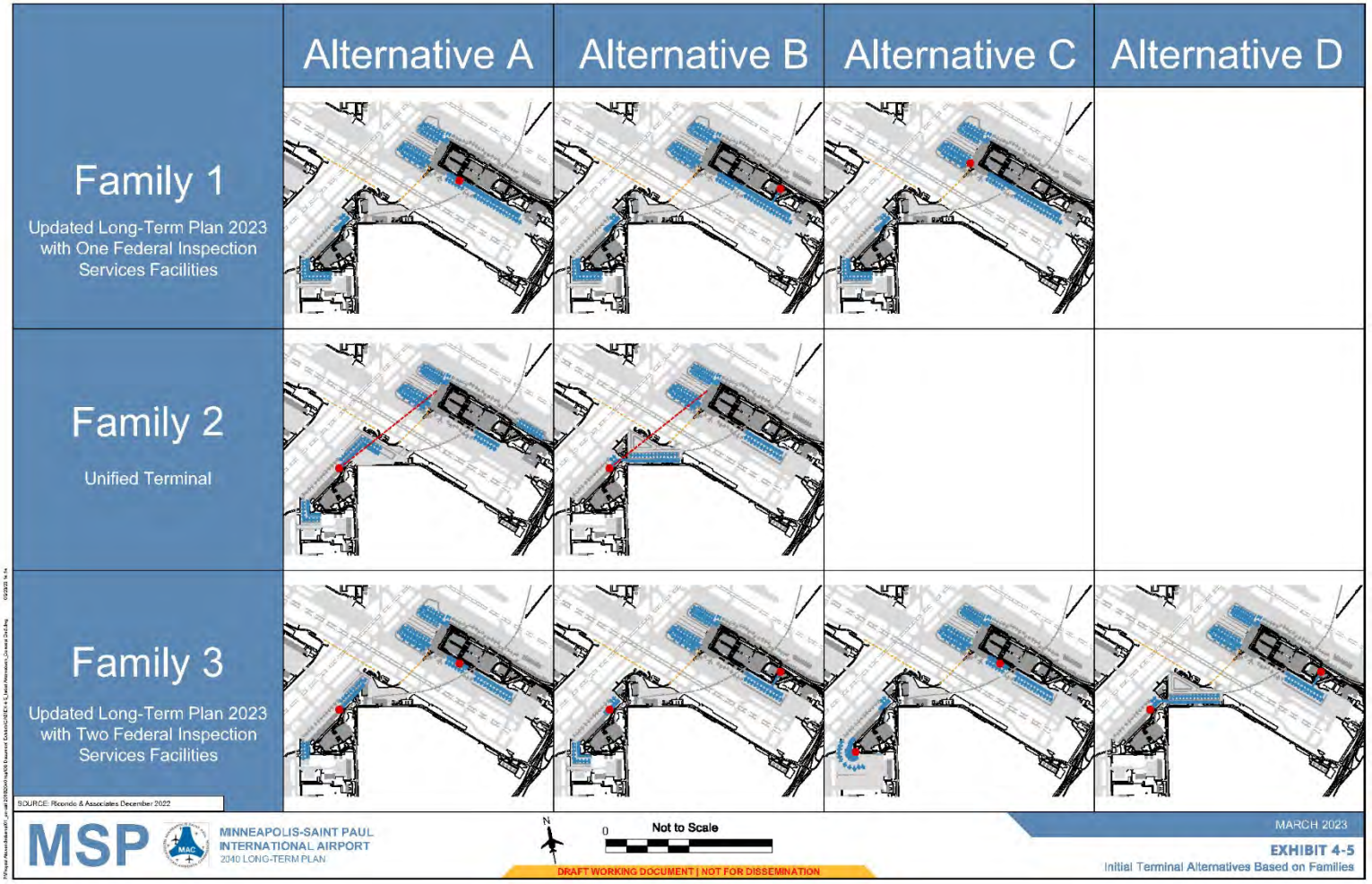

SOURCE: Ricondo & Associates, December 2022.

The following subsections describe each short-listed alternative in greater detail, including the facility development, primary enabling projects, gate counts, and passenger convenience.

4.2.3.1 Terminal – Alternative 1A

Exhibit 4-6 displays the Alternative 1A terminal layout. The following subsections describe this alternative.

Facility Development

Alternative 1A would maintain two separate terminals, and a single consolidated FIS facility would be provided in T1. The FIS facility would take approximately five years to construct.

For Alternative 1A, T1 consists of a single-loaded 10-gate expansion on Concourse G, with the redevelopment of Concourses D, E, and F to align with the existing Concourses C and G flight lines. The alternative would also provide a single-loaded 13-gate expansion on the south end of T2.

Enabling Projects

The enabling projects for T1 include redevelopment of the Green/Gold Ramps, relocation of the Runway 30L deicing facility, and demolition of Concourses D, E, and F, with temporary relocation of their contact gates.

The enabling projects for T2 include relocation of the landside Quick Turn Around (QTA) facility, flight kitchen, and Ground Runup Enclosure (GRE), as well as realignment of Taxiway S2 for the southern concourse extension.

Gate Summary

A total of 137 gates would be provided, meeting the gate requirements for both PAL 2 and PAL 3. PAL 2 does not require gate sharing between carriers in T1, while sharing is required as the gate demand approaches PAL 3.

Walking Distances and Connectivity

T1 provides 86 gates within a 10-minute walking distance of the FIS facility and 71 gates within a 10-minute walking distance of a Safety and Security Checkpoint (SSCP). T2 provides 29 gates within a 10-minute walking distance of a SSCP, without airside access to the FIS facility.

Passengers can connect between the two terminals via two non-secure routes: the Metro Blue Line and commercial vehicles via landside access. There is no airside connectivity between the terminals.

Airfield Considerations

The largest airfield impacts associated with this alternative are to the Runway 30L deice pad and adjacent Remain Overnight (RON) positions and Delta maintenance ramp. The Concourse G expansion extends southeast from the existing terminal to the Delta maintenance hangar abeam the Runway 30L approach end. The terminal expansion results in the elimination of RON parking positions (exact number dependent on the size/type of aircraft being parked at any given time), as well as elimination of the five deicing positions on the Runway 30L deice pad. The Delta maintenance ramp would also be impacted by the last gate position on the concourse.

Exhibit 4-6: Alternative 1A Terminal Layout

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Airfield impacts from the T2 expansion in Alternative 1A are limited to the elimination of two RON parking positions to the north of the existing terminal, adjacent to the ARFF building. A minor reconfiguration of access to the GRE and Delta cargo facilities south of T2 would be required in Alternative 1A; however, these two facilities would remain in their current location.

4.2.3.2 Terminal – Alternative 2A

Exhibit 4-7 displays the Alternative 2A terminal layout. The following subsections describe this alternative.

Facility Development

Alternative 2A would unify the terminals via an airside APM and provide a single FIS facility in T2. The FIS facility would take approximately five years to construct.

For Alternative 2A, T1 would have a single-loaded 4-gate expansion on Concourse G, with the redevelopment of Concourses D, E, and F to align with the existing Concourses C and G flight lines.

T2 would extend to both the north and the south of the existing footprint. On the south end of T2, a single-loaded 10-gate expansion would be provided. On the north end of T2, a single-loaded 13-gate expansion would be provided, causing the displacement of the existing Fixed Base Operator (FBO).

Enabling Projects

The enabling projects for T1 include reconfiguration of the Runway 30L deicing facility, realignment of the Runway 12R-30L Vehicle Service Road (VSR) tunnel, and demolition of Concourses D, E, and F, with temporary relocation of their contact gates.

The enabling projects for T2 include relocation of the landside QTA facility, flight kitchen, and GRE, as well as realignment of Taxiway S2 for the southern concourse extension. The northern concourse extension enabling projects include relocation of the FBO and adjacent surface parking lots and realignment of the Runway 12R-30L VSR tunnel.

Gate Summary

A total of 139 gates would be provided in PAL 2, meeting the gate requirements, with room for expansion, and a total of 128 gates would be provided in PAL 3, meeting the gate requirements. The PAL 2 configuration requires international gate sharing in T1. The PAL 3 configuration does require gate sharing in both terminals to accommodate PAL 3 gate demand.

Based on existing operations, some airlines, such as Delta, would be required to use split-operations in this alternative, where international traffic operates in T2 and domestic out of T1.

Walking Distances and Connectivity

T1 provides 71 gates within a 10-minute walking distance of a SSCP. T2 provides 96 gates within a 10-minute walking distance of the FIS facility and 96 gates within a 10-minute walking distance of a SSCP.

Exhibit 4-7: Alternative 2A Terminal Layout

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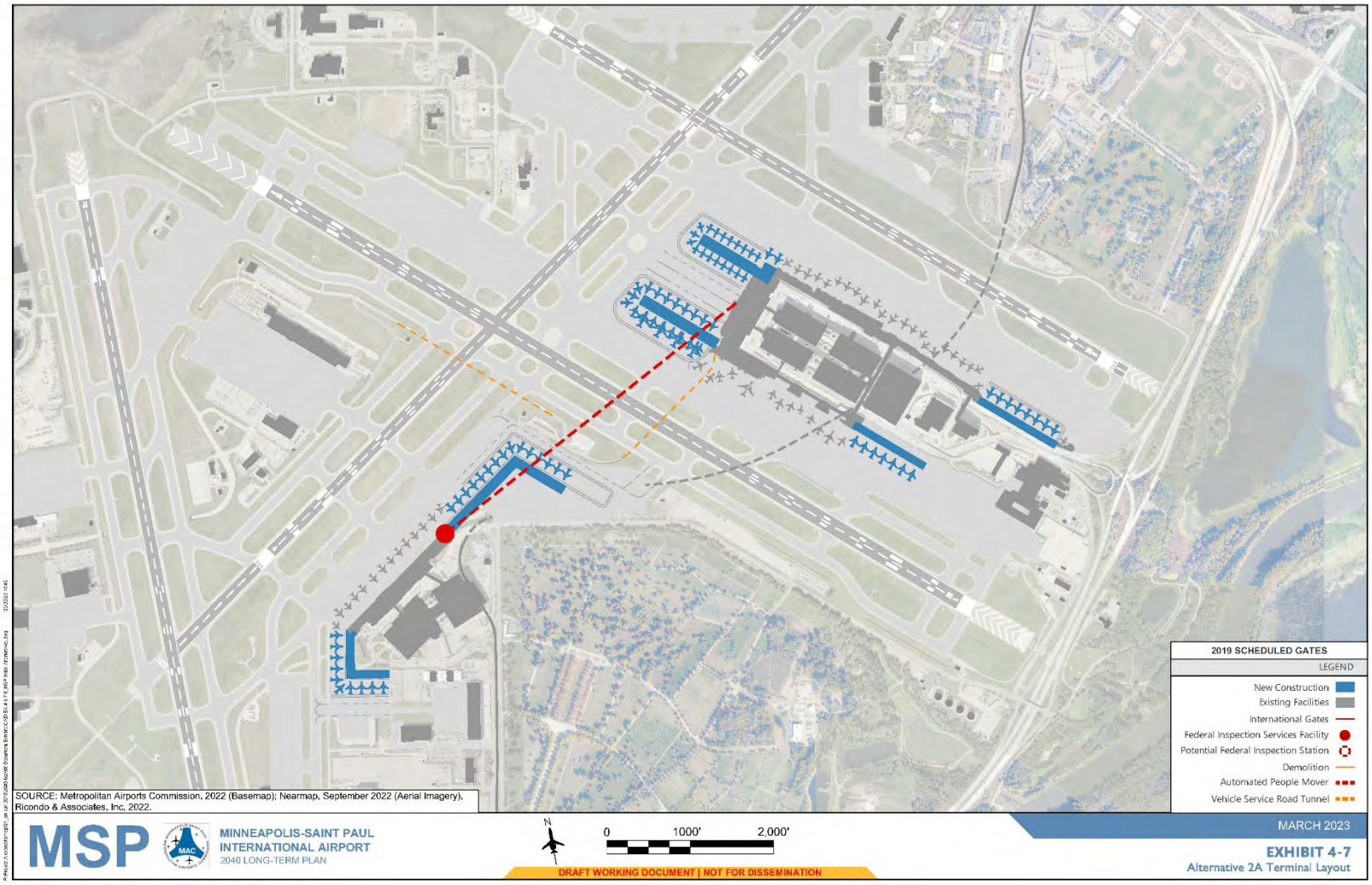

This alternative is based on the capability to use gates on either terminal, regardless of which terminal passengers process through. Passengers can connect between the two terminals via one secure and two non-secure routes. The non-secure routes are the Metro Blue Line and commercial vehicles via landside access. The terminals are connected on the secure airside via a future APM crossing under Runway 12R-30L, with single termination points at the T1 headhouse and T2 headhouse, adjacent to the relocated centralized FIS facility.

Airfield Considerations

The primary airfield impacts associated with this alternative are to the existing FBO apron north of T2. The north expansion of T2 would require the relocation of the FBO terminal and hangars. Like Alternative 1A, a minor reconfiguration of the access to the GRE and Delta cargo facility is required. Both facilities would remain in their existing location.

4.2.3.3 Terminal – Alternative 3A

Exhibit 4-8 displays the Alternative 3A terminal layout. The following subsections describe this alternative.

Facility Development

Alternative 3A would provide an FIS facility in each terminal and maintain separation between the two terminals and is how the airfield operates today.

Regarding Terminal 1, Alternative 3A would provide a single-loaded 4-gate expansion on Concourse G and the redevelopment of Concourses D, E, and F to align with the existing Concourses C and G flight lines.

A single-loaded 10-gate expansion would be provided on the south end of T2. On the north end, a single-loaded 9-gate expansion would be developed northeast of the existing ARFF facility connected by an airside bridge.

Enabling Projects

The enabling projects for T1 include redevelopment of the Green/Gold Ramps, reconfiguration of both the Runway 30L and 30R deicing facilities, realignment of the Runway 12R-30L VSR tunnel, and demolition of Concourses A, B, D, E, and F, with temporary relocation of their contact gates.

The enabling projects for T2 include relocation of the landside QTA facility, flight kitchen, and GRE, as well as realignment of Taxiway S2 for the southern concourse extension. The northern concourse extension enabling projects include relocation of the FBO and adjacent surface parking lots and realignment of the Runway 12R-30L VSR tunnel.

Gate Summary

A total of 132 gates would be provided in PAL 2, meeting the gate requirements, and a total of 129 gates would be provided in PAL 3, meeting the gate requirements. PAL 2 requires international gate sharing in T1 and T2. In PAL 3, the alternative does require sharing in both terminals.

Walking Distances and Connectivity

T1 provides 91 gates within a 10-minute walking distance of the FIS facility and 71 gates within a 10-minute walking distance of a SSCP. T2 provides 32 gates within a 10-minute walking distance of the FIS facility and 32 gates within a 10-minute walking distance of a SSCP.

Passengers can connect between the two terminals via two non-secure routes: the Metro Blue Line and commercial vehicles via landside access. There is no airside connectivity between the terminals.

Airfield Considerations

The primary airfield impacts associated with this alternative are to the existing FBO apron north of T2. The north expansion of T2 would require the relocation of the FBO terminal and hangars. Like Alternative 1A, a minor reconfiguration of the access to the GRE and Delta cargo facility is required, but both facilities would remain in their existing location. Deice and RON parking east of Concourses B and G would also be impacted.

Exhibit 4-8: Alternative 3A Terminal Layout

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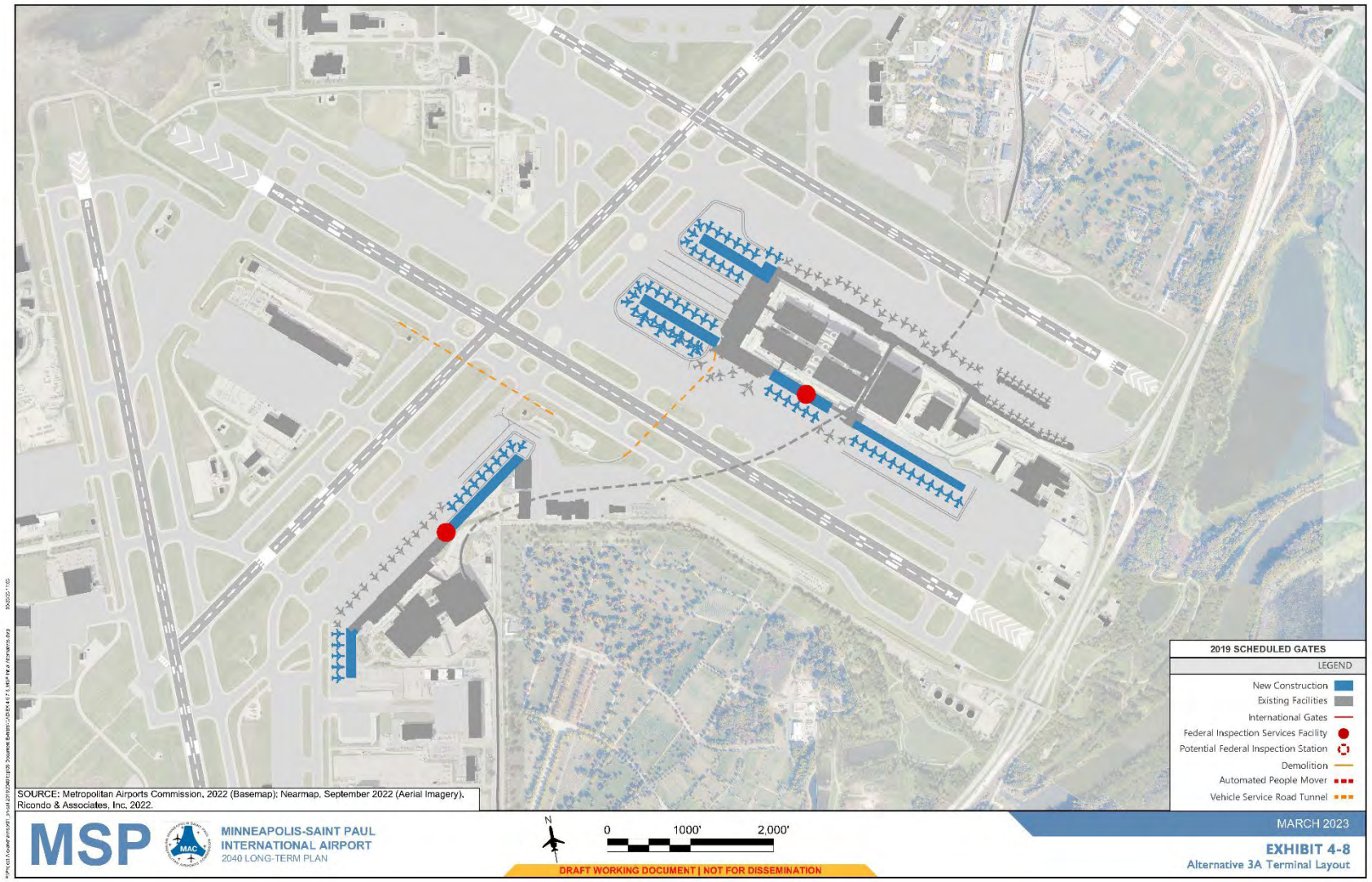

4.3 AIRFIELD DEVELOPMENT

Chapter 3 reviewed the existing conditions at MSP, considering the design standards set forth in FAA AC 13B, and it identified Airport components not in compliance with the AC. Chapter 3 also identified other airfield improvements needed to meet operational needs and airfield capacity throughout the forecast horizon. The requirements determined in Chapter 3 were used to develop this section. This section describes the airfield alternatives according to geometric alternatives, airfield capacity, deice facilities, RON parking, air cargo, and FBO.

4.3.1 Geometric Alternatives

4.3.1.1 Safety Areas

The gap analysis summarized in Chapter 3 identified several objects within safety areas (i.e., RSA, ROFA, taxiway safety area, and TOFA) that are not fixed by function and therefore not allowed within these areas. Objects such as wind cones, weather reporting stations (automated surface observing system [ASOS]), NAVAID shelters, and VSRs should be relocated outside the applicable safety areas. These objects are tabulated in Chapter 3.

4.3.1.2 Taxiway Edge Geometry

The standards in 13B call for the outer pavement edges of taxiways located at runway ends to be curved. The curved taxiway edge distinguishes the taxiway from the runway and has been identified as a runway incursion mitigation (RIM) factor, which guards against wrong-surface landings. MSP has five locations where the outer edge of taxiway pavement at a runway end was constructed with a 90-degree angle. These locations are the Taxiway L / Taxiway L3 intersection, Taxiway L / Taxiway L10 intersection, Taxiway K / Taxiway K1 intersection, Taxiway W / Taxiway W1 intersection, and Taxiway R / Taxiway R10 intersection. Implementation of the improvements at these locations entails removing existing taxiway pavement and replacing it with grass.

4.3.1.3 Taxiway Edge Safety Margin

Standard taxiway corners are constructed with a series of straight-line tangents along the inner portion of the turn. The TESM analysis conducted as part of the LTP identified numerous taxiway turning movements throughout the airfield where the TESM was not met for both TDG 5 and TDG 6 aircraft. Violations of the TESM criteria were identified through turning movement analysis in AutoCAD using the AviPLAN application. The largest violations indicated that for some turning movements, the aircraft's main landing gear would track outside the taxiway width and onto the shoulder. This situation would likely result in taxiway edge lights being hit and knocked over. However, there was no feedback received from Airport operations staff noting that this was a common occurrence, which indicates pilots may use judgmental oversteer while taxiing at MSP.

As taxiways are either reconstructed or rehabilitated through the CIP, standard taxiway fillets should be installed at taxiway intersections. Locations likely to experience movements by TDG 5 and TDG 6 aircraft should be prioritized for improvements. These locations include intersections along Taxiway T leading to the Central Cargo Apron and intersections along Taxiways A, B, C, D, and W, which are the primary taxiway routes between the terminals and runways.

4.3.2 Airfield Capacity

Airfield capacity regarding runway quantity, alignment, and length were not considered as facility needs in the alternative analysis process. The airfield capacity study analysis, completed at the onset of the LTP, concluded the current runway configuration meets the future demand of MSP operations. This analysis considered multiple future improvements with the goal of enhancing the airfield's capacity. These improvements included alternatives for a crossfield taxiway between Runways 30L and 30R, an End-Around Taxiway (EAT), a Runway 30R partial parallel taxiway, and removing a pinch point along of Taxiways A and B.

4.3.2.1 Crossfield Taxiway

The location of T1 between two of the Airport's primary runways can lead to long taxi times for aircraft on gates at Concourses A and B and Concourse G when they need to access a runway on the opposite side of the terminal. The taxiway route for this condition is on Taxiway C or Taxiway D, which can be further congested by aircraft accessing gates at Concourses F and G. To provide more direct access between the ends of Runway 30L and Runway 30R, a crossfield taxiway built to ADG V standards was considered.

Two taxiway alignments were considered for the capacity enhancement. The first alignment maintained a straight taxiway path connecting the ends of Runway 30L and Runway 30R. The second alignment avoided impacting the Runway 30R deice pad by offsetting the alignment to the west. **Exhibits 4-9** and **4-10** present the two alignments as Alternatives 1 and 2, respectively. Both alignments would require partial demolition of Concourse A and would cause significant impacts to the Delta maintenance facility located east of T1. Significant landside impacts would be expected from the required lowering of the T1 access roads to allow for the crossfield taxiways to cross over the landside roadways. For these reasons, both crossfield taxiways were eliminated from further consideration.

4.3.2.2 End-Around Taxiway (EAT)

An EAT enhances airfield capacity by allowing aircraft to safely taxi from one side of a runway to the other during departure operations, as well as cross the extended runway centerline without a clearance from ATC. At MSP, capacity improvements would be expected through the construction of an EAT at the departure end of Runway 30L. During North Flow, a Runway 30L EAT would allow an aircraft landing on Runway 35 to access the T1 gates without crossing Runway 30L. Similarly, during Mixed Flow A, aircraft taxiing from T1 to Runway 17 for departure would not need to cross Runway 30L and experience a crossing delay. Three EAT alignment alternatives were considered, as shown on **Exhibits 4-11** to **4-13**.

EAT Alternative 1 - EAT Alternative 1 includes an EAT connecting Taxiway B to Taxiway L. Alternative 1 crosses the extended Runway 30L centerline approximately 2,800 feet from the Runway 12R threshold.

Construction of EAT Alternative 1 would likely impact Mother Lake and its surrounding wetland areas. Therefore, Alternative 1 was eliminated from further consideration.

EAT Alternative 2 - EAT Alternative 2 includes an EAT connecting Taxiway B to Taxiway K. Alternative 2 crosses the extended Runway 30L centerline approximately 2,800 feet from the Runway 12R threshold.

Like EAT Alternative 1, construction of EAT Alternative 2 would likely impact Mother Lake and its surrounding wetland areas. Therefore, Alternative 2 was eliminated from further consideration.

EAT Alternative 3 - EAT Alternative 3 also includes an EAT connecting Taxiway B to Taxiway K. However, Alternative 3 would cross the extended Runway 30L centerline 1,800 feet from the Runway 12R threshold. This alignment avoids impacts to Mother Lake and surrounding areas, but it would require reconfiguration of the ALS for Runway 12R.

Since the EAT crosses the extended runway centerline closer to the Runway 12R threshold, there is not as much clearance to the Runway 30L departure surface as in Alternatives 1 and 2. Aircraft operating on the EAT Alternative 3 alignment would be limited to a tail height of 45 feet (i.e., Boeing 757-200) to operate on the EAT without a specific ATC clearance. However, most aircraft that would be expected to use the EAT would be smaller, as larger aircraft typically operate on Runway 12L-30R due to its longer length and would not need to use the EAT to access Runway 17-35.

Exhibit 4-9: East Crossfield Alternative - Alternative 1

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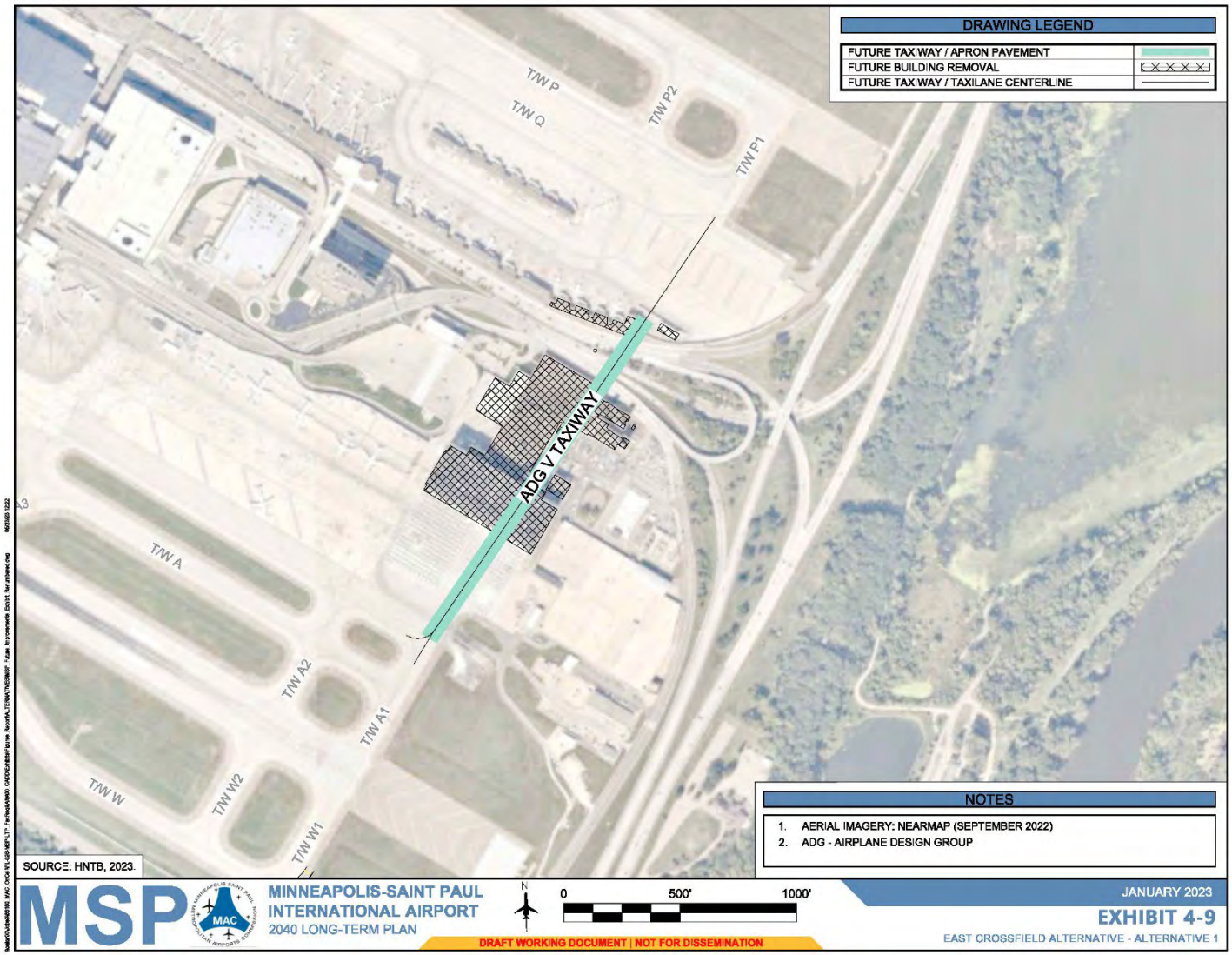

Exhibit 4-10: East Crossfield Alternative - Alternative 2

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Exhibit 4-11: End-Around Taxiway - Alternative 1

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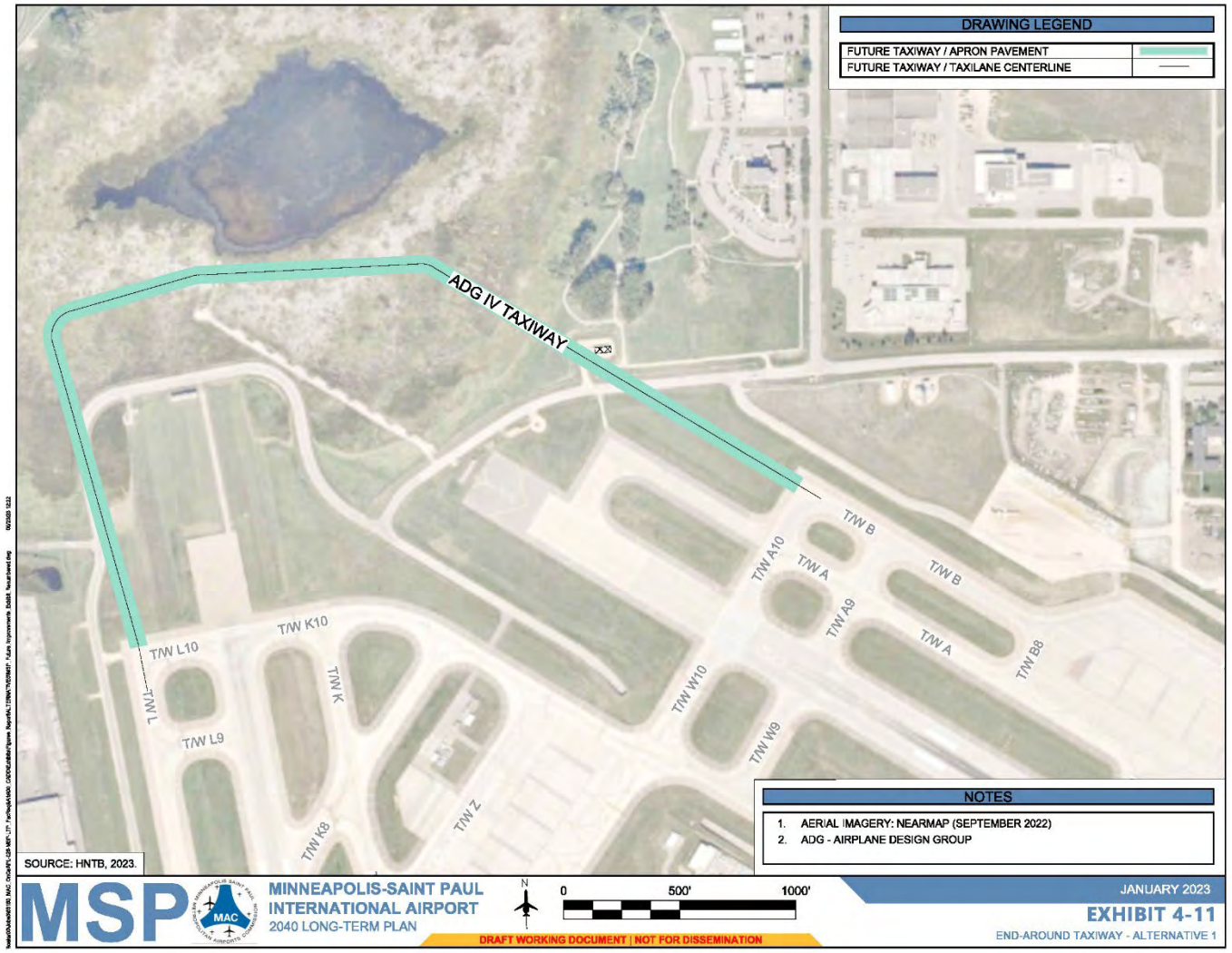

Exhibit 4-12: End-Around Taxiway - Alternative 2

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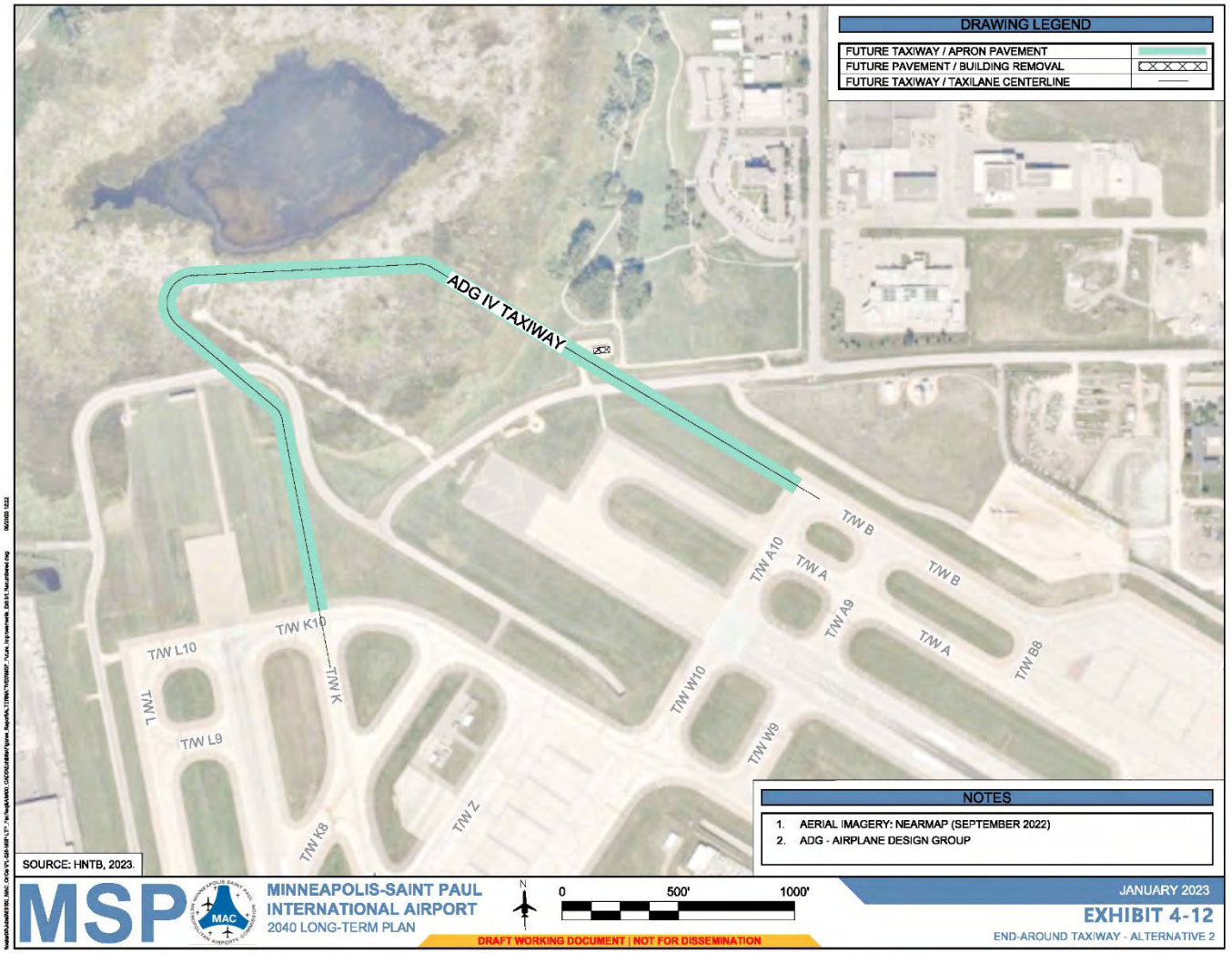

Exhibit 4-13: End-Around Taxiway - Alternative 3

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4.3.2.3 Runway 30R Partial Parallel Taxiway

Today, aircraft operating to and from the MNANG apron must cross Runway 12L-30R to access all runways, except for Runway 22. To eliminate the runway crossing when the MNANG is operating on Runway 12L-30R in either of the Airport's five primary operating conditions, an outboard taxiway connecting Taxiway G to the approach end of Runway 30R was evaluated, as shown on **Exhibit 4-14**. This alternative includes the realignment of Taxiway G and Taxiway P3 to 90-degree crossings of Runway 12R-30L and a bypass entrance taxiway at the Runway 30R approach end.

In addition to serving MNANG operations, the outboard taxiway can be used for additional aircraft staging and departure queuing for Runway 30R, eliminating congestion on Taxiway P and Taxiway Q. Currently, Taxiways P and Q have ADG wingspan limitations. This north partial parallel taxiway would permit fully conforming ADG V aircraft access to the Runway 30R approach end. Enabling this project would likely require the relocation of the existing Runway 30R glideslope antenna.

4.3.2.4 Reconfiguration of Taxiway A and Taxiway B

The separation between the centerlines of Taxiway A and Taxiway B between Taxiway A5 and Taxiway A7 is reduced to 55 feet due to the existing VSR tunnel between T1 and T2. The centerline spacing results in an operational restriction where only one aircraft on either Taxiway A or Taxiway B can taxi past the tunnel at a time. This area can become a bottleneck for aircraft taxiing to or from the terminal or the Runway 30L approach end. **Exhibit 4-15** shows the realignment of Taxiway B to a straight-line configuration to remove the bottleneck condition. Straightening the Taxiway B centerline alignment requires reconstruction of the tunnel under Runway 12R-30L to fill in over the existing tunnel. The daylight location of the tunnel is shifted closer to T1 in this alternative. As a result, the Taxiway A to Taxiway B centerline spacing increases to 240.0 feet, meeting ADG IV standards. The Taxiway B centerline spacing to the proposed VSR is 121.5 feet, meeting the requirements for an ADG IV TOFA.

4.3.3 Deice Facilities

The Runway 30R and Runway 30L deice facilities would both be impacted by the Alternative 3A terminal layout. The removal of Concourse B and the reduction in size of Concourse A allow the size of the Runway 30R deice pad to be increased beyond its existing footprint. As shown on **Exhibit 4-16** (same exhibit as in **Section 4.3.2.4**), a 4-position deice pad accommodating ADG III aircraft fits in the available space resulting from the Concourse A and Concourse B reconfigurations.

The aircraft parking positions resulting from the Concourse G expansion overlap with the Runway 30L deice pad. Seven deice pad options were evaluated with the common goal of matching or exceeding the existing deice pad capability and providing RON parking near the approach end of Runway 30L. **Exhibit 4-17** through **Exhibit 4-23** show the seven deicing options.

Exhibit 4-14: Runway 30R Partial Parallel Taxiway

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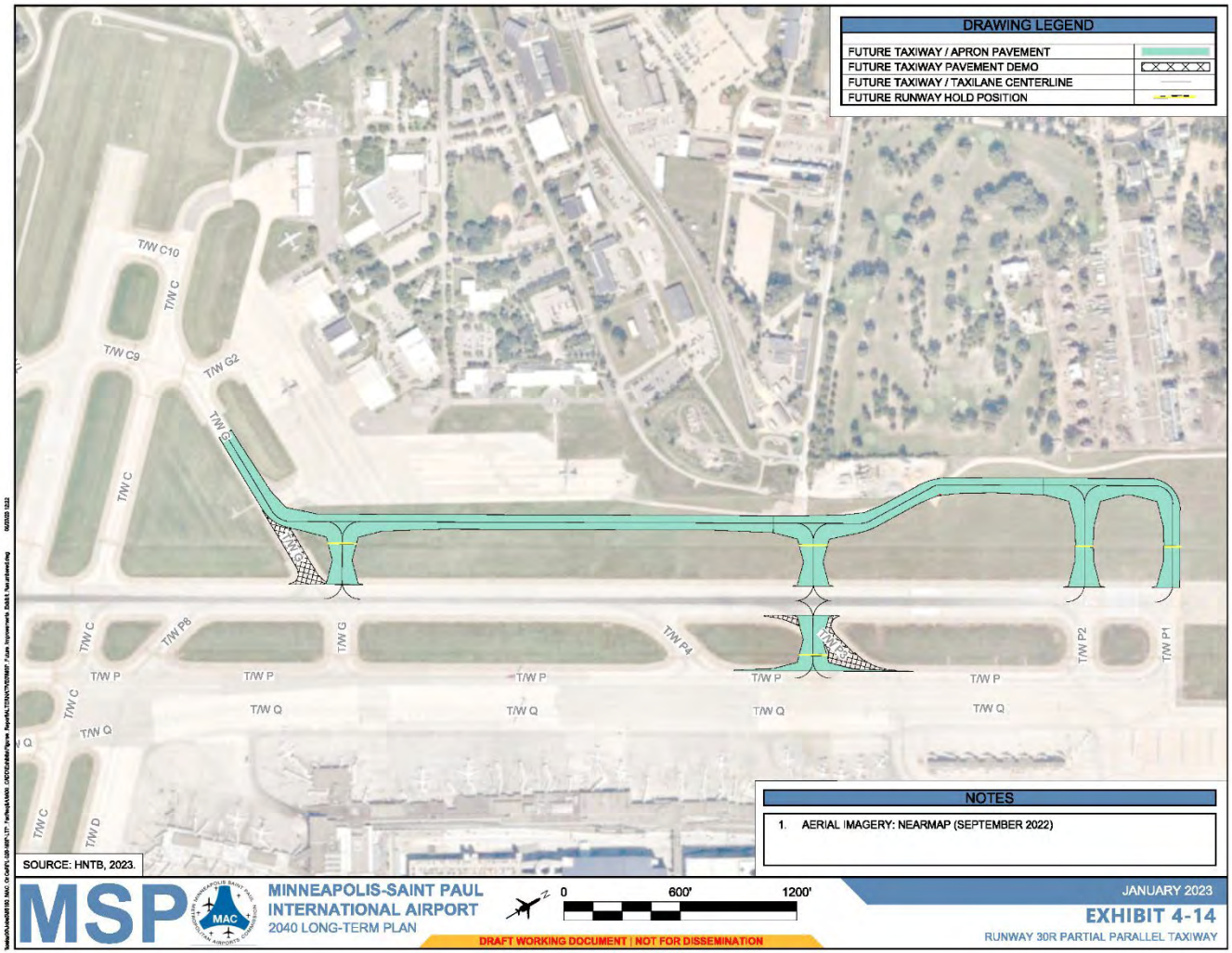

SOURCE: HNTB, 2023.

Exhibit 4-15: Reconfiguration of Taxiway A and Taxiway B

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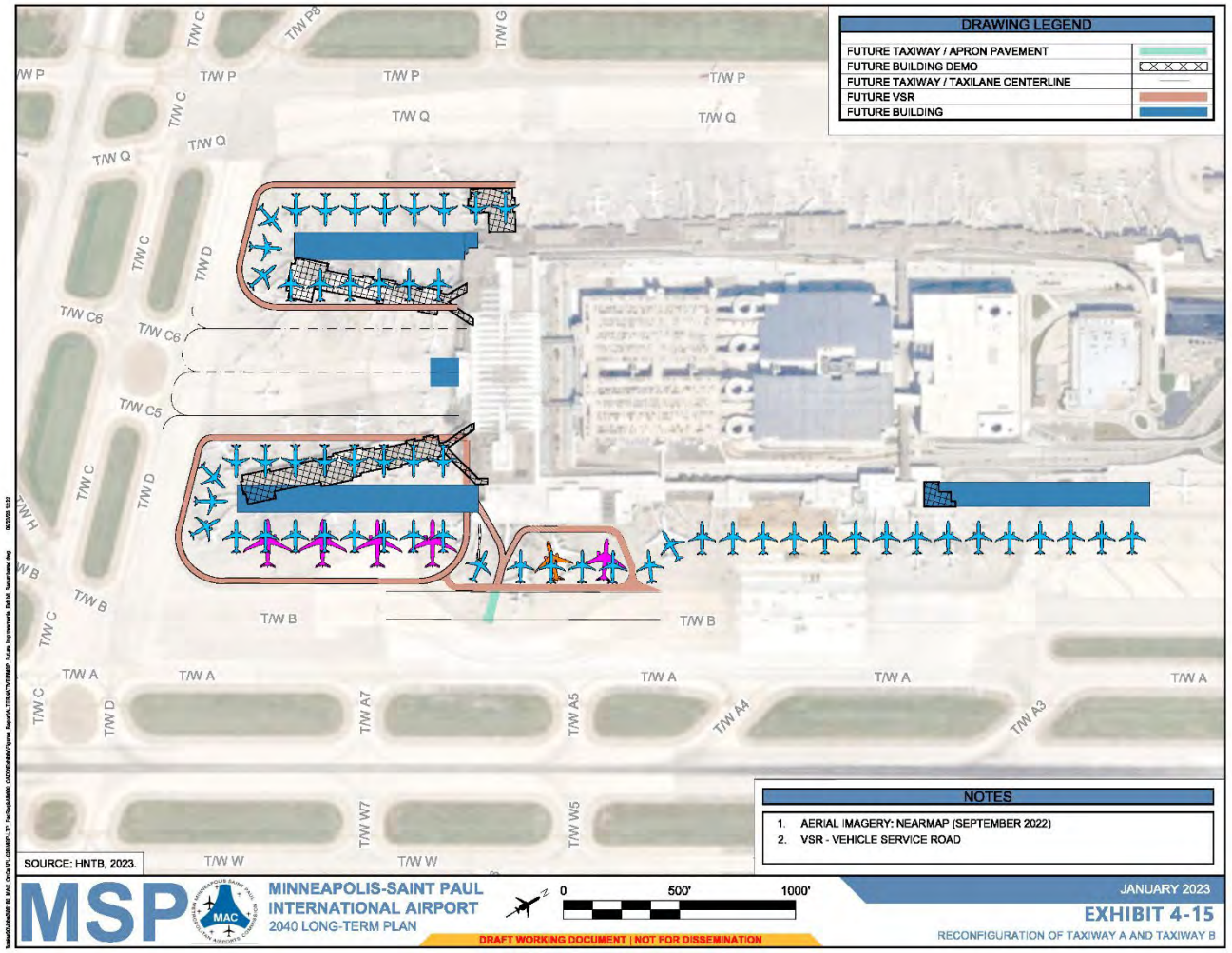

Exhibit 4-16: Terminal 1 Concourse A/B Deice Pad

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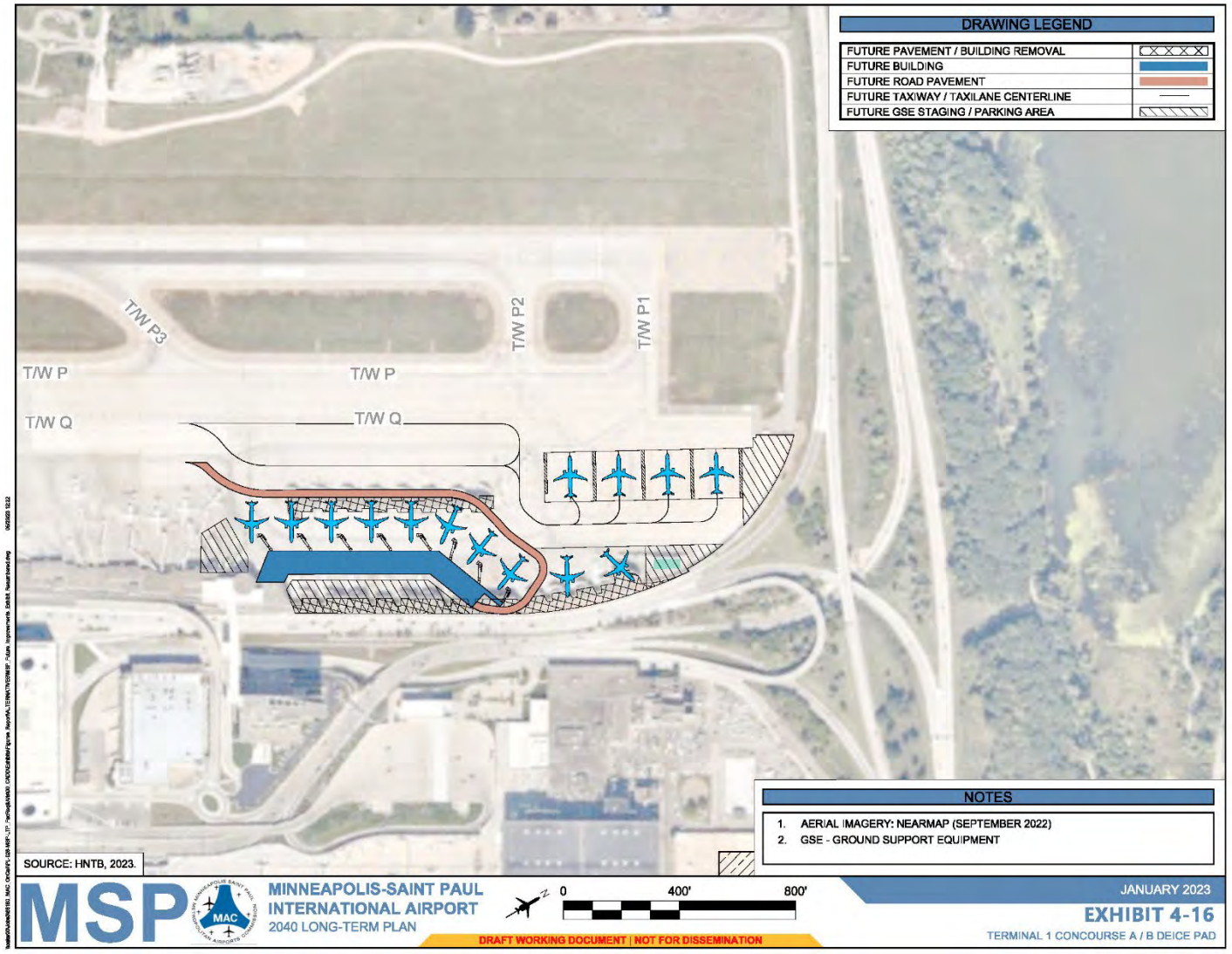

Exhibit 4-17: Runway 30L Deice Pad – Option 1

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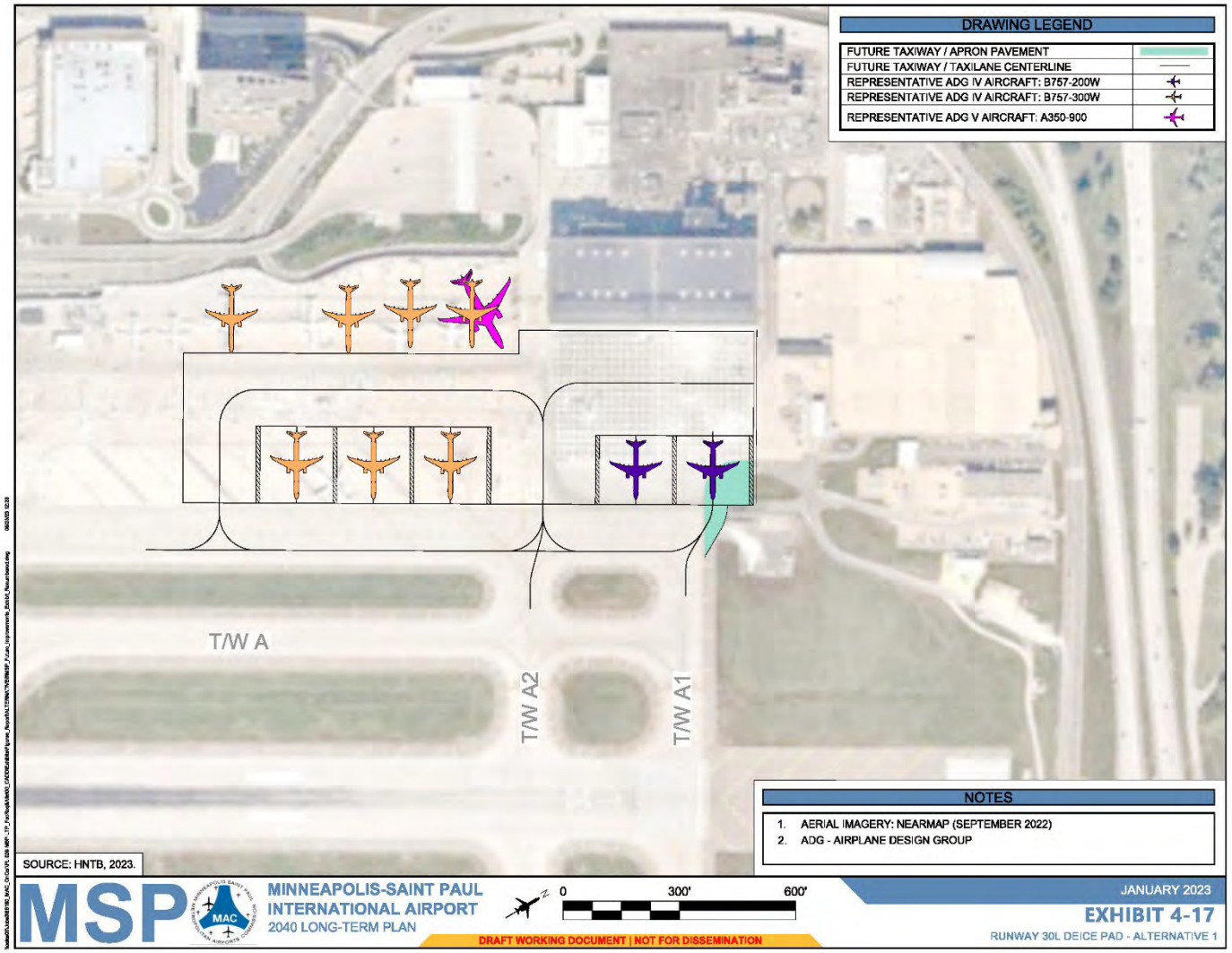

Exhibit 4-18: Runway 30L Deice Pad – Alternative 2

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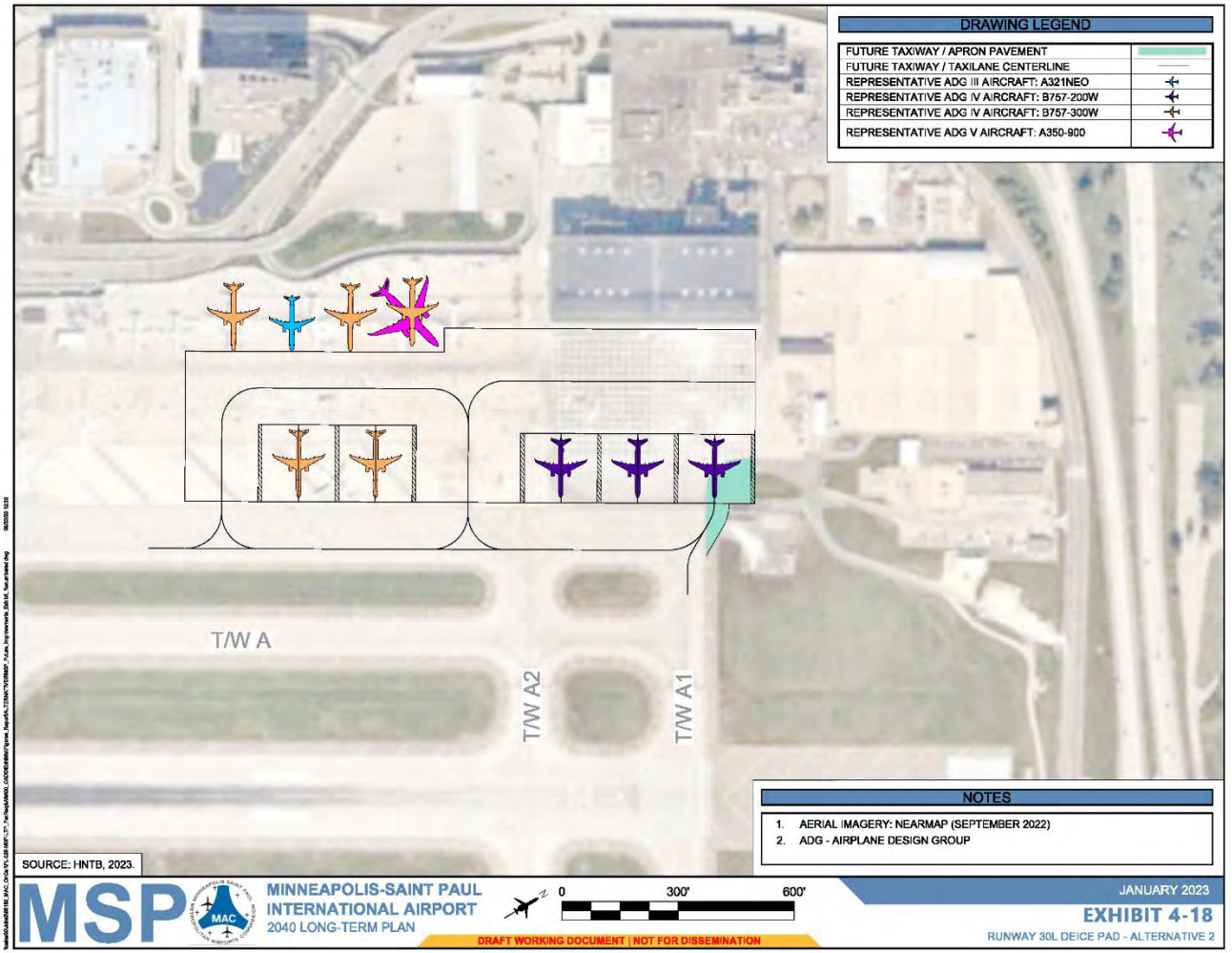

Exhibit 4-19: Runway 30L Deice Pad – Alternative 3

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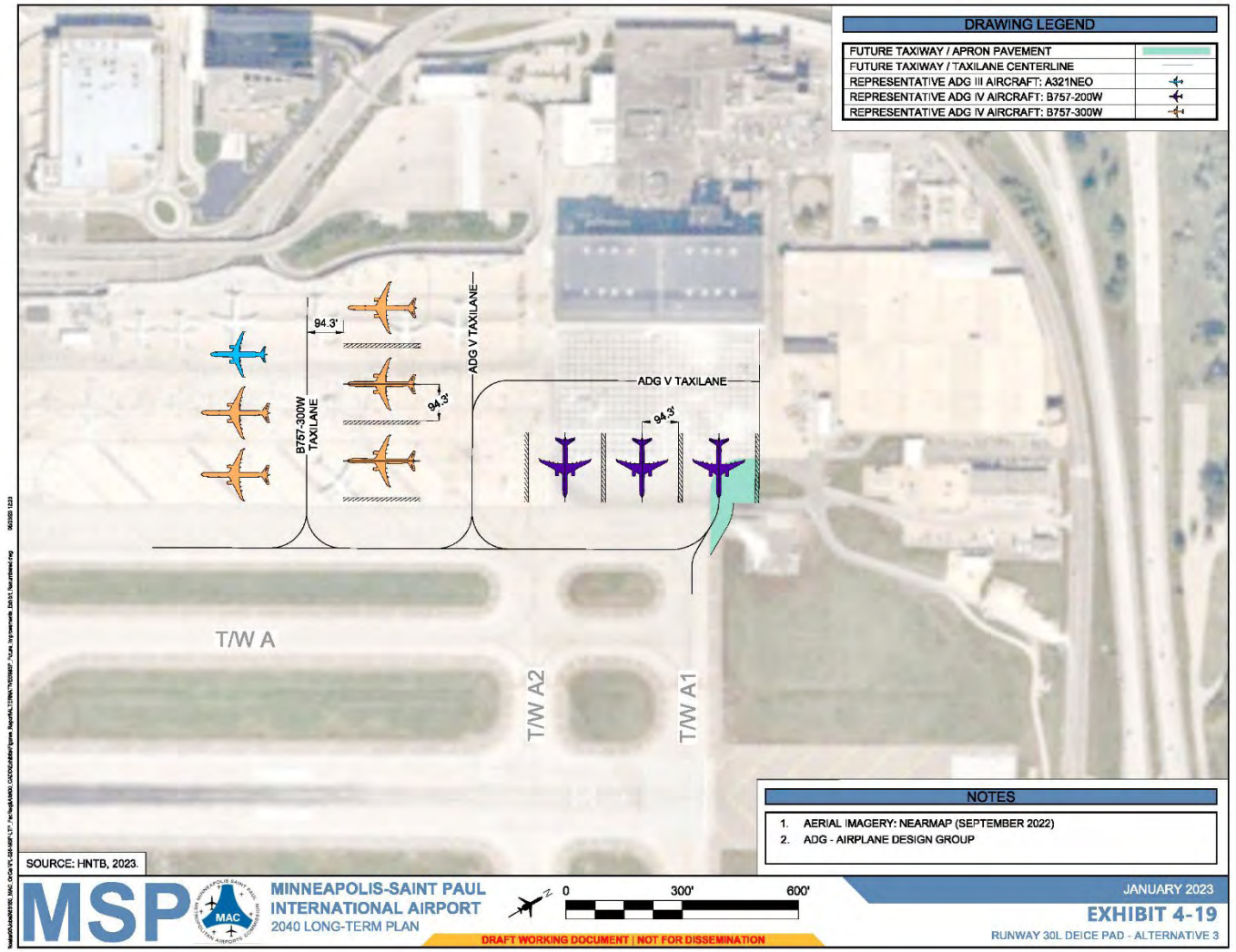

Exhibit 4-20: Runway 30L Deice Pad – Alternative 4

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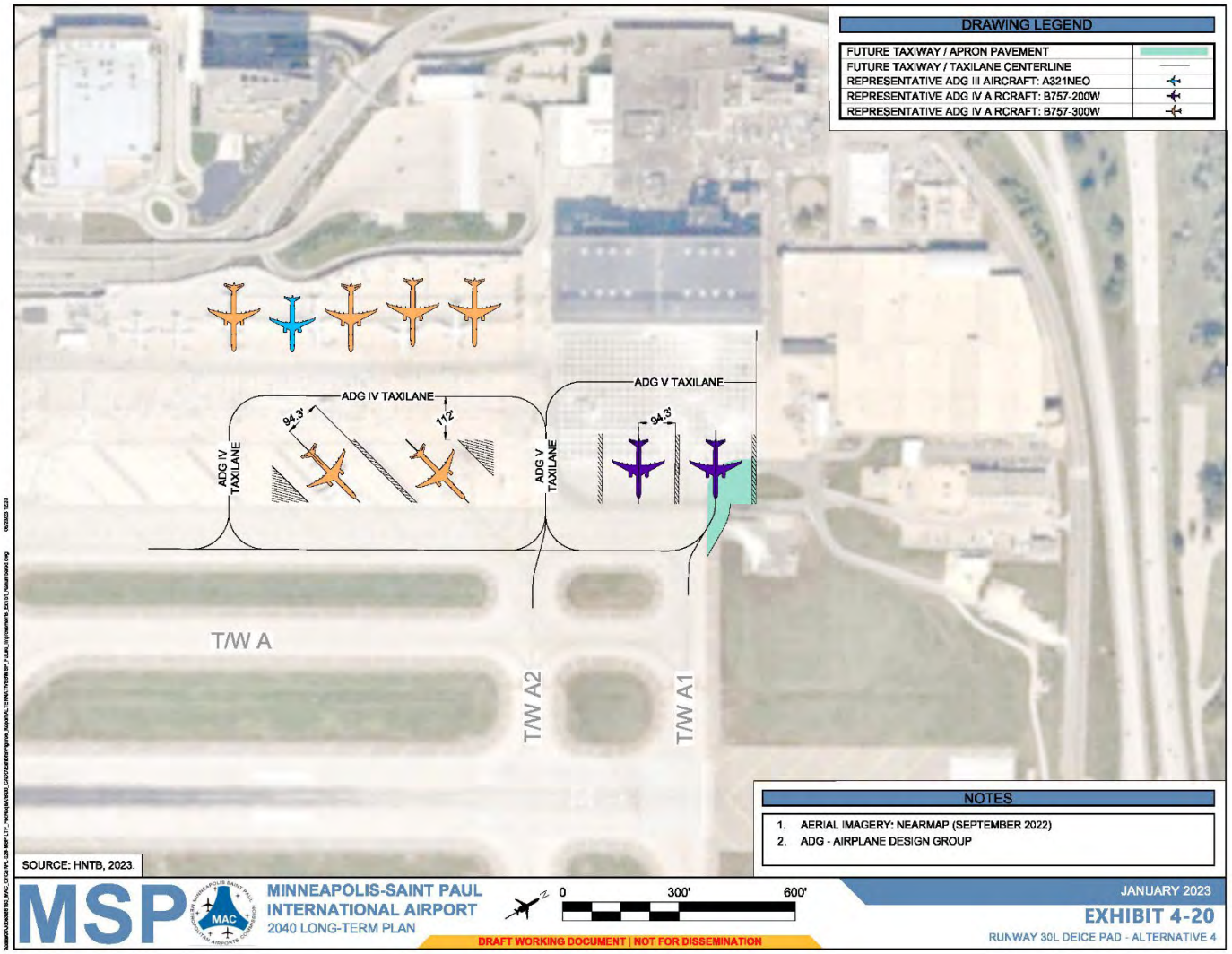

Exhibit 4-21: Runway 30L Deice Pad – Alternative 5

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Exhibit 4-22: Runway 30L Deice Pad – Alternative 6

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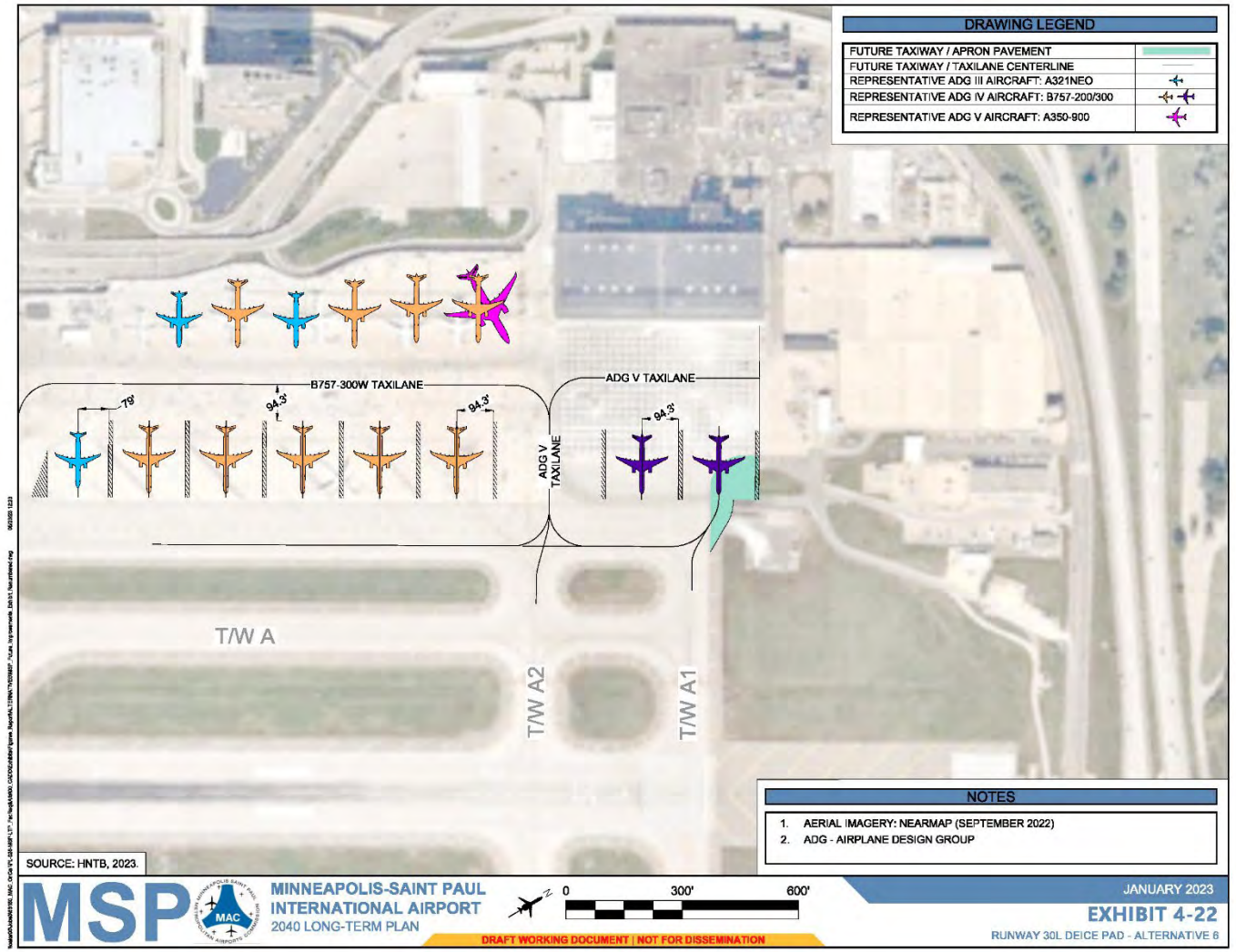

Exhibit 4-23: Runway 30L Deice Pad – Alternative 7

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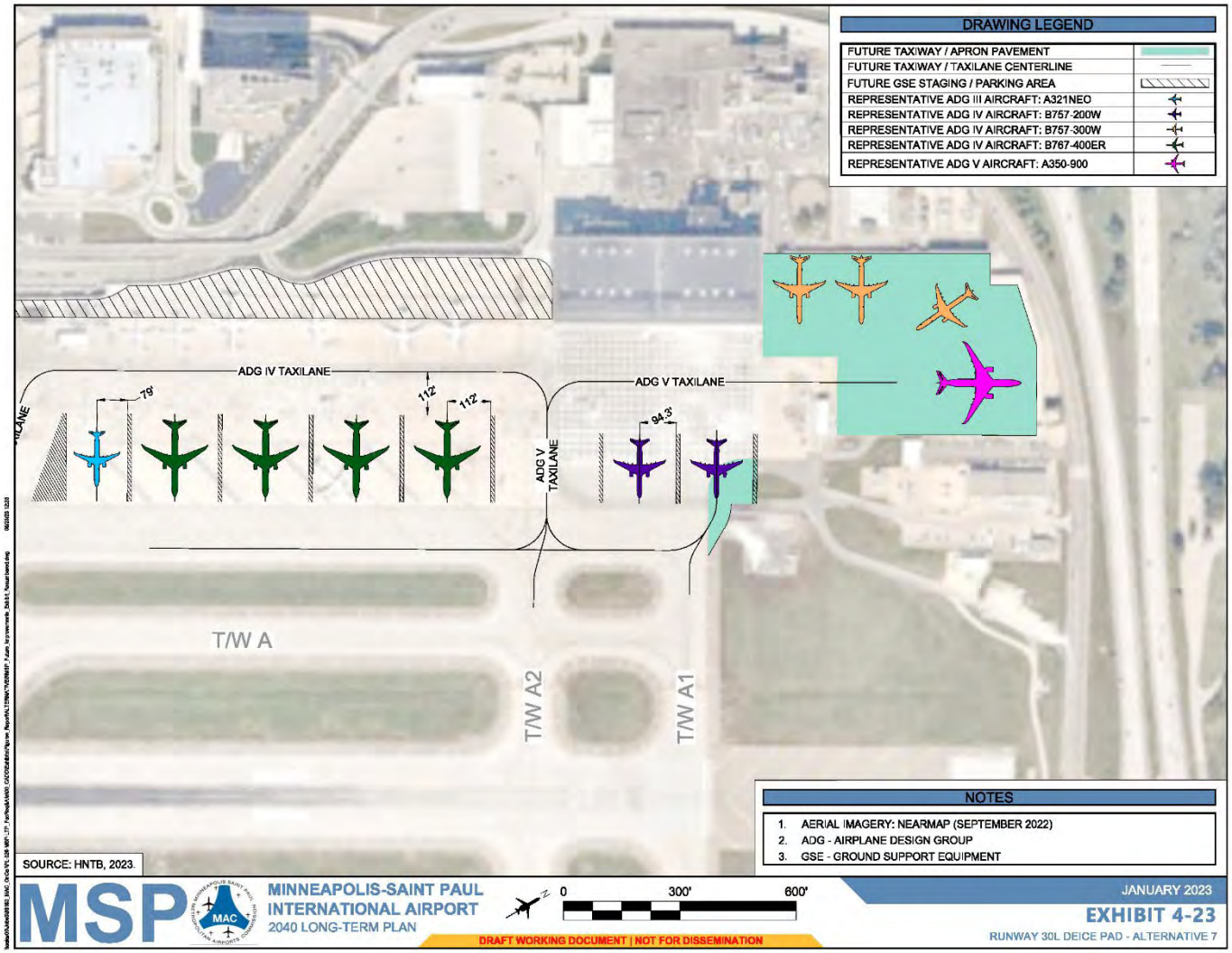

Runway 30L Deice Pad Alternative 1 was chosen as the preferred layout, since it maximizes the available space for RON parking, increases the existing deice pad capability, and minimizes impacts to the Delta maintenance apron. Alternative 1 includes three deice positions that can accommodate aircraft up to a Boeing 757-300W and two deice positions that can accommodate aircraft up to a Boeing 757-200W. The five deice positions increase the deice pad's capability from the existing condition as it accommodates ADG IV aircraft. Access to the Delta maintenance ramp is maintained through an ADG V taxilane, which also provides access to the two B757-200W deice positions. The three B757-300W deice positions and RON parking are accessed through a B757-300W–specific taxilane. Aircraft larger than the B757-300W would be restricted from using this taxilane. However, ADG V capabilities are maintained adjacent to existing taxiway A2, which allows for RON parking of one widebody aircraft in the veranda area north of the future deice pad layout.

4.3.4 Remain-Overnight Parking

The existing RON parking available at MSP is not adequate to meet the future demand. Three alternative locations were considered for future RON parking expansion including the existing Delta parking lot south of Delta's maintenance facility on Taxiway S, the north side of the airfield at the approach end of Runway 12R, and north of the T2 expansion adjacent to Taxiway W.

Alternative 1, shown on **Exhibit 4-24**, can accommodate a mixture of ADG II, III, and IV aircraft. This alternative accommodates 7 ADG II aircraft, 10 ADG III aircraft, and 3 ADG IV aircraft. The exact number of aircraft that can be accommodated is dependent on the type of parking configuration used: dependent or independent. A dependent parking position requires at least one aircraft to be moved to allow movement of the position in question. As shown, a mix of dependent and independent positions is included, which can be configured based on shifting demands.

Alternative 2, shown on **Exhibit 4-25**, also includes a mix of dependent and independent parking positions. The area accommodates 15 ADG III aircraft and 5 ADG V aircraft. The primary advantage of the north RON site over the south site is the ability to accommodate ADG V aircraft. The primary disadvantage of the north RON site is the loss of proximity to the terminals and maintenance facilitates. Alternative 2 is identified as the preferred location for the relocated FBO apron; therefore, RON parking at this location was eliminated from further consideration.

Alternative 3, shown on **Exhibit 4-26**, accommodates 10 ADG III aircraft. This location is immediately adjacent to T2, requiring short tow distances. The RON apron will need to be configured to limit impacts to the existing VSR, which passes through this area from T1 to the central cargo area. Impacts to the VSR tunnels under the runways are not desired due to the cost and complexity of reconstruction.

Alternative 1 was selected as the preferred location for future RON parking. The south RON apron location is closer to the terminals and maintenance facilities where these aircraft will be towed to and from. Most aircraft requiring RON parking are expected to be ADG III–sized aircraft, which the south location accommodates. Alternative 3 would be best suited as a deice pad, as discussed in **Section 4.3.3**. However, during non-deicing conditions, aircraft can also be parked on the deice pad, adding RON parking capacity to the Airport.

Exhibit 4-24: Remain-Overnight Parking – Alternative 1

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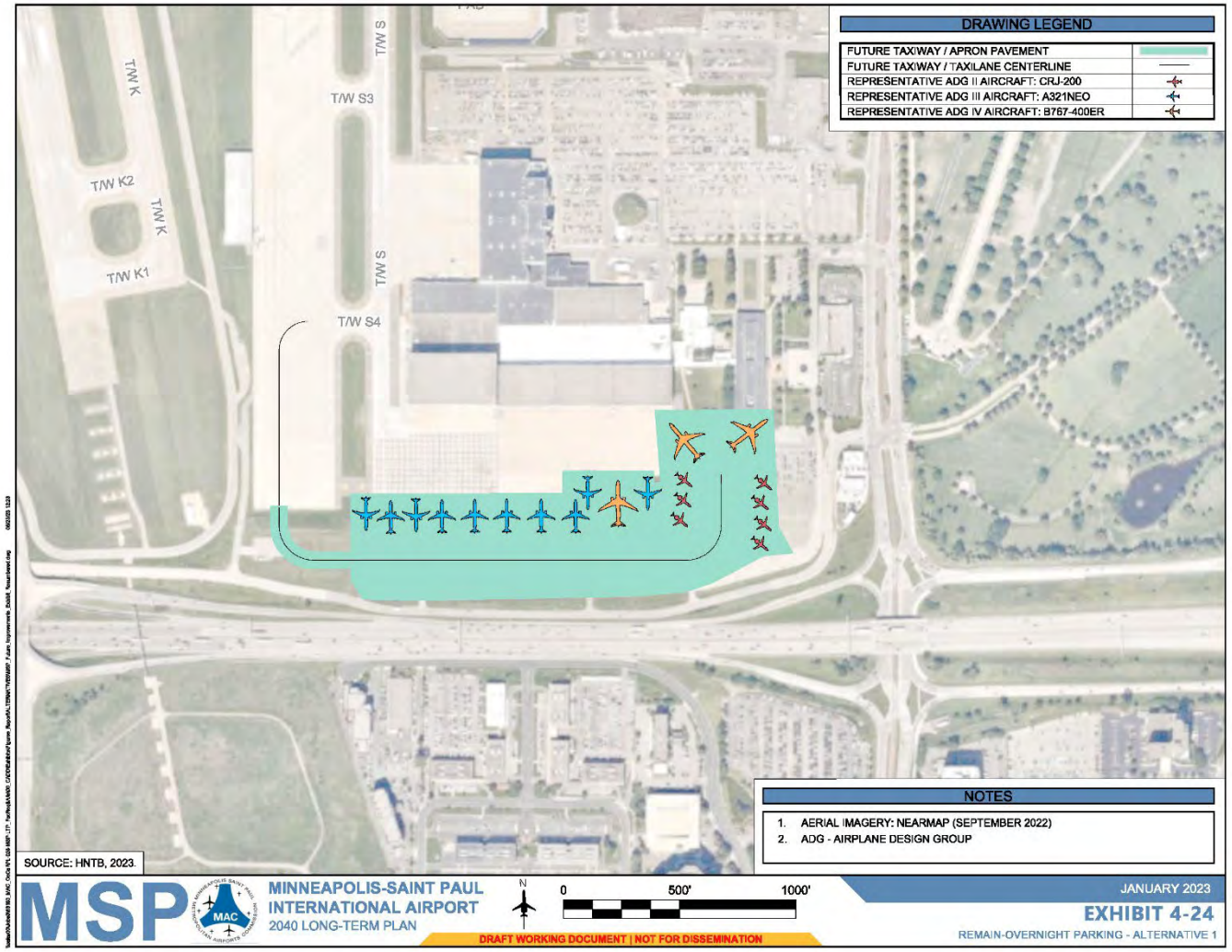

Exhibit 4-25: Remain-Overnight Parking – Alternative 2

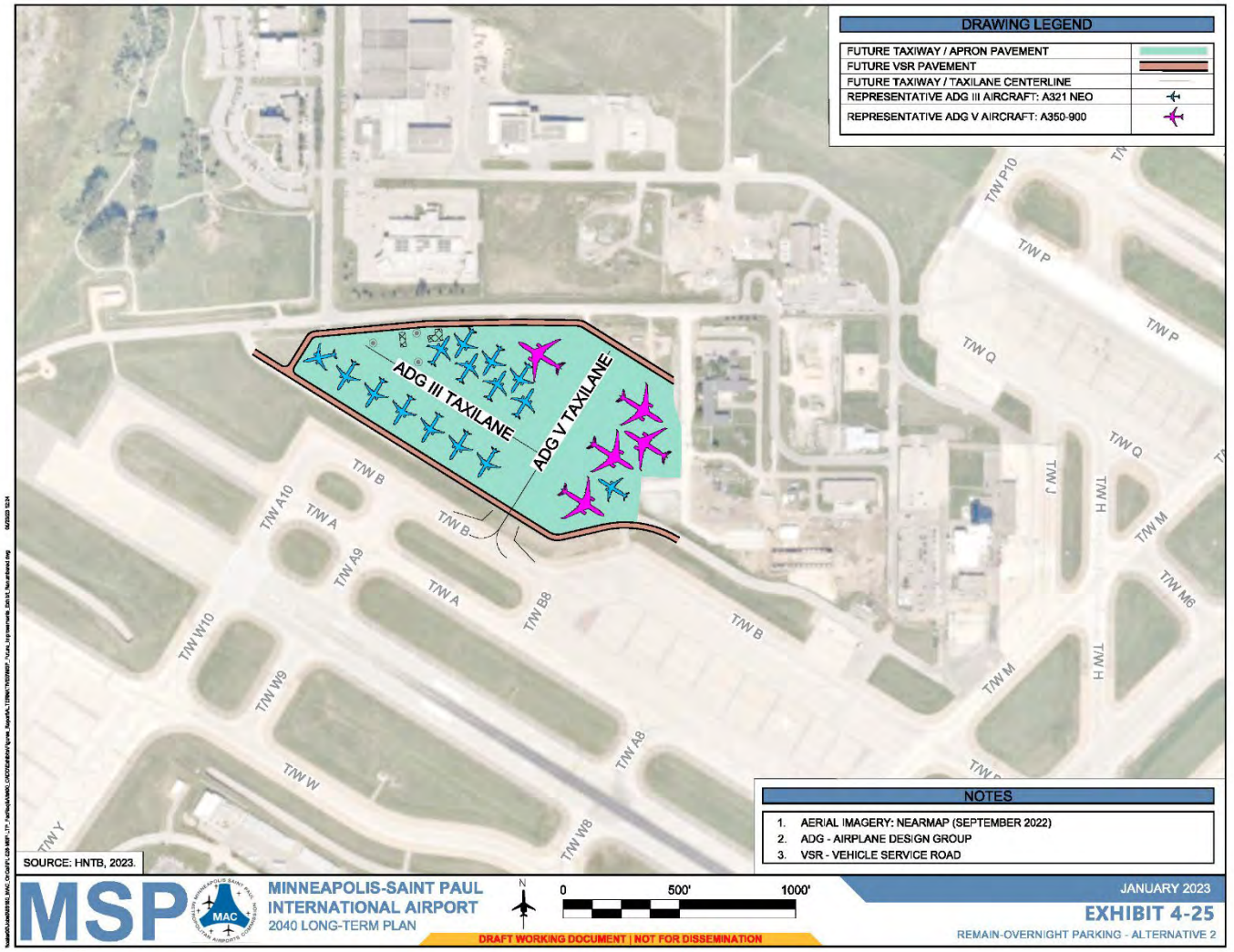

Exhibit 4-26: Remain-Overnight Parking – Alternative 3

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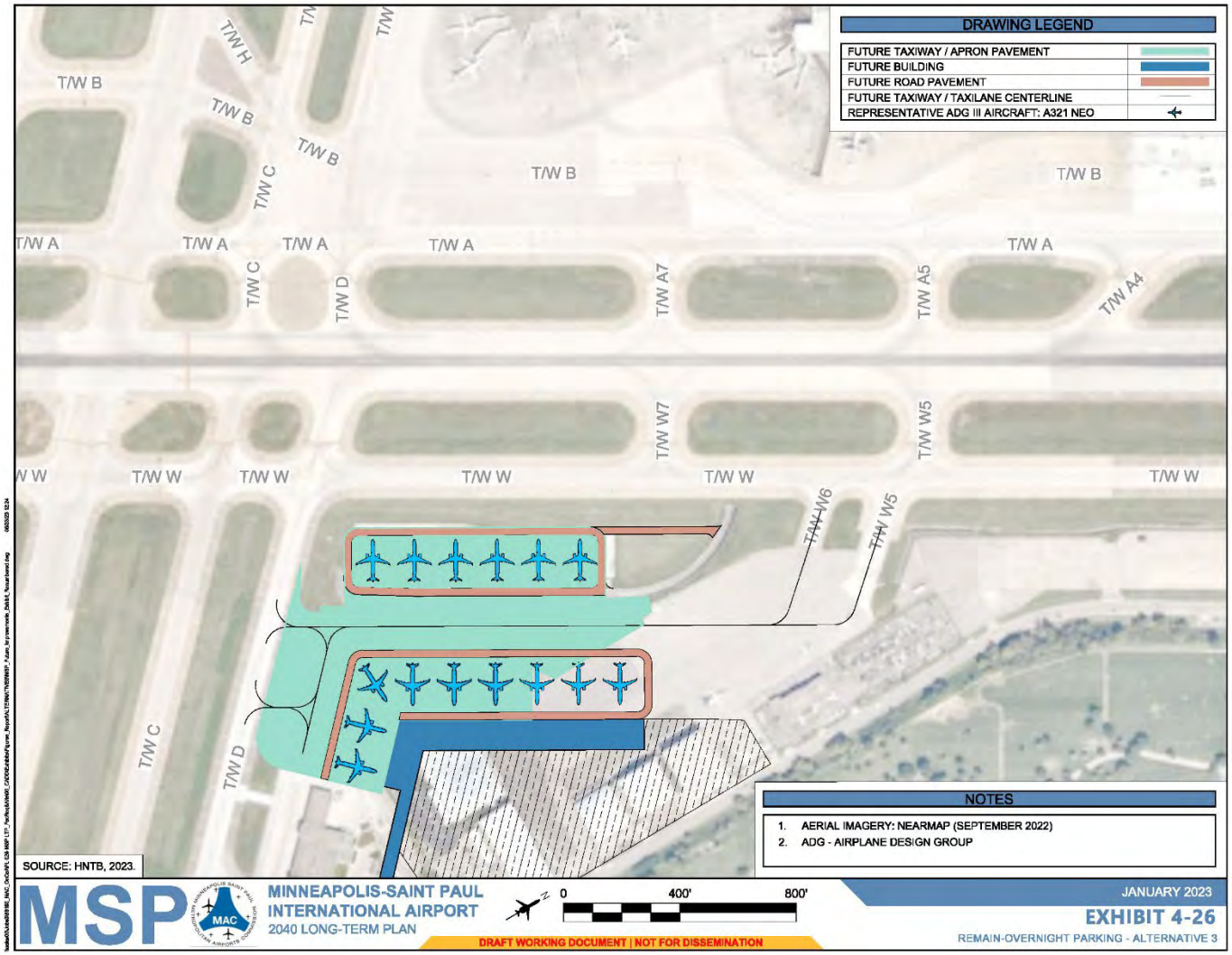
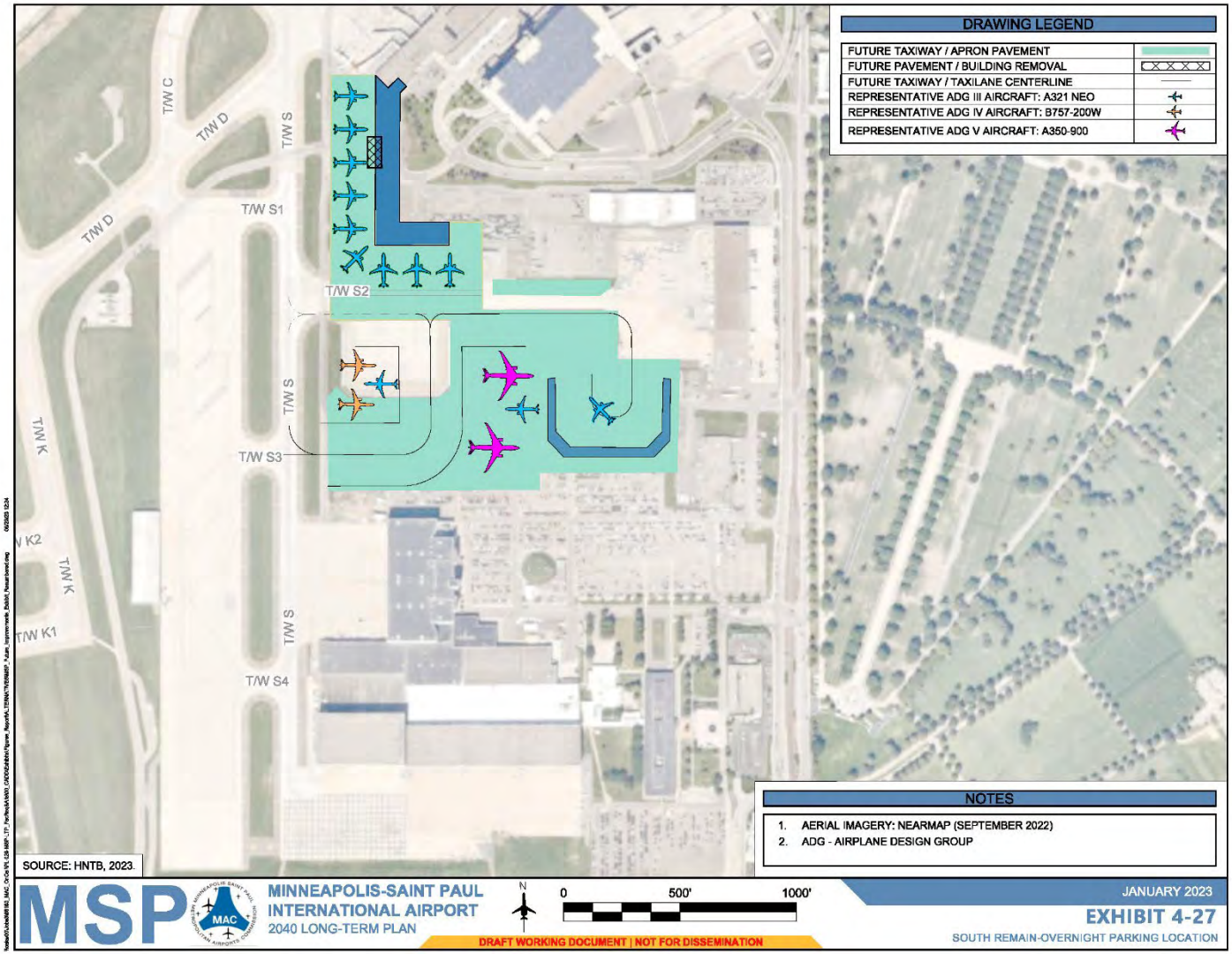


Exhibit 4-27: South Remain-Overnight Parking Location



Other areas on the airfield can provide limited additional RON parking capacity including south of the T2 expansion at the site of the existing GRE, as well as adjacent to the Runway 320L deicing pad. **Exhibit 4-27** and **Exhibit 4-15** (same exhibit showing Concourses A and B) show these additional RON parking locations.

Depending on operational needs, the location south of T2 at the existing GRE site can accommodate two ADG III aircraft, two ADG IV aircraft, and two ADG V aircraft. This location might be best suited for short-term parking to free up T2 gate positions since it is located close to T2.

The 30L RON parking location is an existing location used for RON parking. Changes to the Runway 30L deice pad, because of the Concourse G expansion, may change the size of aircraft that are able to use this location for RON parking. The possible RON parking configurations for this site are shown on **Exhibits 4-24** through **4-26** in **Section 4.3.4**.

4.3.5 Air Cargo

Section 3.1.9 discusses specific requirements for future air cargo buildings and apron area. The requirements presented in the 2021 Landrum & Brown, Inc., study were incorporated into the preferred alternative at the existing FedEx / UPS cargo apron and in a new air cargo facility located on the west side of the airfield.

4.3.5.1 FedEx / UPS Ramp

Two additional UPS parking positions are required to meet future demand, per the Landrum & Brown, Inc., study. Expansion of the UPS apron to accommodate two additional parking positions is possible on the west side of the apron. As shown on **Exhibit 4-28**, a new ADG IV taxilane extending south from Taxiway T to an extended apron provides access to the two new positions, with a limited amount of new apron required.

4.3.5.2 West Cargo

According to the Air Cargo Assessment Study, Amazon does not have enough existing facility space to accommodate its future forecast growth. A 110,000-square-foot building footprint was identified as the requirement for meeting future growth. The only feasible location identified in the long-term planning process that is suitable for a building of this size was an open parcel on the west side of the airfield, north of the existing shared Amazon / DHL apron. The parcel provides direct access to Longfellow Avenue for landside trucking and to Taxiway L for airside access. **Exhibit 4-29** shows a building footprint meeting the Amazon requirement for an aircraft parking apron with access to Taxiway L. The future cargo facility apron is separated from the existing West Cargo Apron, but there is flexibility to merge the two aprons and reconfigure aircraft parking, if desired. Four Boeing 767-300 freighter parking positions are included, with an option for a single Boeing 747-800 freighter parking position. The Boeing 747 parking position is limited to the south end of the site due to the tail height of the aircraft in relation to the Title 14 Code of Federal Regulations (CFR) Part 77 transitional surface.

Exhibit 4-28: 2021 Cargo Study - Preferred FedEx / UPS Ramp Alternative

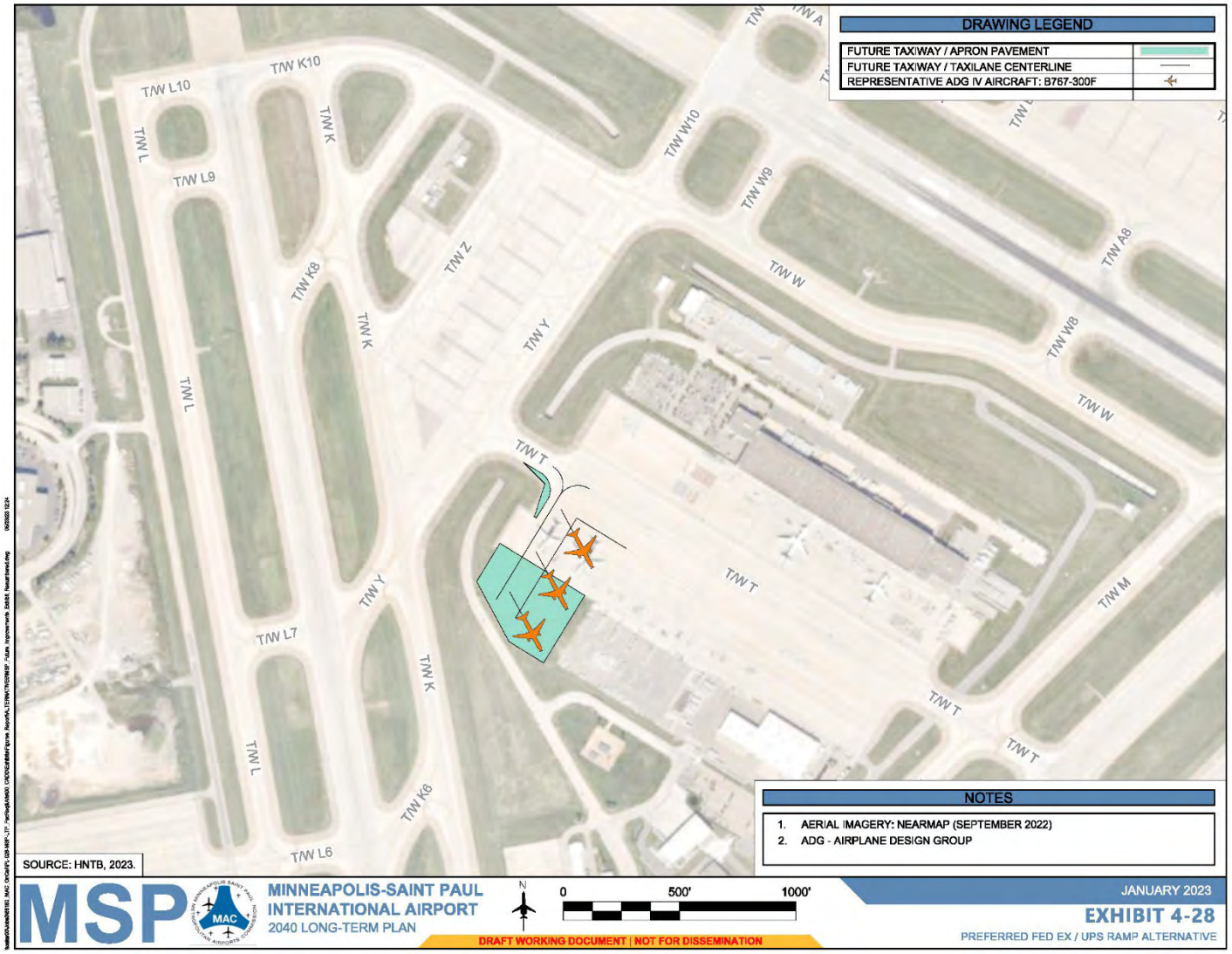
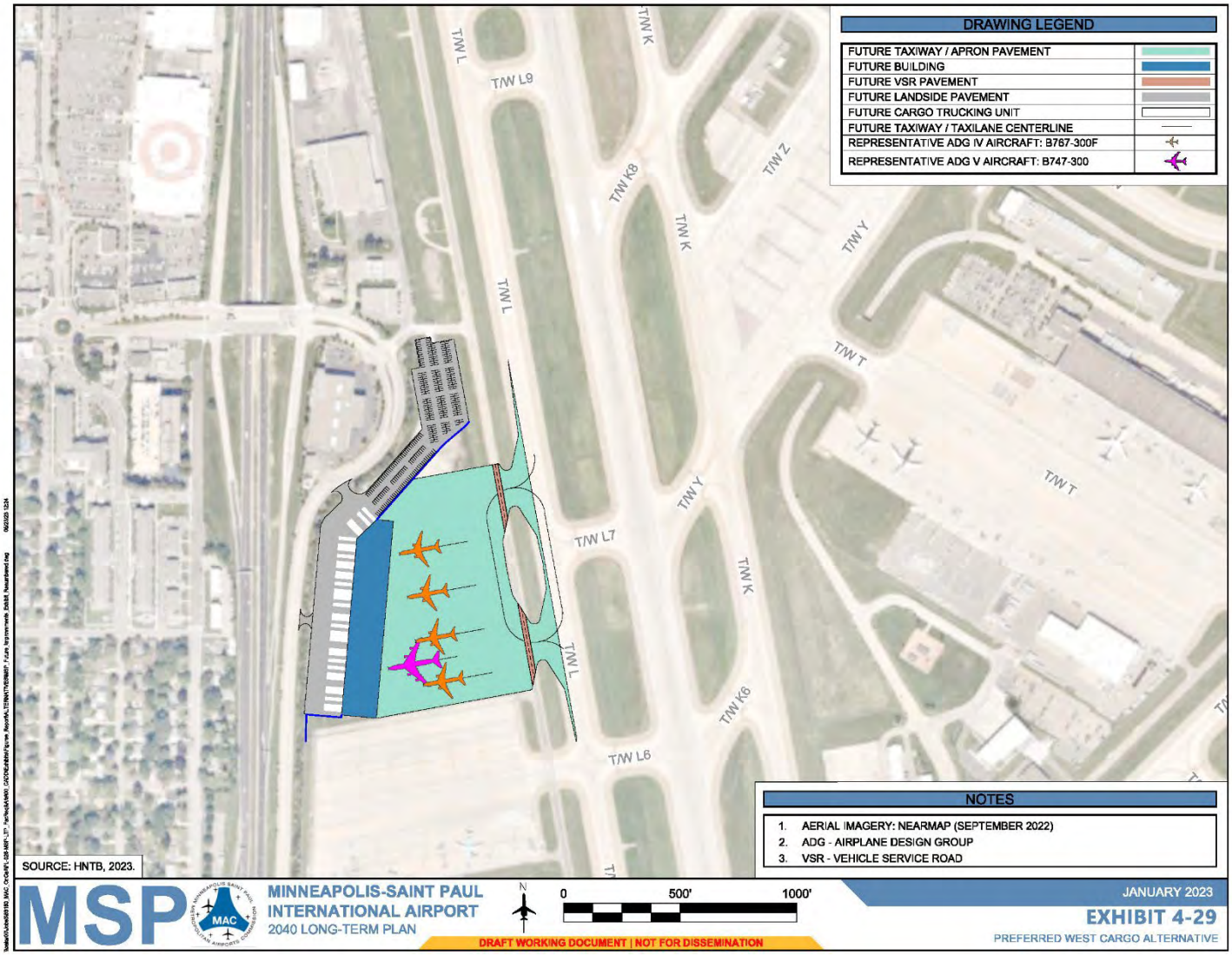


Exhibit 4-29: 2021 Cargo Study - Preferred West Cargo Alternative



4.3.6 Fixed Base Operator

As proposed in the preferred terminal alternative, the northward expansion of T2 would require relocation of the existing FBO. Three initial alternative locations were evaluated including:

- **Delta Surface Parking Lot** – existing Delta surface parking lot south of the Delta maintenance facility on Taxiway S.
- **South of Terminal 2** – south of the proposed T2 expansion at the location of the existing GRE and QTA facility.
- **North Airfield** – the north side of the airfield adjacent to Taxiway B at the approach end of Runway 12R.

4.3.6.1 South Alternative - Delta Surface Parking Lot

The location on the south side of the airfield alternative was dismissed from further consideration. A best-use determination concluded that this parcel of land is better suited for RON parking. The south FBO site is constrained by the existing Delta maintenance facility to the north and Airport Lane and I-494 to the south, and it does not provide adequate space for an FBO apron and hangars. **Exhibit 4-30** shows Alternative 1.

4.3.6.2 South of Terminal 2 Alternative

The location south of the proposed T2 expansion alternative was also dismissed from further consideration because this area is required for relocation of the GRE and the impacts to the QTA facility. **Exhibit 4-31** shows Alternative 2.

4.3.6.3 North Airfield Alternatives

The location on the north side of the airfield alternative was chosen as the preferred location of the relocated FBO. Three separate alternatives were evaluated on the north site; these alternatives were developed considering the future security center development planned north of the Runway 12R deice pad. All three alternatives require relocation of the remote transmitter/receiver (RTR) and remove center air/ground (RCAG) antennas and supporting buildings at the site. These facilities are owned by the FAA. All three options include an ADG III and ADG V taxilane connection from Taxiway B for access to the FBO site, and all three alternatives include a proposed parking lot north of East 62nd Street within the existing dog park. **Exhibit 4-32** through **Exhibit 4-34** show the three north FBO alternatives.

- **North Airfield Alternative (Alternative 1)** - Alternative 1 includes a 20,000-square-foot FBO terminal building with landside access to East 62nd Street, three hangars totaling approximately 175,000 square feet, and an apron area of approximately 15 acres. This alternative fits wholly within the existing available footprint, without impacts to East 62nd Street or the planned security center development site. The building area is an increase over the existing FBO terminal, which is only approximately 14,000 square feet. The site is smaller than the existing FBO footprint, resulting in a reduction in both the available hangar space and apron space. The existing hangar space is approximately 263,000 square feet (a 33% decrease), and the existing apron area is approximately 17.5 acres (a 15% decrease).

- **North Airfield Alternative (Alternative 2)** - Alternative 2 includes a 20,000-square-foot FBO terminal building and approximately 175,000 square feet of hangar space. The primary difference with this alternative, compared to Alternative 1, is that the northeast portion of the apron is extended east approximately 50 feet. This provides an apron footprint of approximately 15.7 acres, which is a 10% decrease from the existing area. With the eastward expansion of the FBO apron, the security center access location is shifted from the existing driveway west of the old US Navy building to 32nd Avenue South. There are no other impacts to the planned security center development, other than moving the access point to the employee parking lot, which remains in its proposed configuration. Alternative 2 was chosen as the preferred north FBO alternative since it maximizes the FBO apron area, while limiting impacts to the future security center under design.
- **North Airfield Alternative (Alternative 3)** - Alternative 3 provides the 20,000-square-foot FBO terminal building and hangar space provided in Alternatives 1 and 2 and extends the northeast quadrant of the apron to the east as in Alternative 2, and it also extends the apron to the northwest across East 62nd Street. This results in an apron area of approximately 20.3 acres, a 16% increase over the existing area. This alternative reduces the existing dog park footprint by approximately 4.0 acres, requires reconfiguration of the security gate leading to the airfield on East 62nd Street, and requires reconfiguration of the airfield perimeter road north of the Runway 12R approach. Due to the impacts to the dog park and required reconfiguration of the security gate and perimeter road, this alternative was not chosen as the preferred alternative.

Exhibit 4-30: South Alternative – Delta Surface Parking Lot

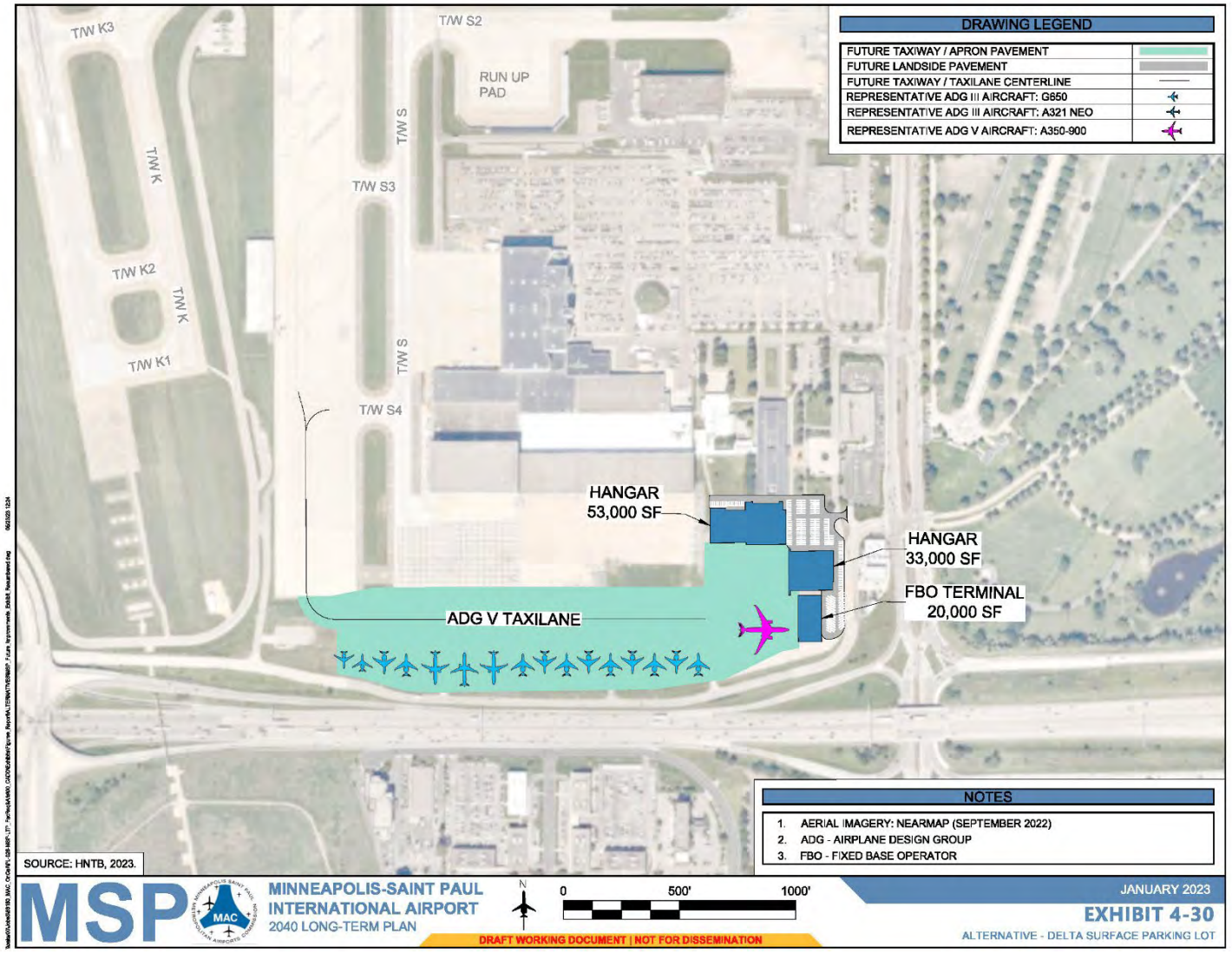


Exhibit 4-31: South of Terminal 2 Alternative

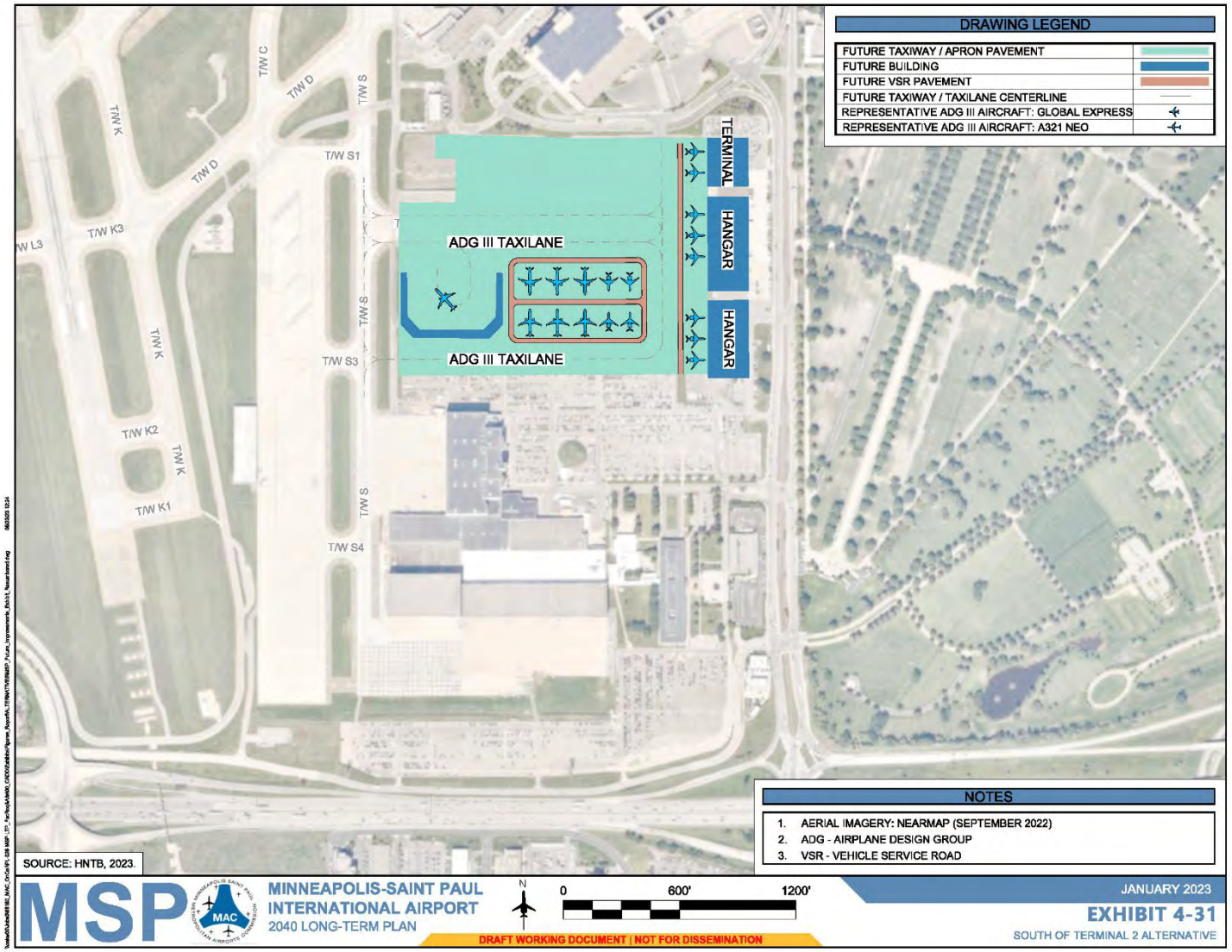


Exhibit 4-32: North Airfield Alternative – Alternative 1

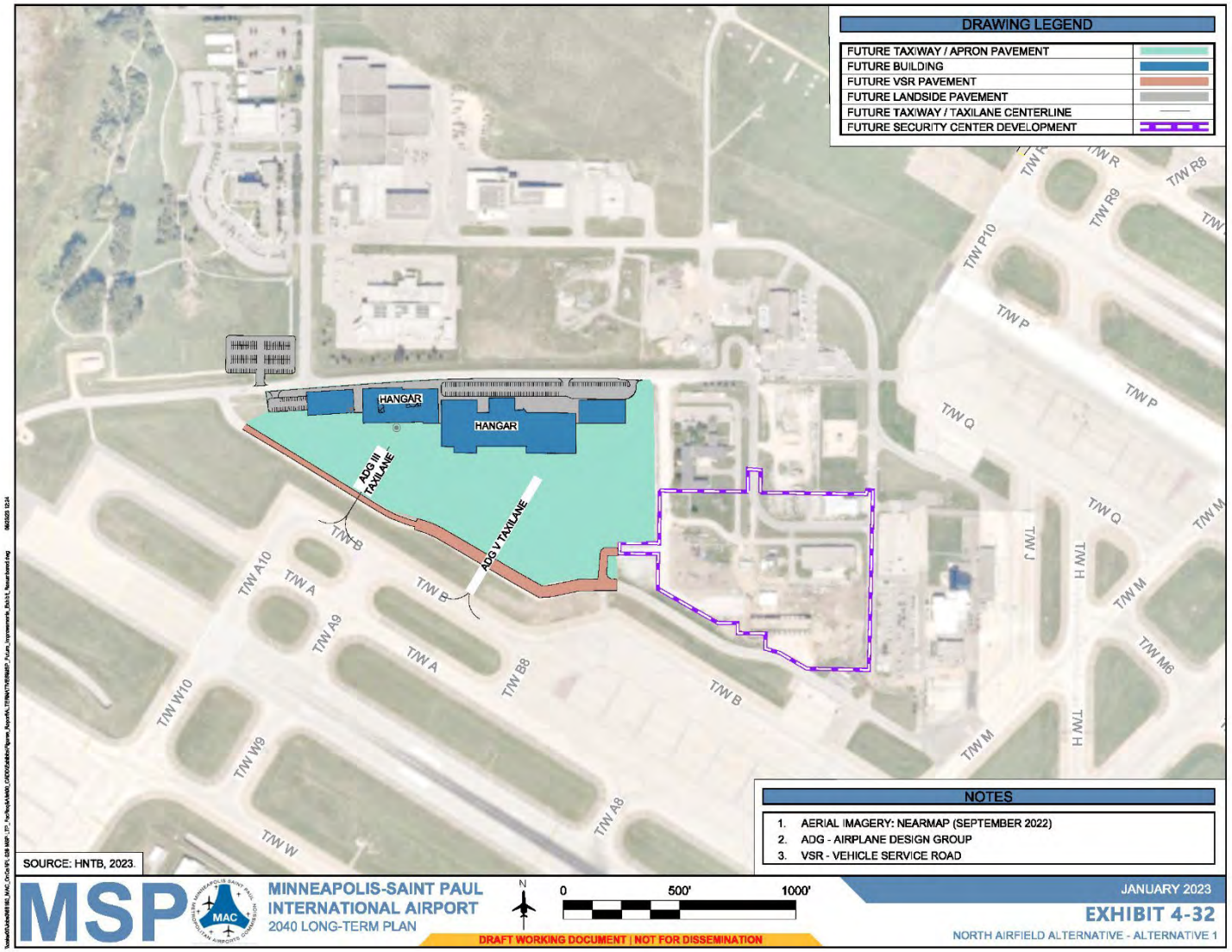


Exhibit 4-33: North Airfield Alternative – Alternative 2

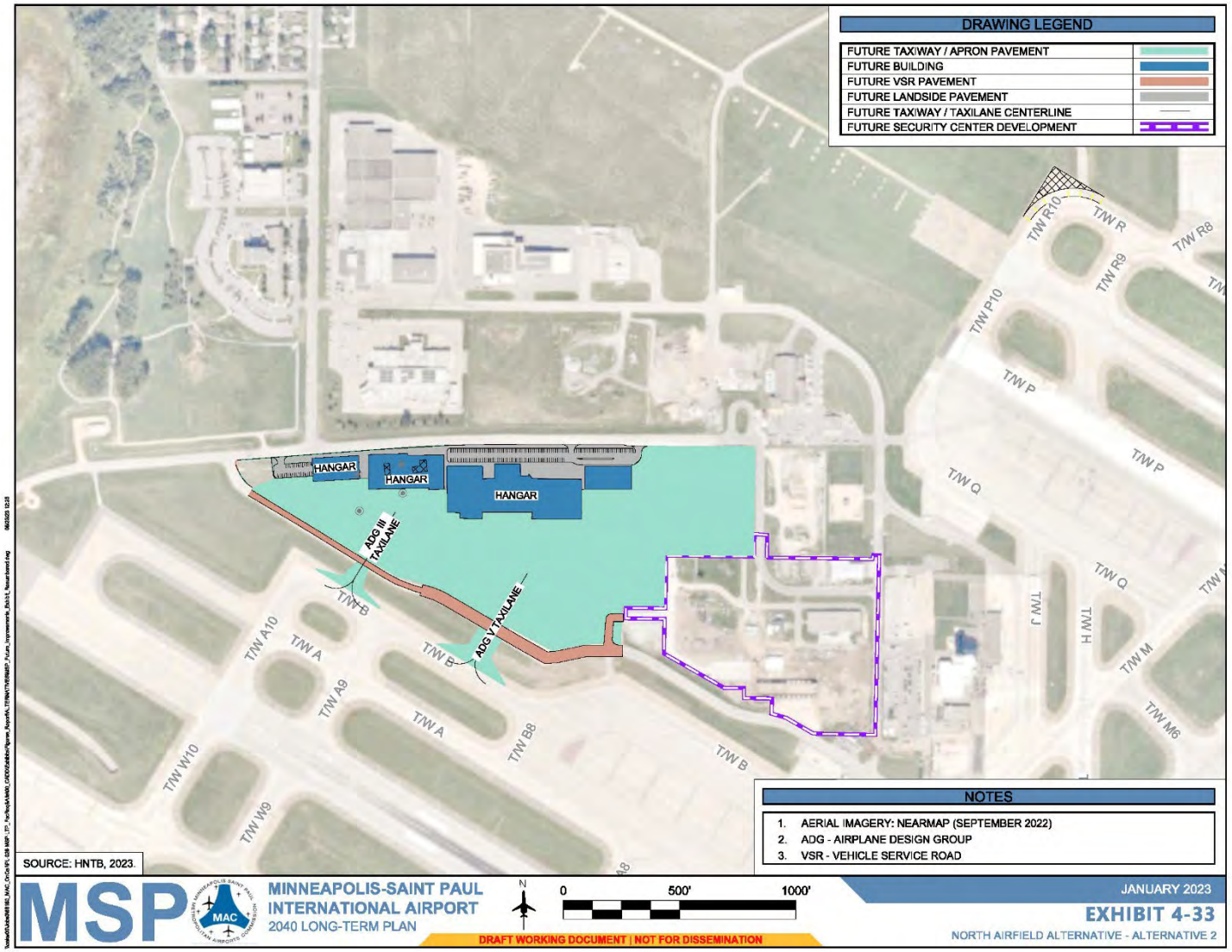
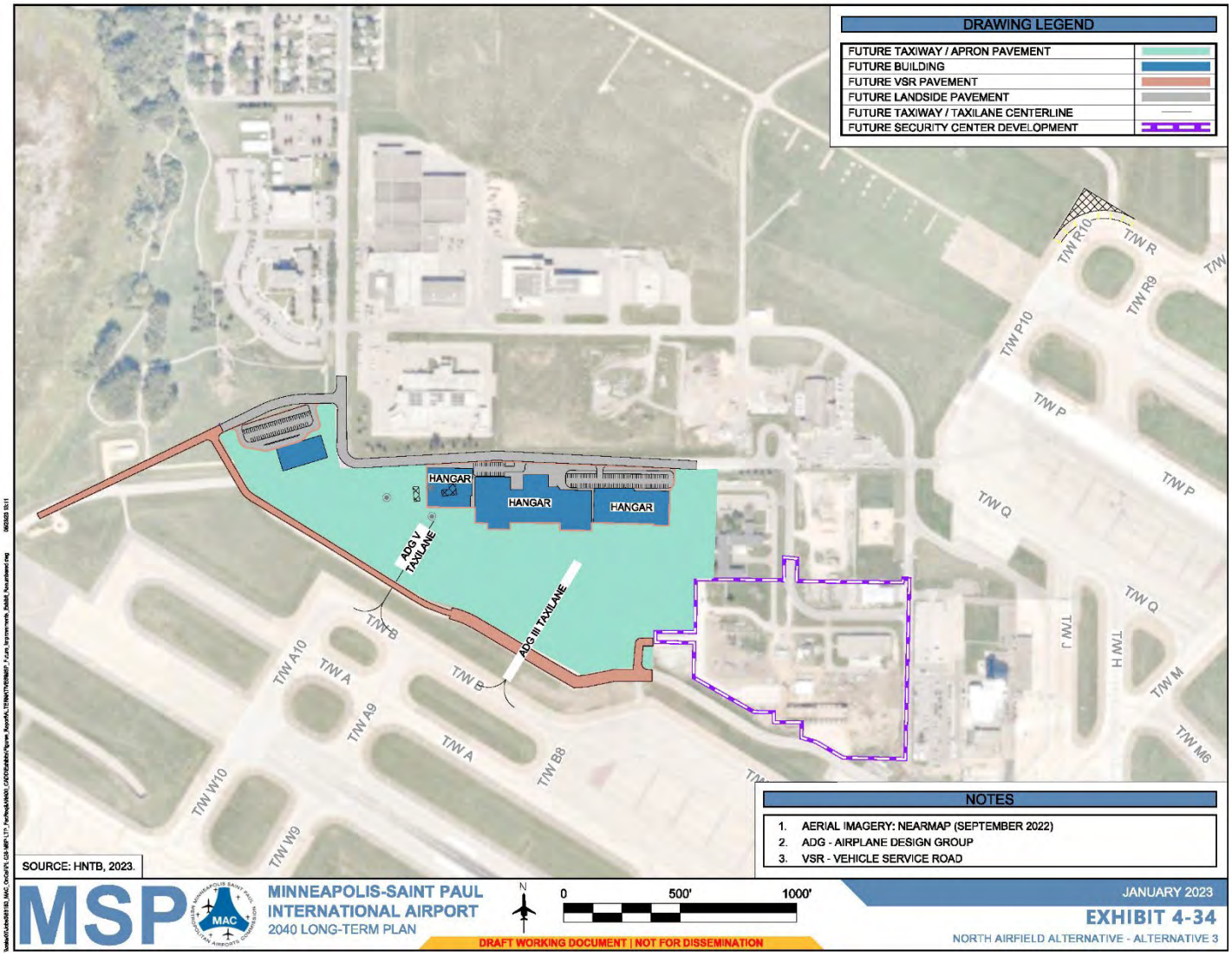


Exhibit 4-34: North Airfield Alternative – Alternative 3



4.4 LANDSIDE ALTERNATIVE DEVELOPMENT

This section reviews the landside elements considered during the initial planning process, such as curbside, parking, rental cars, and regional roadway access. Three landside alternatives were developed based on the alternative terminal families described in **Section 4.2.2**. These alternatives were developed to reflect a range of potential improvements based on each family. Specific landside improvements are dependent upon a preferred terminal plan; therefore, refined landside alternatives are reviewed in **Section 4.6**.

4.4.1 Landside Considerations

While MSP has a relatively large total area, it has limited existing undeveloped landside areas to meet the facility requirements. The following subsections provide a brief overview of the approach to identifying priority areas for landside development.

4.4.1.1 Privately-Owned Vehicle Curbside

Privately-owned vehicle (POV) curbside operations serve direct passenger drop-off and pick-up at the passenger terminal. POV curbside operations are most effective when placed near the terminal ticketing and baggage claim facilities. T1 and T2 have differing site constraints and facility requirements that impact the feasible POV alternatives. Planning should consider both the projected curbside requirements for the preferred terminal operation scheme and requirements based on the number of gates, understanding that operating schemes can change over time.

Terminal 1

The existing ticketing and baggage claim facilities are planned to remain in their current location throughout the planning horizon. The existing pick-up and drop-off curbside facilities east of the passenger processor should remain in all alternatives to continue providing convenient passenger service. Alternatives should explore POV curbside development within the Green/Gold Ramp redevelopment footprint to meet facility requirements, as this is the next closest location to the passenger terminal. Multiple parallel north–south curbs are required to meet facility requirements due to the limited distance between Concourse C and Concourse G.

Terminal 2

The existing single-level, combined pick-up and drop-off curbside east of the passenger processor is not adequate to meet the long-term facility requirements. MAC stakeholders expressed a desire to explore traditional grade separated POV curbside operations, as well as strategies utilizing the existing parking facilities to address growing curbside requirements.

4.4.1.2 Parking

The parking alternatives must consider the total Airport parking requirement, as well as the parking requirement at each terminal. The requirement at each terminal is driven by the terminal operational scenarios and the airlines allocated to each terminal. Parking alternatives must also consider the end-of-life demolition of the Green and Gold Ramps and off-Airport parking supply impacts.

T2 parking facilities include accommodations for the parking expansion that should be considered with the alternatives. The planned expansion includes:

- Purple Ramp Outrigger (Level 2 to Level 8) – 1,275 stalls
- Orange Ramp Outrigger (Level 4 to Level 8) – 750 stalls
- Orange Ramp LRT Outrigger (Level 4 to Level 8) – 360 stalls
- Orange Ramp Vertical (Level 9 and Level 10) – 1,250 stalls

Parking alternatives must consider developments that impact the existing Delta employee parking along 34th Avenue. Prior MSP planning efforts identified a structured parking development to consolidate Delta employee parking and provide an opportunity for additional economy public parking.

4.4.1.3 Rental Cars

The rental car facility alternatives must consider the total Airport rental car facility requirement, as well as the requirement at each terminal. The requirement at each terminal is driven by the terminal operational scenarios and the airlines allocated to each terminal. Both T1 and T2 have existing rental car facilities that must be considered with any alternative. The T1 CSB and ready/return area were relocated to the Silver Ramp in 2020; Airport stakeholders identified these rental car operations remaining in the Silver Ramp as a development constraint.

The remote consolidated rental car facility alternative was recommended as part of a prior MSP planning study. This rental car operating alternative was discussed with stakeholders during initial screening. The stakeholder feedback did not support this alternative due to negative customer experience associated with travel times to/from remote facilities, high costs associated with passenger movement between passenger terminals and the consolidated rental car facility, and recent Silver Ramp development with new rental car facilities.

4.4.1.4 United States Postal Service Site

The existing MSP USPS sortation and customer-facing operations are located east of the Silver Ramp. This site includes structured parking that supports valet parking for the Airport hotel. The USPS leases the existing facility. MAC can end the USPS lease early through a buyout; the buyout cost reduces each year. As of 2020, the USPS ended its sortation operations. MSP stakeholders directed the planning team to assume the USPS operations can be removed from the MSP campus.

4.4.1.5 Energy Management Center

The Energy Management Center (EMC) is the central utility plant for MSP T1. MAC commissioned a separate study evaluating alternative locations for the EMC. The consolidated landside alternatives incorporate potential landside EMC sites, as identified by the separate study.

4.4.1.6 Commercial Development Corridor

A T2 study completed in 2020 identified a commercial development corridor west of 34th Avenue. This corridor is envisioned as an opportunity to generate non-aeronautical revenue. The corridor vision includes shifting northbound 34th Avenue west of the LRT tracks and shifting southbound 34th Avenue west of the commercial development space. This alternative requires modifications to the 34th Avenue and I-494 interchange; modifications were not explored as part of this study.

4.4.1.7 Regional Roadway Access

The MAC identified improvements to the regional roadway system as part of a separate planning study and EA for the 2030 LTP. The alternatives developed in the prior study were incorporated into this planning effort as the basis for alternative development.

MSP stakeholders expressed interest in a more intuitive, consolidated Airport entry in lieu of the existing split entry for T1 and T2. However, this study did not include refinements to the prior planning work that identified improvements to the regional roadway network to accommodate this change in preferred Airport access. Future coordination is required with the Minnesota Department of Transportation (MnDOT) to align the proposed MSP access modification with planned improvements to I-494 and TH 5.

4.4.1.8 Bicycle Access

Hennepin County published a feasibility study titled "Bicycle Route Access to Minneapolis-Saint Paul International Airport (MSP)" in October 2016. The study identified a preference for bicycle facilities connecting with the regional trail network on roadways including Longfellow Avenue (dual cycle track), East 77th Street (dual cycle track), Airport Lane (dual bike lanes), 34th Avenue (shared path on the west side of the road), East Street / Post Road (dual cycle track). The study proposed bicycle access to Terminal 1 via Northwest Drive with a termination at the Silver Ramp transportation center. The bicycle facilities along Northwest Drive could use dedicated bicycle lanes between Post Road and the Quick Ride Ramp; shared bicycle and vehicle lanes were proposed between the Quick Ride Ramp and Silver Ramp due to existing roadway widths.

4.4.2 Consolidated Landside Alternatives

The planning team explored a range of landside improvements to meet the facility requirements and accommodate demand for terminal and aeronautical facilities. The improvements identified for each family alternative are intended to reflect a range of potential landside improvements in lieu of a specific set of improvements directly tied to each terminal operating alternative. The input from Airport stakeholders on priorities related to airline allocations among terminals and anticipated gates at each terminal will influence the refined and preferred landside alternative.

4.4.2.1 Family 1 Landside Alternative

The Family 1 Landside Alternative responds to a terminal operating alternative that focuses FIS operations at T1 and locates airlines requiring access to the FIS accordingly. This alternative is shown in **Exhibit 4-35** and includes:

- **T1**
    - FIS facility within the Green/Gold Ramp redevelopment site
    - POV curbside expansion within the Green/Gold Ramp redevelopment site
    - Public parking development within the Green/Gold Ramp redevelopment site
    - Public parking and rental car QTA facility development within the USPS site
    - EMC facilities south of the exit plaza
    - Access/egress roadway realignment/reconfiguration for the crossfield taxiway

- **T2**
    - Purple Ramp outrigger expansion
    - Orange Ramp expansion
    - POV curbside expansion within the parking ramps
- **Other**
    - Commercial vehicle hold lot and cell phone lot operations relocated to the vacated Super America site along Post Road
    - Delta employee / remote public parking ramp west of 34th Avenue at 75th Street
    - Commercial corridor west of 34th Avenue

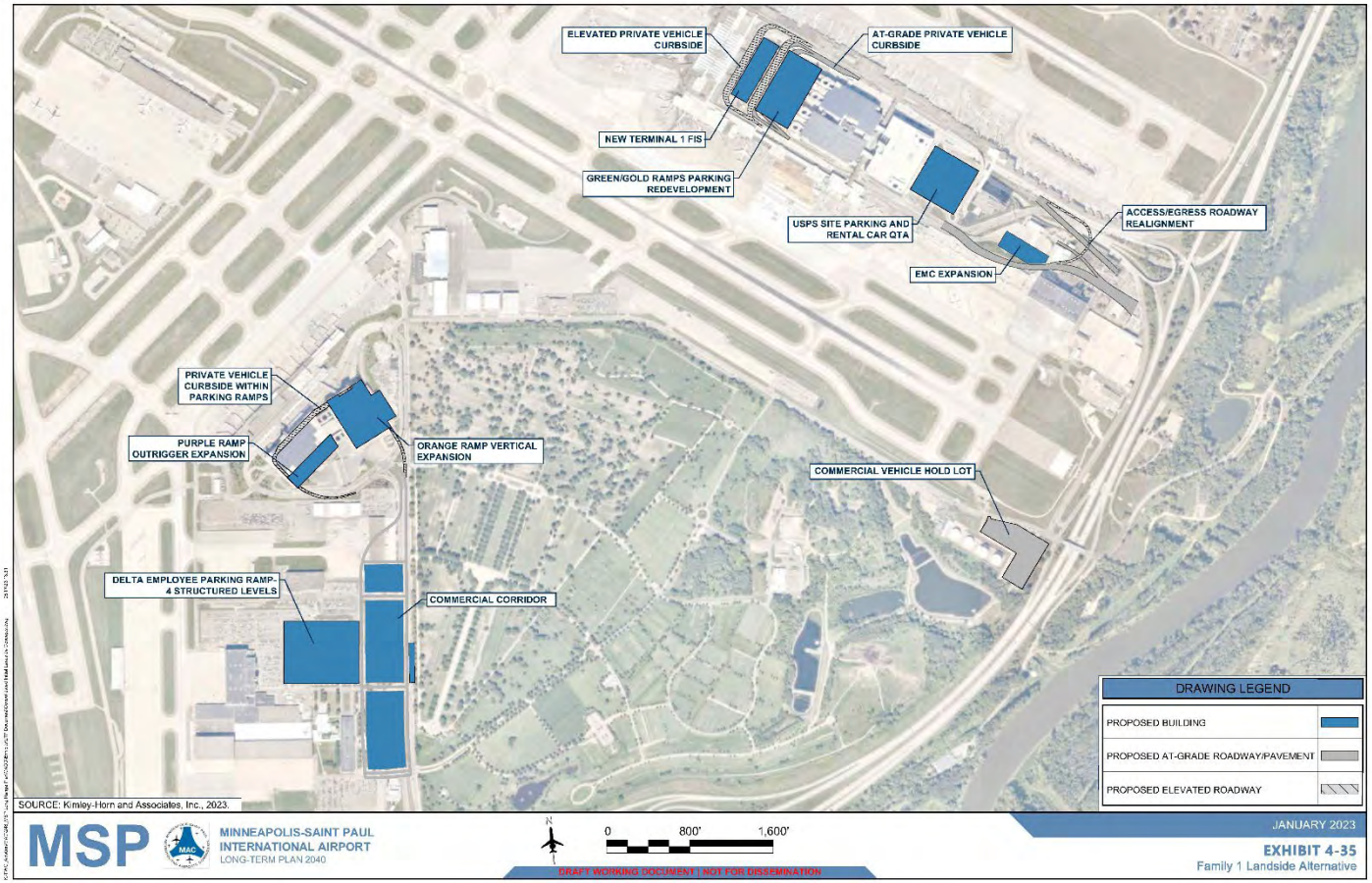
The general landside advantages of this alternative include:

- The USPS site parking development offsets a portion of parking displaced by the Green and Gold Ramps demolition.
- Rental car operations are efficient at T1, including an opportunity for a new QTA facility designed to meet EV requirements.
- A new T1 rental car QTA facility provides an opportunity to redevelop the existing Red/Blue Ramp Level 1.

The general landside challenges of this alternative include:

- The FIS facility placement reduces the supply of highest value walking-distance parking at T1.
- There are significant roadway reconfiguration costs, and extended coordination is required with MnDOT and other outside agencies to construct the T1 access roadway modifications.
- The T2 gate expansion impacts the existing rental car QTA facility, requiring relocation or consolidation in another location not identified in this alternative.
- T2 parking is required to meet the T1 parking demand due to T1 site constraints.

Exhibit 4-35: Family 1 Landside Alternative



4.4.2.2 Family 2 Landside Alternative

The Family 2 Landside Alternative responds to a terminal operating alternative that focuses FIS operations at T2 and provides secure passenger connectivity between T1 and T2. This alternative generates the highest landside facility requirements at T1 due to the airline allocation. This alternative is shown in **Exhibit 4-36** includes:

- **T1**
  - POV curbside expansion within the Green/Gold Ramp redevelopment site
  - Public parking development within the Green/Gold Ramp redevelopment site
  - Public parking and rental car QTA facility development within the USPS site
  - EMC facilities expanded in place within Concourse C
- **T2**
  - Northern POV curbside expansion for international arrivals
  - POV curbside expansion within the parking garages
  - Access relocated from 34th Avenue to Post Road / East 70th Street
  - 34th Avenue and East 70th Street intersection improvements
- **Other**
  - Commercial vehicle hold lot and cell phone lot operations relocated to the vacated Super America site along Post Road
  - Post Road / TH 5 interchange reconstruction
  - Delta employee / remote public parking ramp west of 34th Avenue at 75th Street
  - Commercial corridor west of 34th Avenue

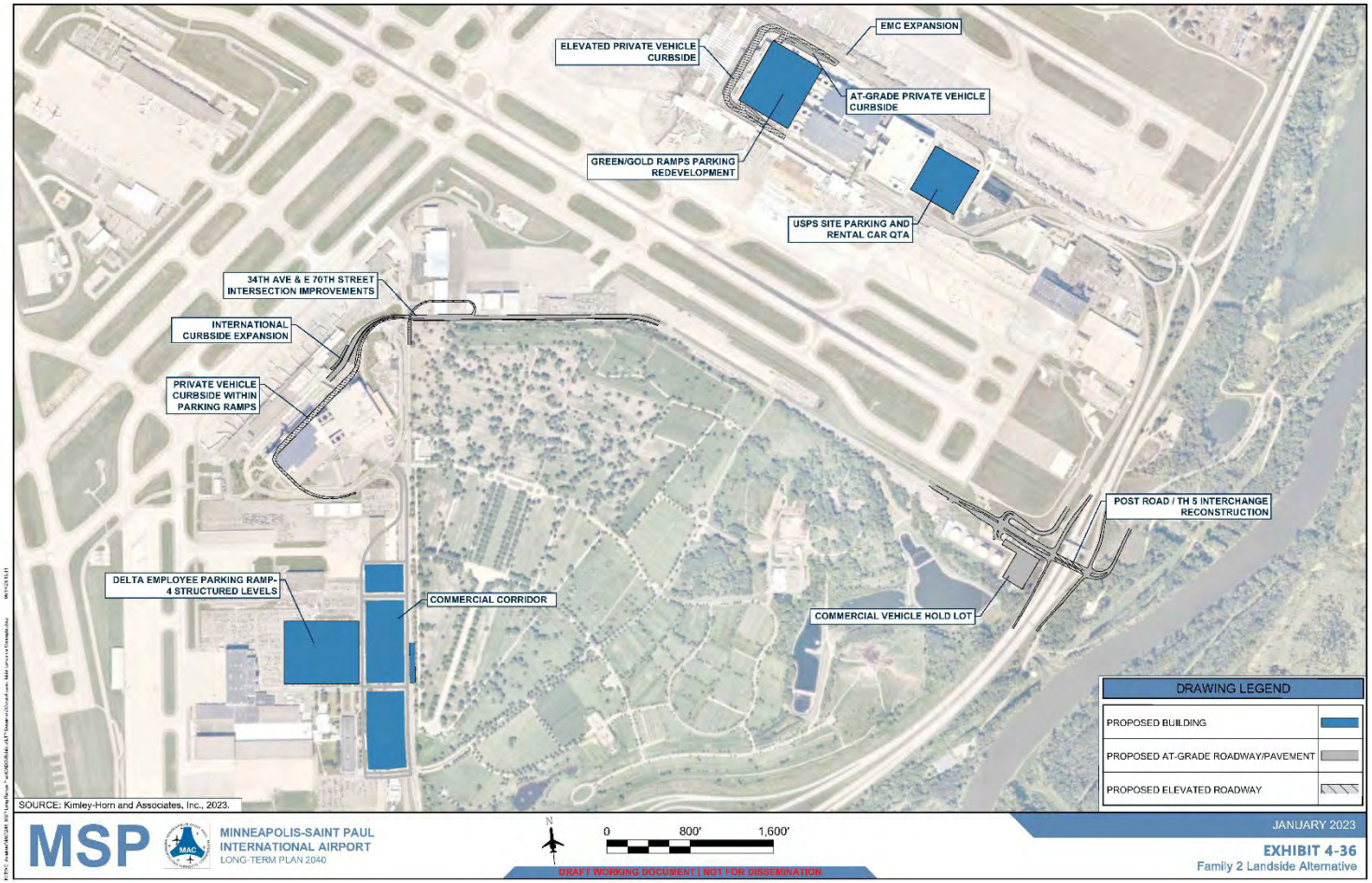
The general landside advantages of this alternative include:

- The USPS site parking development offsets a portion of parking displaced by the Green and Gold Ramps demolition.
- Rental car operations are efficient at T1, including an opportunity for a new QTA facility designed to meet EV requirements.
- T1 parking demand is met at T1 without diversion to T2 during peaks.
- The existing T2 rental car QTA facility remains.
- Enhanced Airport wayfinding through consolidated entry to both T1 and T2 from TH 5.

The general landside challenges of this alternative include:

- The commercial vehicle hold lot and cell phone lot site is inadequate to meet long-term Airport needs.
- This alternative does not take advantage of the planned parking expansion capacity at T2.
- Improvements at Post Road and TH 5 are constrained by existing airspace and require MnDOT coordination for improvements off Airport property.

Exhibit 4-36: Family 2 Landside Alternative



4.4.2.3 Family 3 Landside Alternative

The Family 3 Landside Alternative responds to a terminal operating alternative with FIS operations at both T1 and T2, along with the relocation of multiple airlines to T2. This alternative generates the highest landside facility requirements at T2 due to the airline allocation. This alternative is shown in **Exhibit 4-37** and includes:

- **T1**
  - FIS facility within the Gold Ramp redevelopment site
  - POV curbside expansion within the Green/Gold Ramp redevelopment site using alternative operational schemes to traditional linear curbside (i.e., kiss and ride curb or ultra-short-term parking)
  - Public parking development within the Green/Gold Ramp redevelopment site
  - Public parking development within the USPS site
  - EMC facilities within the USPS site
  - Rental car QTA facility development within the Quick Ride Ramp site
- **T2**
  - Purple Ramp outrigger expansion
  - Orange Ramp outrigger, LRT, and vertical expansion
  - Orange Ramp north expansion
  - Stacked POV curbside development above existing curbside
  - Access relocated from 34th Avenue to Post Road / East 70th Street
  - 34th Avenue and East 70th Street intersection improvements
- **Other**
  - Post Road / TH 5 interchange reconstruction
  - Rental car QTA facility support operations along Post Road
  - Commercial vehicle hold lot and cell phone lot operations along Post Road
  - Delta employee / remote public parking ramp west of 34th Avenue at 75th Street
  - Commercial corridor west of 34th Avenue

The general landside advantages of this alternative include:

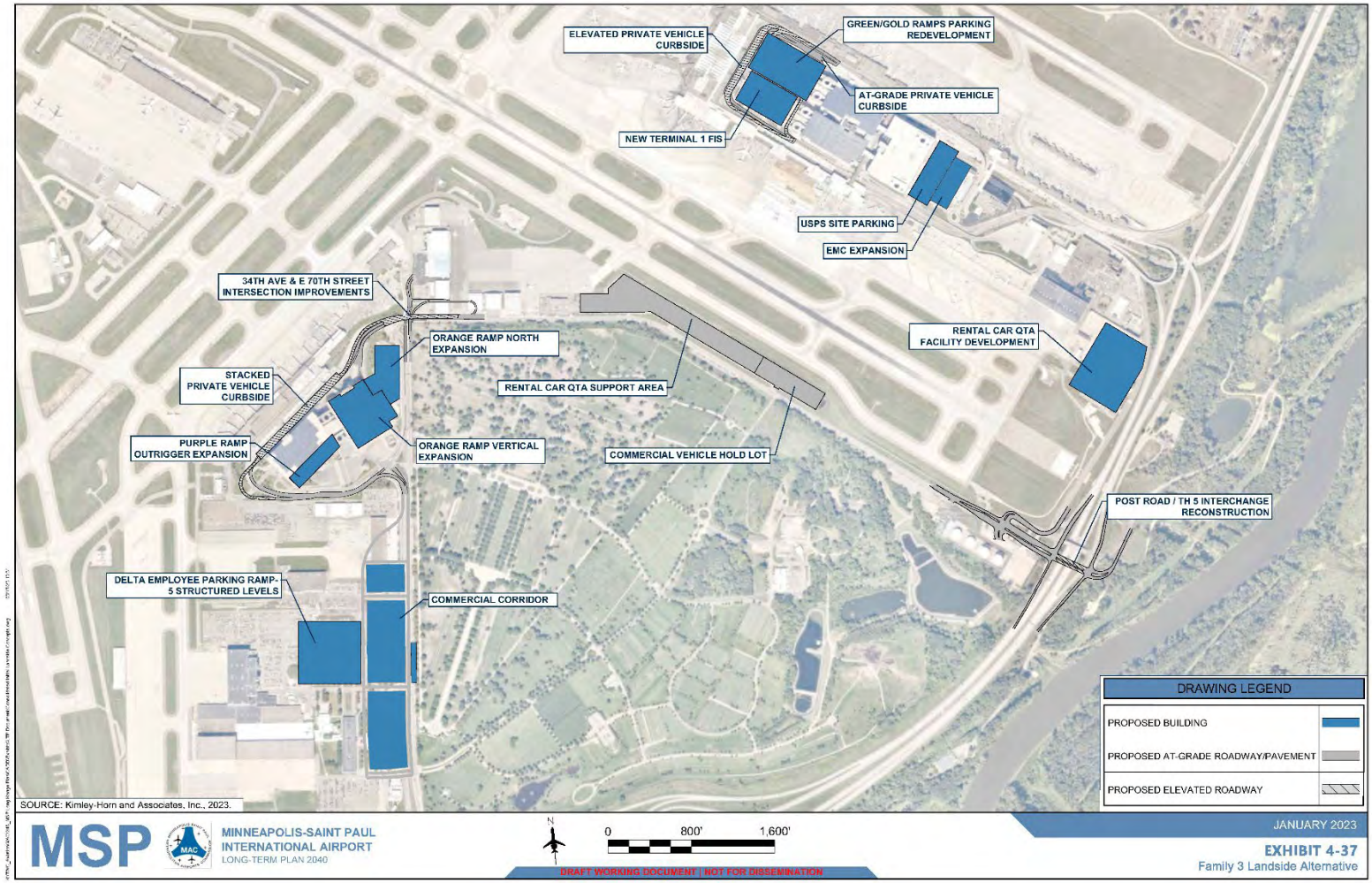
- There is an opportunity to develop a new T1 FIS facility without demolishing the Green Ramp.
- The USPS site parking development offsets a portion of parking displaced by the Green and Gold Ramps demolition.
- A new rental car QTA facility provides an opportunity to redevelop the existing Red/Blue Ramps Level 1.
- Airport access is consolidated to both T1 and T2 from TH 5.
- The T2 curbside customer experience is enhanced.

The general landside challenges of this alternative include:

- There are limited opportunities to expand the T1 POV curbside.
- T2 parking is required to meet the T1 parking demand due to T1 site constraints.
- The T2 gate expansion impacts the existing rental car QTA facility, requiring relocation or consolidation in another location.
- Security and traffic associated with shuttling rental cars between the rental car ready/return area and the remote QTA facility at both T1 and T2.

- Increased T2 airline activity drives the need for significant access roadway enhancement.
- This alternative cannot meet the commercial vehicle hold lot and cell phone lot program requirements.
- Improvements at Post Road and TH 5 are constrained by existing airspace and require MnDOT coordination for improvements off of Airport property.

Exhibit 4-37: Family 3 Landside Alternative



4.5 ALTERNATIVE EVALUATION

The MAC and Airport stakeholders evaluated the short-listed alternatives to identify a preferred development alternative. An evaluation exercise was completed for Alternatives 1A, 2A, and 3A based on six main categories[1] including passenger convenience, terminal, landside, airside, operation expenditures / capital expenditures, and "other."

4.5.1 Passenger Convenience Evaluation

The score for the passenger convenience category was based on two supporting categories: terminal walking distance / ease of use and landside walking distance / ease of use. Each supporting category was founded on a variety of ancillary topics:

- **Supporting Category 1 - Terminal walking distance / ease of use**
  - Proximity of gates to FIS facility, SSCPs, and terminal facility as a whole
  - Anticipated difficulty of terminal wayfinding based on navigability of horizontal and vertical circulation

- **Supporting Category 2 - Landside walking distance / ease of use**
  - Proximity of nearest terminal exit portal from curbside for both passenger and commercial vehicles
  - Proximity of parking spaces to nearest terminal exit portal considering level changes
  - Anticipated difficulty of regional and Airport complex roadway wayfinding

In comparison to its counterparts, Alternative 1A had the lowest score for passenger convenience, primarily due to longer landside walking distances and proximity of gates within the terminal facility. Alternative 2A scored slightly higher than Alternative 3A, primarily due to the proximity of gates to an FIS facility and SSCP, as well as curbside proximity.

4.5.2 Terminal Evaluation

The score for the terminal category, passenger convenience, was based on two supporting categories: terminal walking distance / ease of use and landside walking distance / ease of use. Each supporting category was founded on a variety of ancillary topics:

- **Gating Strategy**
  - Capability to fulfill airline operational strategies
  - Flexibility to accommodate changes in airline operations or new entrants
  - Consistency of flight lines

- **FIS Facilities**
  - Proximity of FIS facilities to gates, curbside, and security
  - LOS for passenger convenience processing from arrival gate to curb or connection at other gates
  - Capability for future expansion
  - Consolidation of FIS facilities

[1] The six main categories were selected based on the primary objectives identified for the LTP, as described in Chapter 1, Section 1.2.

In comparison to its counterparts, Alternative 1A had the lowest score for the terminal evaluation, primarily due to less contiguous operations from bifurcated terminal facilities. Alternative 2A ranked slightly higher than Alternative 3A, primarily due to proximity of gates to an FIS facility and SSCP, as well as curbside proximity.

4.5.3 Landside Evaluation

The score for the landside category was based on two supporting categories: roadway and curbside efficiency and parking. Each supporting category was founded on a variety of ancillary topics:

- **Roadway and Curbside Efficiency**
  - Passenger proximity to SSCPs and baggage claim
  - Ability to meet facility requirements
  - Balanced peak hour activity between terminals
- **Parking**
  - Proximity to nearest terminal entry/exit for passengers and meeters/greeters
  - Ability to meet terminal-specific facility requirements

In comparison to its counterparts, Alternative 1A had the highest score for landside, followed closely by Alternative 3A.

4.5.4 Airside Evaluation

The score for the airside category was based on two supporting categories: roadway and curbside efficiency and parking. Each supporting category was founded on a variety of ancillary topics:

- **Operational Efficiency**
  - Minimization of airside traffic flow congestion between taxiways
  - Minimization of apron conflicts in pushbacks, runup procedures, and VSR crossings
  - Maximization of flight service lines for carriers
- **Airfield Capacity**
  - Maximization of runway operations
  - Minimization of slot/gate constraints

In comparison to its counterparts, Alternative 1A had the lowest score for airside efficiency and capacity, primarily due to increased gate capacity in already congested airside areas. Alternative 2A scored slightly higher than Alternative 3A in airfield capacity due to cross-use of facilities between the two terminal aprons, and lower in efficiency because of the addition of gates in more congested airside areas.

4.5.5 Fast-Time Simulation

A fast-time airfield simulation was developed using Transoft's AirTOP software, to evaluate the alternative terminal and airfield projects. The PAL 3 schedule was applied to the future model to test the performance of the overall airfield under future conditions. Results were compared to results from a model using the future schedule and the existing airfield (a no-build alternative). The model tested five runway flow configurations and three weather conditions in both the future

no-build and future Alternative 1A airfield and terminal configurations. The build alternative demonstrated significant positive benefit.

The end-around taxiway (EAT) showed significant reduction in delays associated with aircraft crossing Runway 12R/30L. Delay reductions are most significant under “South flow” and “Mixed A flow” conditions when aircraft leave Terminal 1 for departure on Runway 35. Similar benefits are realized during “North flow” for aircraft arriving Runway 17 for Terminal 1.

Another project with demonstrable benefit is to reconfigure Taxiways A and B near Concourse F. Providing two-way taxi flow significantly reduces conflicts between aircraft arriving to existing and extended concourse G and those taxing for departure on Runway 30L.

Other projects identified in Alternative 1A show benefits under some runway use configurations or during some weather conditions, which are sufficient to warrant further study following completion of the LTP.

4.5.6 Operational Expenditures / Capital Expenditures

The score for the operational expenditures (OPEX) and Capital Expenditures (CAPEX), was based on capital and operating costs for each alternative. Each of the supporting categories was founded on a variety of ancillary topics which are summarized as:

- **OPEX**
  - Complexity of logistics – how well the layout for each alternative allows for usage of facilities, equipment, and personnel.
  - Cross-use of facilities – the capability of an alternative’s facilities to be highly utilized through the balancing and spread of operations across the airport.
  - Efficiency – the ability to operate airport facilities in an efficient manner and allow for the seamless flow of passengers, bags, and aircraft.

- **CAPEX**
  - Assumed cost of construction for each alternative.
  - Ongoing costs of maintaining facilities within the Airport

In comparison to its counterparts, Alternative 2A had the highest score for OPEX and the lowest score for CAPEX, both due to the high interconnectivity between the two terminal complexes via a new APM tunnel. Alternative 1A had the lowest score for OPEX and the highest score for CAPEX, due to the size of the capital improvements that do not address the operational needs as well as the other two alternatives. Alternative 3A scored the highest overall, balancing the OPEX and CAPEX needs of the Airport.

4.5.7 Other

The other category looks at the strategic needs of the Airport, which include the MAC’s goals for the plan, as well as ease of implementation, maintaining or enhancing existing capabilities, and minimizing disruption of operations during implementation of the preferred alternative. The MAC goals for the LTP include:

- **MAC Goals**
  - Plan for future facilities that will meet projected passenger activity levels in a manner that maintains and enhances customer service, while facilitating a seamless experience
  - Produce a development plan that positions the MAC to meet future demand, enhance financial strength, leverage environmental stewardship, and infuse sustainable thinking
  - Conduct the planning process in a manner that includes meaningful stakeholder engagement

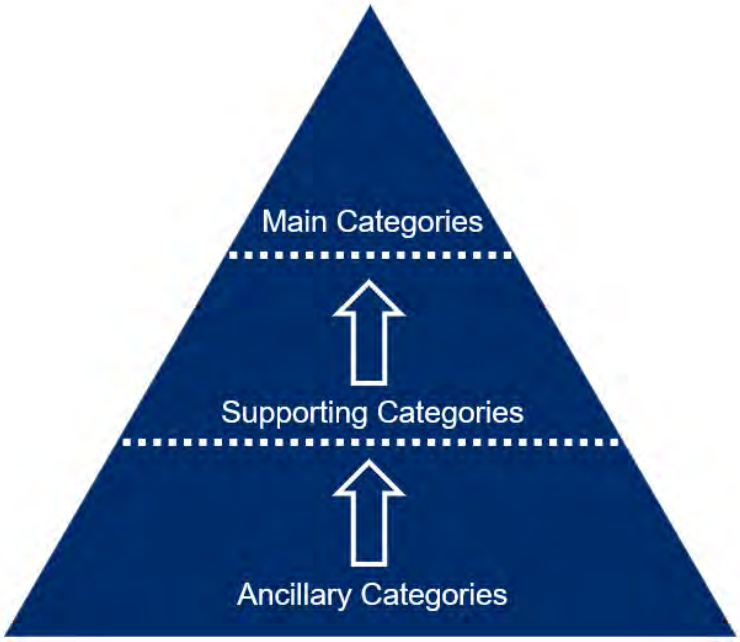
Exhibit 4-38 shows the evaluation matrix. Each main category was measured using a scoring system ranging from low to high, with low being least favorable and high being most favorable. A comprehensive score was assigned to each alternative, which assisted the MAC in selecting the most beneficial alternative for the future development of MSP. Alternative 3A received the highest cumulative score and was selected to be further studied and refined. This alternative would later transform into the preferred development alternative (reviewed in **Section 4.6**). While Alternative 3A did not receive the highest score for each main category, it performed consistently well in nearly all categories. Each category was based on the sum of two respective supporting categories, as shown on the evaluation matrix. Each supporting category was the product of multiple ancillary categories, which are reviewed throughout the remainder of this section. **Exhibit 4-39** presents the evaluation category hierarchy.

Exhibit 4-38: Evaluation Matrix

Evaluation Categories	Alt 1A	Alt 2A	Alt 3A
Passenger Convenience (15%)	**Low**	**High**	**Mid**
Terminal Walking distances/Ease of use	Low	High	Mid
Landside Walking distances/Ease of use	Low	High	Mid
Terminal (19%)	**Low**	**High**	**High**
Gating Strategy	Low	Mid	High
FIS Facilities	Mid	High	Mid
Landside (13%)	**High**	**Low**	**Mid**
Road/curb efficiency	High	Low	Mid
Parking	Mid	Low	Mid
Airside (13%)	**Low**	**Mid**	**High**
Operational Efficiency	Low	Mid	High
Airfield Capacity	Low	High	Mid
OPEX/CAPEX (20%)	**High**	**Low**	High
OPEX	Low	High	Mid
CAPEX	High	Low	Mid
Other (20%)	**Mid**	**Low**	**High**
Mission/Goals	Low	Mid	High
Implementation	High	Low	Mid
CUMULATIVE SCORE (100%)	**Mid**	**Low**	**High**

NOTES: Scores are low to high, with low being least favorable and high being most favorable. For details regarding the scoring system and evaluation process, contact the Metropolitan Airports Commission and/or Ricondo & Associates, Inc.
FIS – Federal Inspection Services; OPEX – Operation Expenditures; CAPEX – Capital Expenditures
SOURCE: Ricondo & Associates, Inc., December 2022.

Exhibit 4-39: Evaluation Category Hierarchy



SOURCE: Ricondo & Associates, Inc., December 2022.

The foundation of the scoring system began with a range from 1 to 5 for the ancillary categories, with 1 being least favorable and 5 being most favorable. In coordination with the MAC and other entities involved in the planning process, specific weights were applied to each supporting and ancillary category based on perceived importance. As shown on **Exhibit 4-39**, each main category was assigned a weight; these weights are the summation of the supporting categories' weights.

4.6 ALTERNATIVE 3A ALTERNATIVE LANDSIDE REFINEMENT

The consistently medium-to-high performance in the alternative matrix categories, Alternative 3A was considered in the LTP process for additional refinements in the landside category. Refinement of the landside alternatives was a response to the identification of the preferred terminal alternative of operations, the preferred terminal gate development locations, and preferred airside developments impacting existing landside facilities.

4.6.1 Terminal-Specific Requirements

Activity was determined for PAL 2 and PAL 3 at each terminal for both the spring and summer flight schedules. The spring activity was the basis for requirements at T2, whereas the summer was the basis for requirements at T1. In addition to the preferred alternative with airlines relocating to T2, a scenario where airlines do not relocate was also studied for T1 to create an envelope of potential future scenarios. **Table 4-1** presents the forecast percentage of activity at each terminal for the PALs based on the developed DDFSs.

Table 4-1: Terminal-Specific Origin and Destination Activity (Percent)

	Terminal Scenario	Terminal 1[1]	Terminal 2[1]
PAL 2 Spring	Airlines Relocate	62.5%	37.5%
PAL 2 Summer	Airlines Remain	85.1%	14.9%
	Airlines Relocate	63.5%	36.5%
PAL 3 Spring	Airlines Relocate	64.5%	35.5%
PAL 3 Summer	Airlines Remain	82.8%	17.2%
	Airlines Relocate	64.7%	35.3%

NOTES:
PAL – Planning Activity Level; Airlines Remain – Airlines from T2 occupy future gate expansion at T2; Airlines Relocate – Airlines from T1 relocate to T2 and occupy future gate expansion at T2.
1 Bolded values represent the design scenarios for the respective terminal.
SOURCE: Kimley-Horn and Associates, Inc., 2022.

The DDFSs for each terminal scenario were analyzed to determine curbside requirements for PAL 3 to account for the additional activity anticipated based on the airline relocations. **Table 4-2** presents the terminal-specific curbside requirements. Refer to **Appendix C.1** for additional information on the methodology used.

Table 4-2: Terminal-Specific Curbside Requirements (Linear Feet)

		Terminal 1[1]		Terminal 2[1]	
	Terminal Scenario	Arrivals	Departures	Arrivals	Departures
PAL 3 Spring	Airlines Relocate	765’	890’	940’	840’
PAL 3 Summer	Airlines Remain	1,130’	1,130’	690’	515’
	Airlines Relocate	940’	1,080’	890’	715’

NOTES:
PAL – Planning Activity Level; Airlines Remain – Airlines from T2 occupy future gate expansion at T2; Airlines Relocate – Airlines from T1 relocate to T2 and occupy future gate expansion at T2.
1 Bolded values represent the design scenarios for the respective terminal.
SOURCE: Kimley-Horn and Associates, Inc., 2022.

Terminal-specific parking requirements were derived from the total Airport parking requirements presented in **Chapter 3**. It was assumed that 250 employees park at T1 and the rest are required to park at T2. As previously mentioned, the summer is the design season for T1 and the spring is the design season for T2. **Table 4-3** presents the parking requirements used to inform the refined landside alternatives.

Table 4-3: Terminal-Specific Parking Requirements (Stalls)

	Terminal Scenario	Terminal 1 [1]	Terminal 2 [1]	Total On-Airport Requirement
PAL 2 Spring	Airlines Relocate	15,545	**11,015**	26,560
PAL 2 Summer	Airlines Remain	**21,085**	5,475	
	Airlines Relocate	**15,800**	10,760	
PAL 3 Spring	Airlines Relocate	20,140	**13,060**	33,200
PAL 3 Summer	Airlines Remain	**25,775**	7,425	
	Airlines Relocate	**20,180**	13,020	

NOTES:
PAL – Planning Activity Level; Airlines Remain – Airlines from T2 occupy future gate expansion at T2; Airlines Relocate – Airlines from T1 relocate to T2 and occupy future gate expansion at T2.
1 Bolded values represent the design scenarios for the respective terminal.
SOURCE: Kimley-Horn and Associates, Inc., 2022.

4.6.2 Refined Landside Alternative Constraints

MAC identified multiple constraints as part of separate studies that informed the refined alternatives. Critical development constraints include:

- *T1 EMC* – The facility expansion will occur in Concourse C. This is the result from a study completed as part of a separate Airport effort.
- *T2 Access Roadway* – The preferred alternative should maintain flexibility to access T2 landside facilities from either 34th Avenue or Post Road / East 70th Street.
- *T1 Electrical Substation* – The existing substation may require expansion. Development should not be planned in close proximity to the existing electrical substation.
- *Part 77 / US Standard for Terminal Instrument Procedures (TERPs) Surfaces* – Airspace restrictions must be considered for T1 landside facilities. The refined alternatives included a cursory review of airspace compliance; however, further study is required to verify feasibility.

4.6.3 Terminal 1

The refinement process for T1 focused on identifying the priority functions for the two primary development areas available at T1: the Green/Gold Ramp redevelopment site and the existing USPS site. The following program needs, and desirable program elements, were established through an analysis of the terminal-specific requirements and engagement with Airport stakeholders:

- Program Needs
    - Arrivals and Departures POV Curbside
    - FIS Facility
    - Public and Employee Parking
    - Rental Car QTA Facility
    - Commercial Vehicle Curbside (due to Green/Gold Ramp redevelopment)
- Desired Program Elements
    - MAC Offices
    - Commission Chambers
    - Solar Infrastructure
    - Additional Ticketing or Baggage Claim Functions
    - APM Station and/or APM Maintenance Space
    - Bike Trail Access

Based on the site attributes and the attributes that are required for each function, as described in **Section 4.4.1**, the program elements were designated a recommended site for development, as summarized in **Table 4-4**.

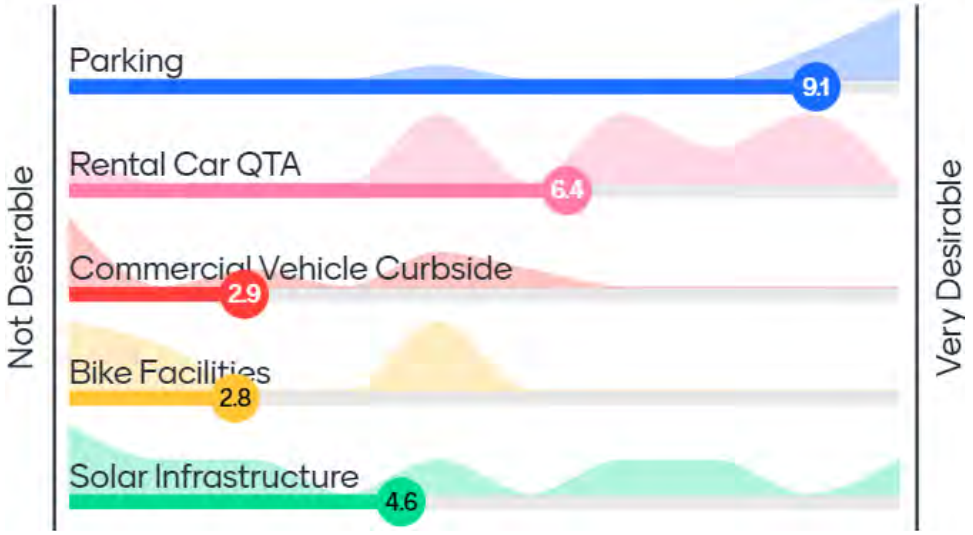
Table 4-4: Recommended Function Allocation

	Green/Gold Ramp Redevelopment Site	Red, Blue, and Silver Ramps	USPS Site
Program Needs	FIS	Commercial Vehicles	Rental Car QTA
	Arrivals and Departures Private Vehicle Curbside	Bike Trail Access	Parking
	Parking		
	Commercial Vehicles		
Potential Functions	Additional Ticketing/Baggage Claim		Solar Infrastructure
	Office Space		APM Space
	Commission Chambers		
	Plaza		
	Solar Infrastructure		
	APM Space		

NOTES:
USPS – US Postal Service; FIS – Federal Inspection Services; APM – Automated People Mover; QTA – Quick Turnaround
SOURCE: Kimley-Horn and Associates, Inc., 2022.

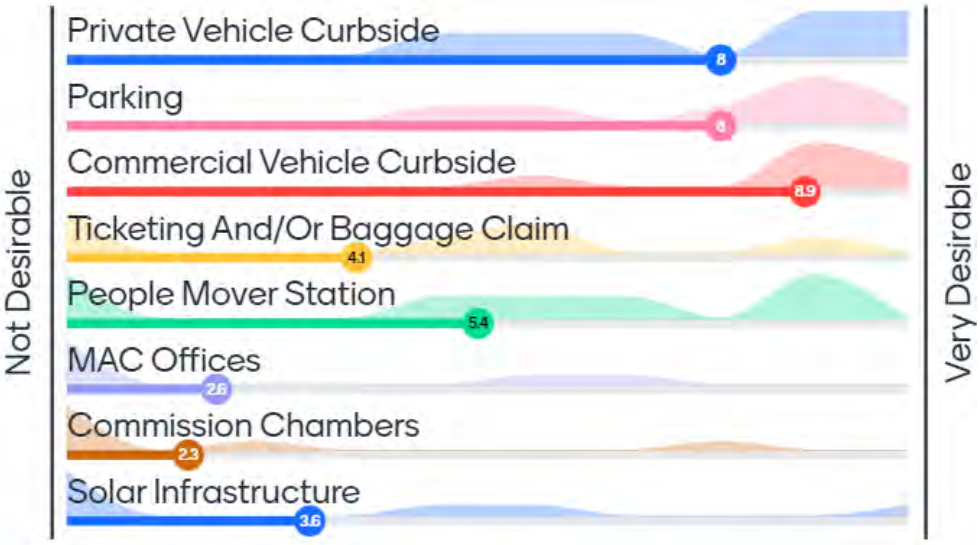
MAC stakeholders were polled to verify the recommended function allocations, which are outlined in **Table 4-4**. The results shown on **Exhibit 4-40** illustrate parking and rental car facilities are high priorities for the USPS site. Polling results related to the Green/Gold Ramp site, shown on **Exhibit 4-41**, indicate the POV curbside, parking, and commercial vehicle curbside are the most desirable uses for that space.

Exhibit 4-40: U.S. Postal Service Site Function Allocation – Poll Results



NOTE:
QTA – Quick Turnaround
SOURCES: Kimley-Horn and Associates, Inc., 2023; Mentimeter, 2023 (interactive presentation software).

Exhibit 4-41: Green/Gold Ramp Function Allocation – Poll Results



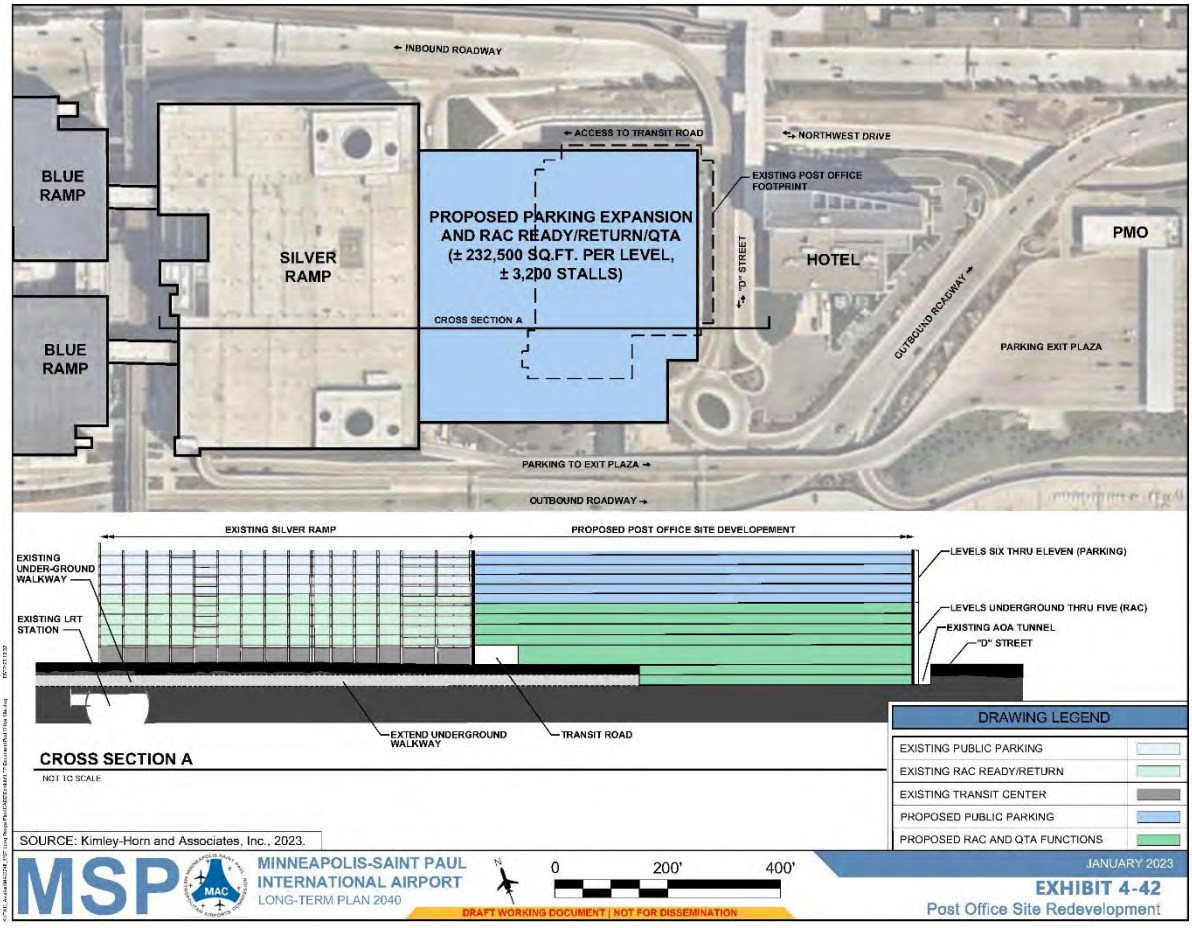
NOTE:
MAC – Metropolitan Airports Commission
SOURCES: Kimley-Horn and Associates, Inc., 2023; Mentimeter, 2023 (interactive presentation software).

4.6.3.1 U.S. Postal Service Site

Through stakeholder engagement, the USPS site was identified as a preferred location for rental car QTA operations and parking. Alternative rental car QTA sites serving T1 were deemed infeasible due to rental car operational requirements. Alternatives for the USPS site focused on maximizing public parking space and expanding rental car vehicle washing and EV fueling within a facility matching the height of the existing Silver Ramp. A multilevel QTA facility is proposed to meet the program requirements within the site footprint and to enhance rental car operations. Locating the QTA facility and parking in the USPS site allows integration with the existing RAC and parking operations, benefiting the operational efficiency of the landside area. **Exhibit 4-42** shows the proposed development footprint, as well as a cross section of the structure. Further planning/design refinement is required to validate the uses for the existing underground portions of the USPS facility that interface with the Airport Operations Area (AOA) tunnel.

The Silver Ramp programming and design included planning for a future eastern expansion into the USPS site. An existing underground tunnel can extend east to the USPS site (note: this requires storm sewer utility relocation). Perimeter columns on the east side of the Silver Ramp were designed to accept columns for an expanded facility. Rental car operations planning included accommodations for accessing a QTA facility east of the Silver Ramp.

Exhibit 4-42: Redevelopment of the U.S. Postal Service Site



4.6.3.2 Green/Gold Ramp Site

Within the Green/Gold Ramp redevelopment site, potential configurations of the functional elements were developed based on meeting program requirements (per **Table 4-2** and **Table 4-3**), minimizing curbside passenger vertical circulation, intuitive pedestrian and vehicular wayfinding, aligning with peer airports, and accommodating desired program elements.

Each alternative assumes pedestrian bridges are provided from Concourses C and G to the FIS facility located in the Green/Gold Ramp redevelopment site; pedestrian bridges are not detailed or described for clarity, as refinement beyond the scope of this planning study is required to validate feasibility and cost. Each alternative described in the following subsections was valued against the evaluation criteria presented in **Table 4-5**. Each element was rated on a scale of 1 to 5 (unsatisfactory to satisfactory).

Alternative 1.A – Two Stacked Curbsides

Alternative 1.A, illustrated on **Exhibit 4-43**, proposes two stacked curbsides separated by a building structure. The first two levels of the building are proposed to mimic the existing terminal, while upper levels can be used for other uses, such as the FIS facility and offices. The ticketing and baggage claim functions are included in the new building to provide an attraction for passengers to use the outer curbside facilities. A new parking development extends from the existing helices to the new building, extending over the curbside facilities, providing approximately 4,300 stalls. This alternative proposes maintaining the existing terminal-to-landside skyways and tunnel, as well as the Green/Gold Ramp vertical circulation core.

Alternative 1.B – Single-Level Curbside and a Stacked Curbside

Alternative 1.B, illustrated on **Exhibit 4-44**, proposes a single-level curbside nearest the existing terminal and a stacked curbside east of the existing vertical circulation core. An open-air plaza is proposed above the single-level curbside to provide connectivity with the new departures curb. The new building space for the FIS facility and the offices is located above the stacked curbside facility. Locating the FIS facility above vehicular functions presents a security concern. A new parking development extends from the existing helices to the new building, providing approximately 5,100 stalls.

Alternative 1.C – Two Stacked Curbsides and a Vertical Circulation Space

Alternative 1.C, illustrated on **Exhibit 4-45**, proposes two stacked curbsides, offset from the terminal by a building extension to the east; a vertical circulation space is proposed to provide terminal access from the outer curbside. The footprint vacated by the existing POV curbside provides space for the FIS facility, a plaza, and offices. Locating the FIS facility adjacent to the existing terminal building could enhance baggage recheck for connecting passengers. A new parking development extends from the existing helices over both curbsides to the face of the existing vertical circulation core, providing approximately 6,250 stalls.

Exhibit 4-43: Alternative 1.A

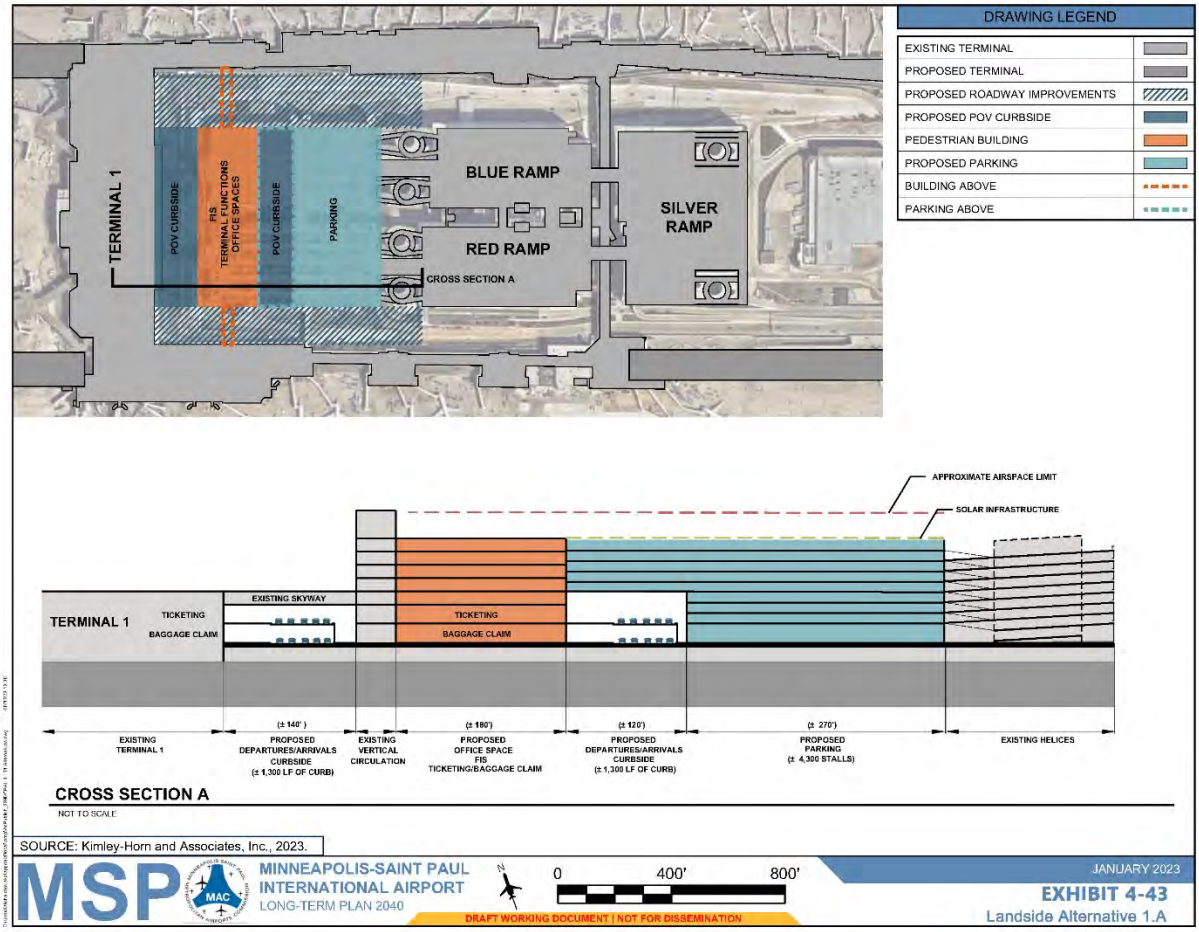


Exhibit 4-44: Alternative 1.B

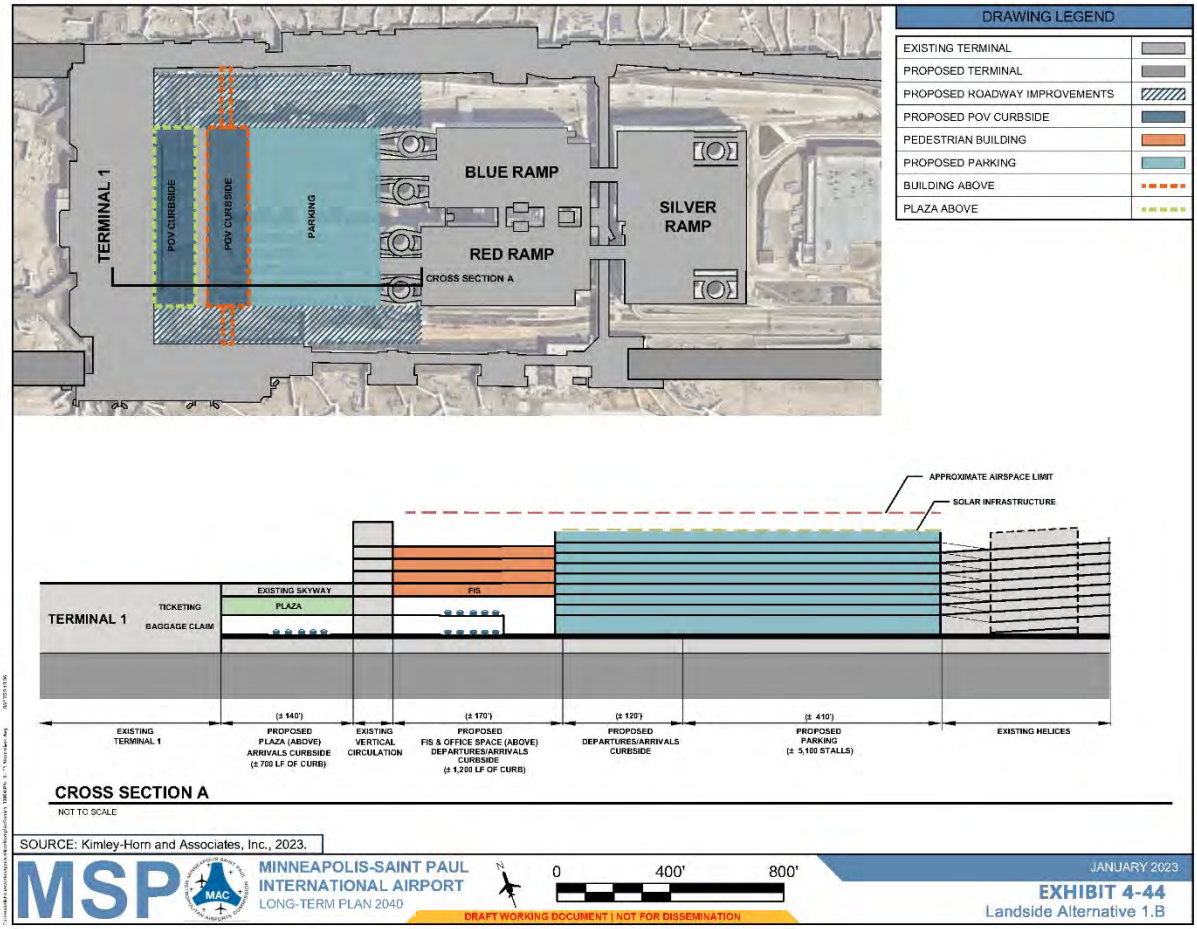
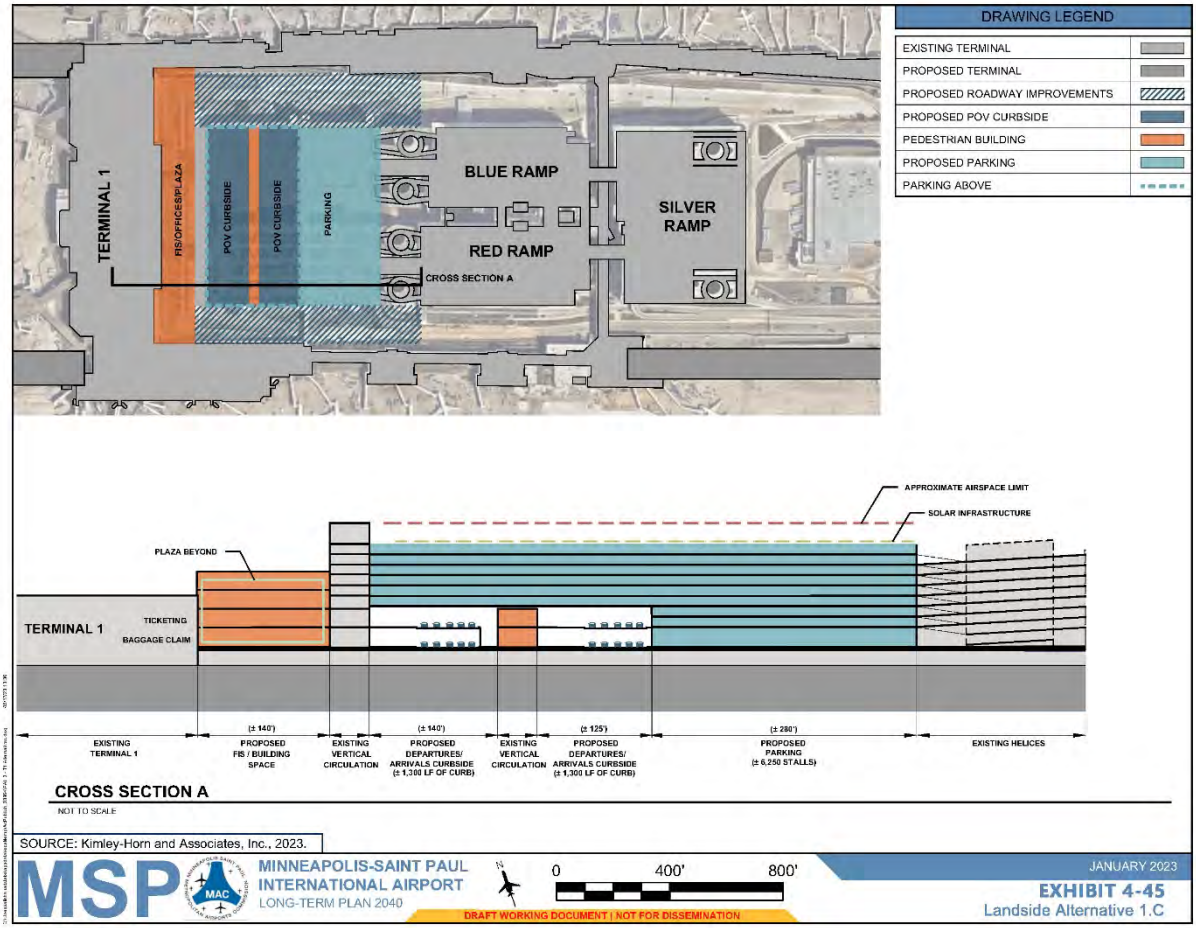


Exhibit 4-45: Alternative 1.C



Alternative 1.D – Hybrid of Alternatives 1.A and 1.C with Extended Terminal Building

Alternative 1.D, illustrated on **Exhibit 4-46**, is a hybrid alternative between Alternatives 1.A and 1.C. Alternative 1.D extends the terminal building east for the FIS facility and office space in the area vacated by the existing POV curbside. Alternative 1.D also introduces a new building structure between the stacked curbsides for baggage claim functions. This alternative would require relocating all baggage claim functions and expanding ticketing functions to Level 1 of the existing terminal facility. Separating baggage claim and ticketing functions will allow traffic to be separated earlier along the inbound roadway to improve wayfinding. A new vertical circulation core, to the west of the existing location, allows for additional parking. This alternative provides approximately 5,690 parking stalls.

Alternative 1.E – Hybrid of Alternatives 1.A and 1.C with Wider Stacked Inner Curbside

Alternative 1.E, illustrated on **Exhibit 4-47**, is a hybrid alternative between Alternatives 1.A and 1.C. Alternative 1.E includes a wider stacked inner curbside to allow for a POV curbside and commercial vehicle curbside. Like the existing condition, the commercial vehicle curbside would have left-sided unloading/loading. A new building structure between the two stacked curbsides would house baggage claim functions, the FIS facility, offices, and vertical circulation. This alternative would require relocating all baggage claim functions and expanding ticketing functions to Level 1 of the existing terminal facility. This alternative provides approximately 4,005 parking stalls.

Table 4-5: Terminal 1 Green/Gold Ramp Redevelopment Evaluation Matrix

	Alternative 1.A	Alternative 1.B	Alternative 1.C	Alternative 1.D	Alternative 1.E
Meets Program Requirements	3	2	4	4	2
Minimize Curbside Passenger Vertical Circulation	4	4	4	4	4
Intuitive Pedestrian and Vehicular Wayfinding	4	3	3	4	3
Aligned with Peer Airports	4	2	3	3	3
Accommodate Desired Potential Functions	4	3	4	3	4
Total	**19**	**14**	**18**	**18**	**16**

NOTE:
Evaluation criteria are ranked on a scale of 1 to 5 (unsatisfactory to satisfactory). A higher value represents a more desirable alternative.
SOURCE: Kimley-Horn and Associates, Inc., 2022.

Exhibit 4-46: Alternative 1.D

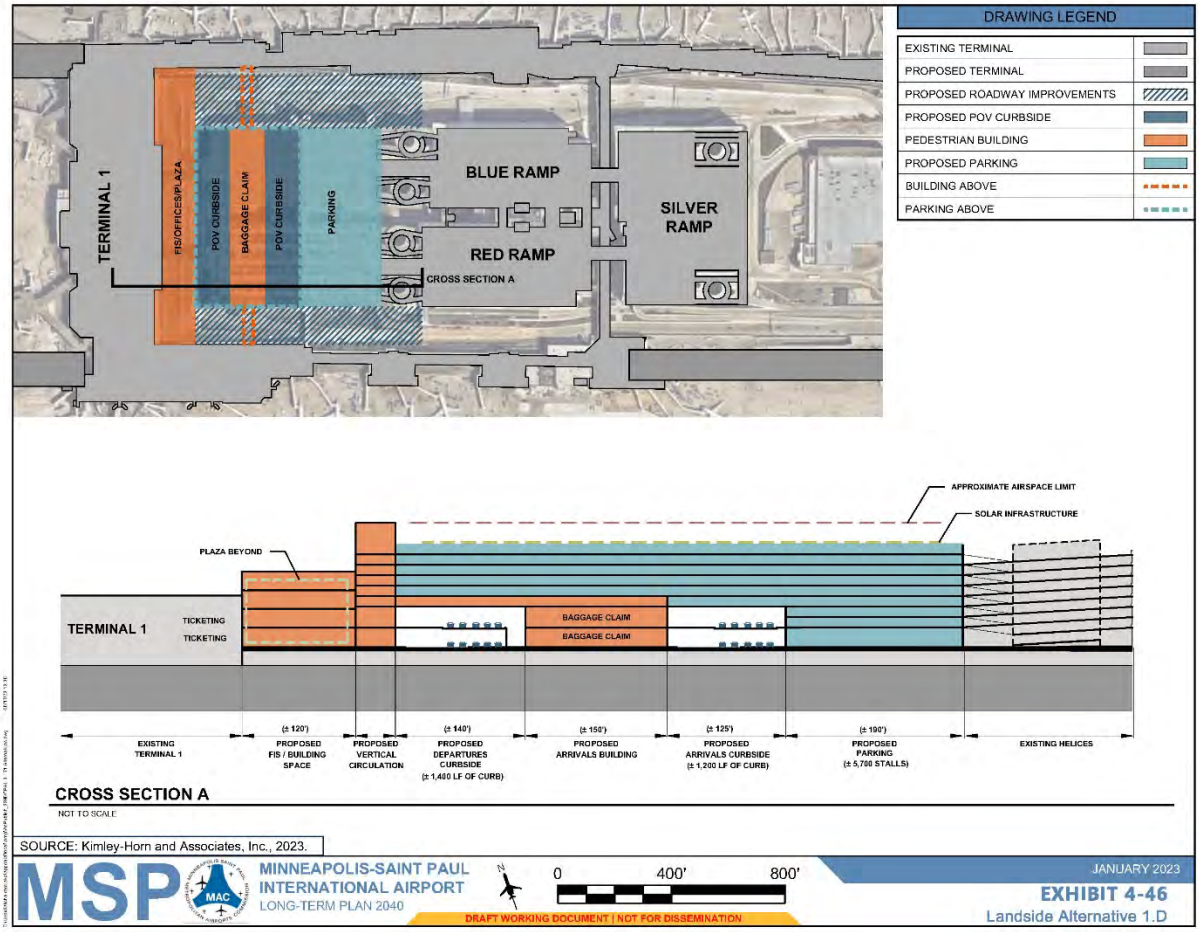
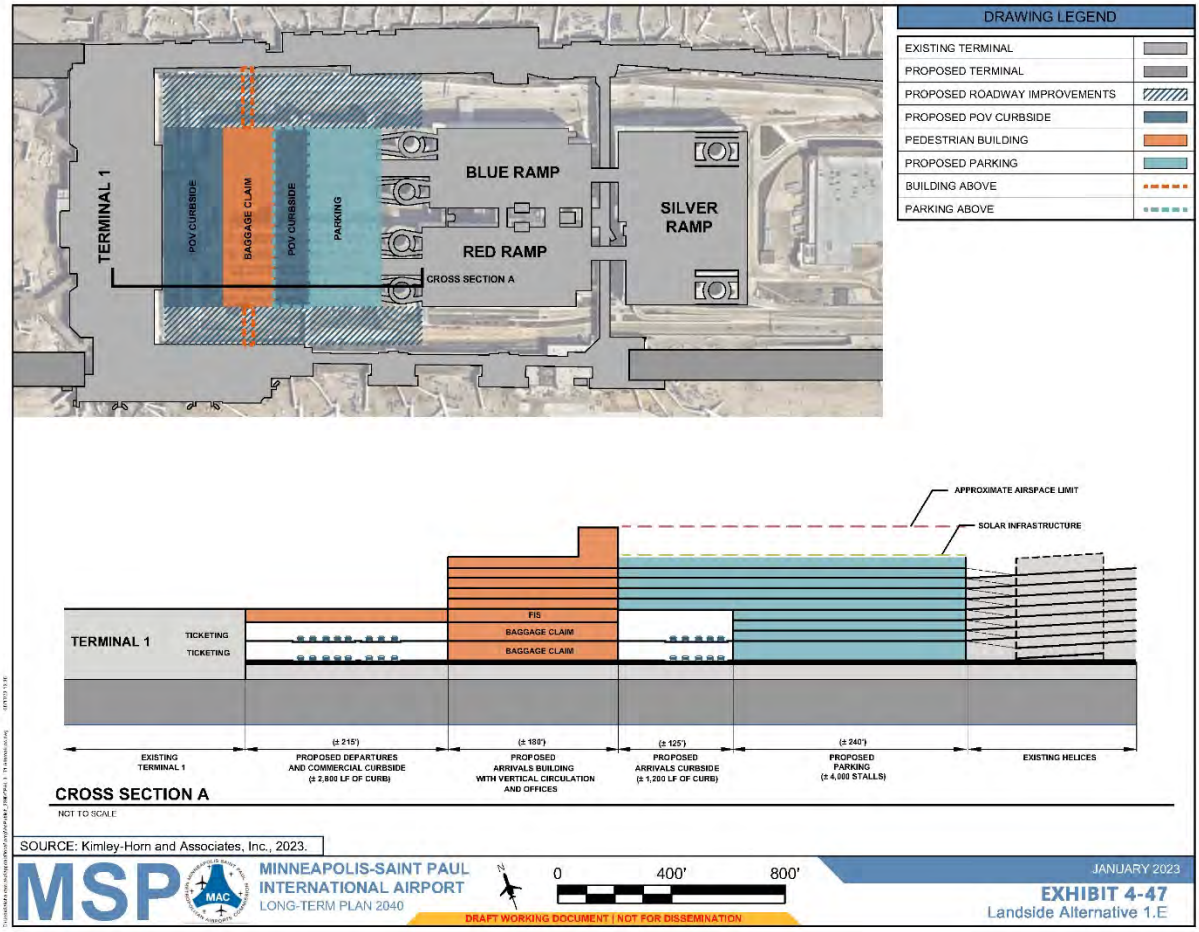


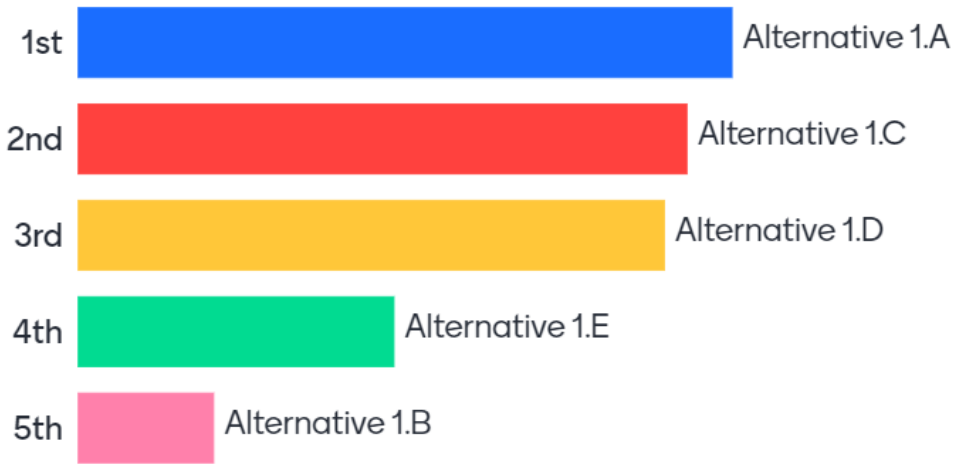
Exhibit 4-47: Alternative 1.E



SOURCE: Kimley-Horn and Associates, Inc., 2023.

Various MAC stakeholders were asked to rank the alternatives from first (favorite) to fifth (least favorite). The weighted average ranking was used to determine the overall ranking, as presented on **Exhibit 4-48**.

Exhibit 4-48: Metropolitan Airports Commission Stakeholder Ranking – Terminal 1 Alternative



SOURCES: Kimley-Horn and Associates, Inc., 2023; Mentimeter, 2023 (interactive presentation software).

4.6.4 Terminal 2

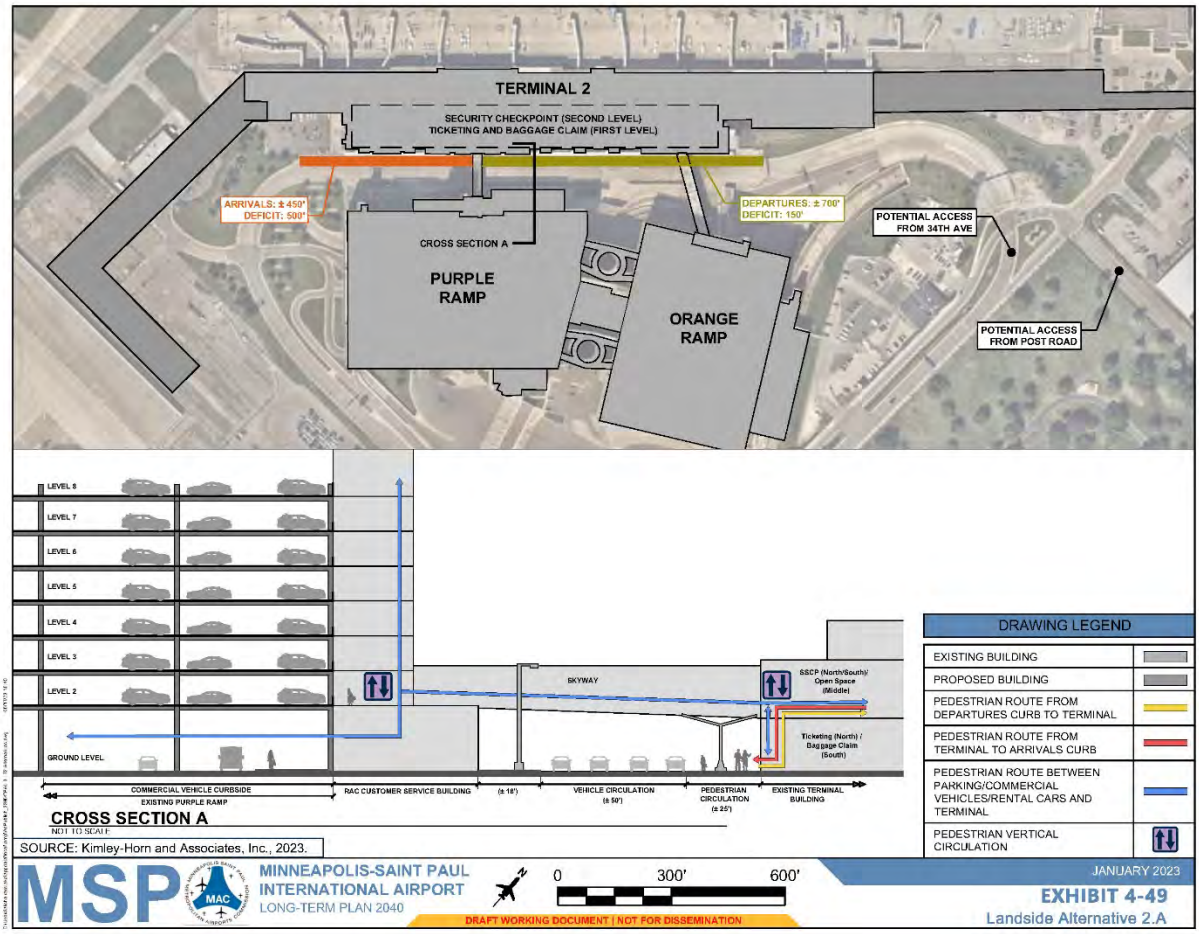
4.6.4.1 Curbside

The proposed additional activity at T2 is expected to put a strain on the existing landside facilities. Like the alternatives process for T1, refined alternatives for the curbside at T2 were developed to address the projected deficits. The curbside alternatives aimed to meet the program requirements, while aligning terminal and landside functions. It was assumed that the terminal processor and parking ramps would remain in their existing location. Curbside alternatives were developed based on setting POV program requirements (per **Table 4-6**) minimizing curbside passenger vertical circulation, impacts to existing facilities, consistent curbside experience with T1, and aligning with peer airports. Each alternative described in the following subsections was valued against the evaluation criteria in **Table 4-6**. Each element was rated on a scale of 1 to 5 (unsatisfactory to satisfactory).

Alternative 2.A – Combined Single-Level Arrivals/Departures Roadway

Alternative 2.A, illustrated on **Exhibit 4-49**, explores maintaining the existing T2 curbside configuration, with arrivals and departures remaining at-grade. The existing curbside cannot be extended in a linear fashion and effectively align with the ticketing and baggage claim areas given the roadway geometry and terminal building constraints. Therefore, this alternative does not meet future curbside needs.

Exhibit 4-49: Alternative 2.A



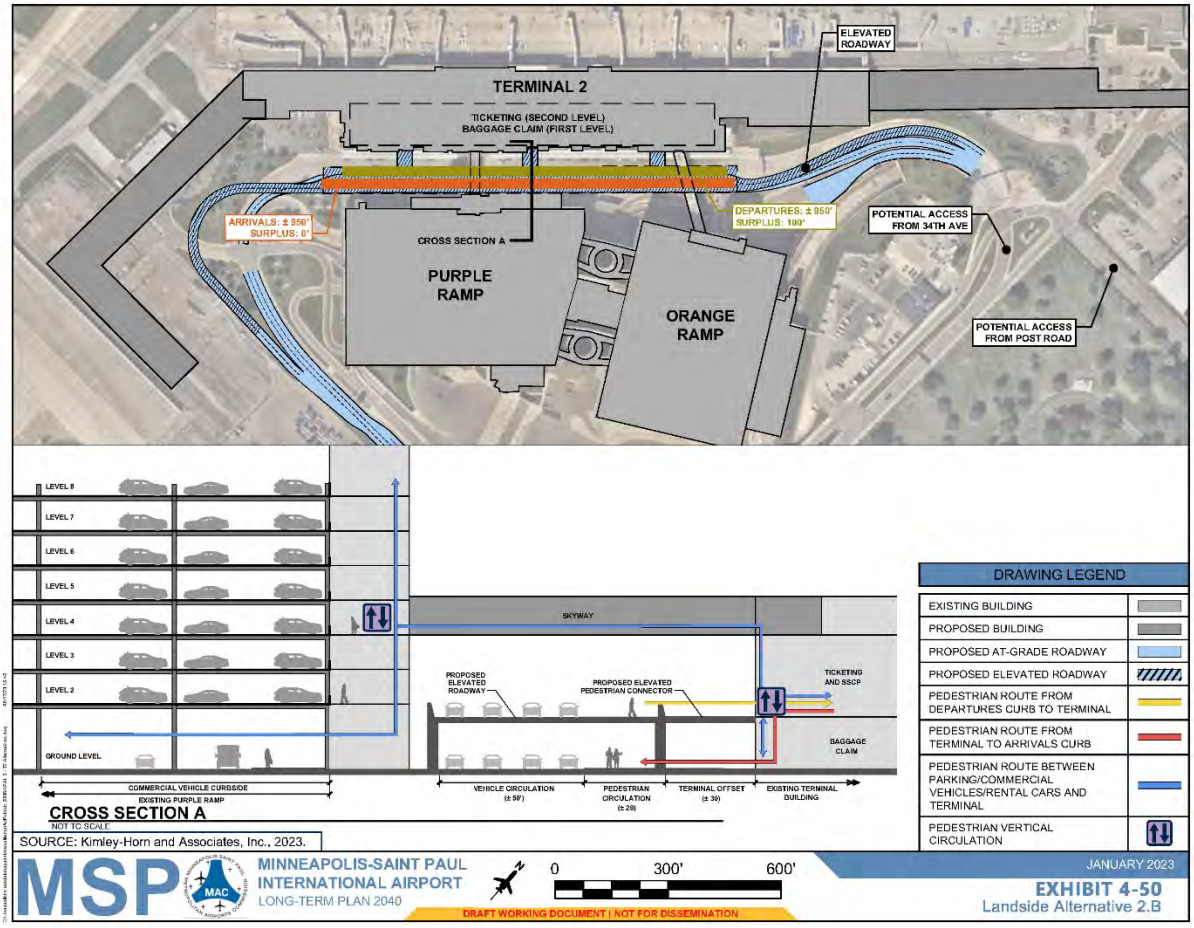
SOURCE: Kimley-Horn and Associates, Inc., 2023.

Alternative 2.B – Stacked Roadway with Elevated Departures

Alternative 2.B, illustrated on **Exhibit 4-50**, proposes constructing a stacked curbside with departures elevated and arrivals at-grade. Given the limited space between the terminal and the parking ramps, a two-level roadway is proposed to meet the program requirements. A stacked curbside provides approximately 950 linear feet of curb per level (1,900 linear feet total). Alternative 2.B shifts the curbside to the east to provide a minimum offset from the terminal building of 30 feet, as requested by the Airport Police Department (APD). In addition to the curbside construction, the following terminal enhancements are needed to align the terminal and landside functions:

- Move ticketing to Level 2.
- Expand baggage claim devices on Level 1.
- Expand the vertical elevator core.
- Reconstruct the existing skyways.
- Relocate the RAC CSB.

Exhibit 4-50: Alternative 2.B



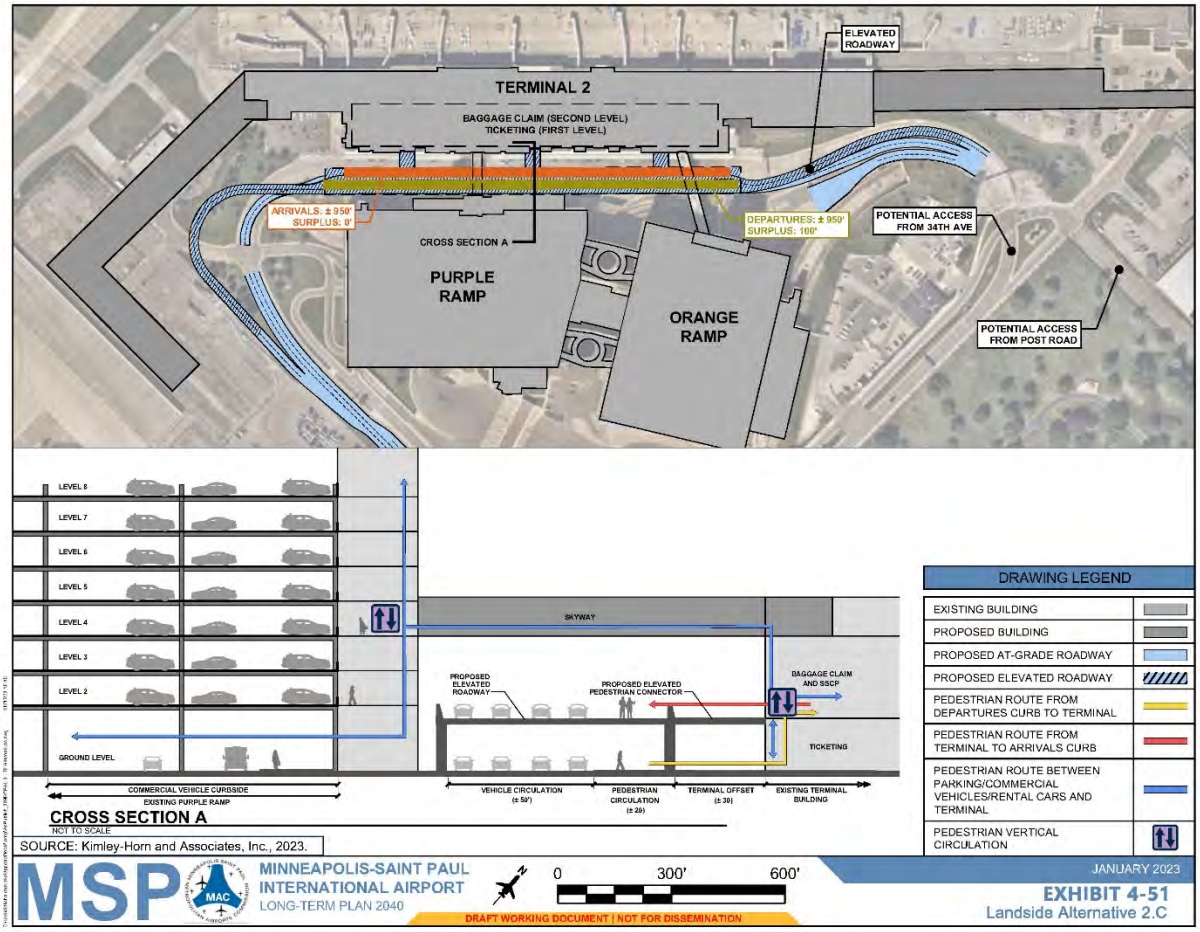
SOURCE: Kimley-Horn and Associates, Inc., 2023.

Alternative 2.C – Stacked Roadway with Elevated Arrivals

Like Alternative 2.B, Alternative 2.C proposes constructing a stacked curbside with departures at-grade and arrivals elevated. Alternative 2.C, illustrated on **Exhibit 4-51**, shifts the curbside to the east to provide a minimum offset from the terminal building of 30 feet, as requested by the APD. In addition to the curbside construction, the following terminal enhancements are needed to align the terminal and landside functions:

- Move baggage claim to Level 2.
- Expand ticketing on Level 1.
- Expand the vertical elevator core.
- Reconstruct the existing skyways.
- Relocate the RAC CSB.

Exhibit 4-51: Alternative 2.C



SOURCE: Kimley-Horn and Associates, Inc., 2023.

Table 4-6: Terminal 2 Curbside Evaluation Matrix

	Alternative 2.A	Alternative 2.B	Alternative 2.C
Meets POV Curbside Program Requirements	1	5	5
Minimize POV Curbside Passenger with Checked Luggage Vertical Circulation	5	5	5
Impacts to Existing Facilities	5	3	2
Consistent Experience with Terminal 1	1	5	1
Aligned with Peer Airports	2	5	3
Total	**14**	**23**	**16**

NOTES:
Evaluation criteria are ranked on a scale of 1 to 5 (unsatisfactory to satisfactory). A higher value represents a more desirable alternative.
POV – Privately Owned Vehicle
SOURCE: Kimley-Horn and Associates, Inc., 2022.

4.6.4.2 Parking

The T2 parking ramps, Orange and Purple Ramps, were designed with the capability of expansion. **Table 4-7** presents the planned expansions and the number of stalls each expansion provides.

Table 4-7: Terminal 2 Existing Parking Ramp Expansions

Parking Expansion Area	Additional Stalls Provided
Purple Outrigger (Level 2 – Level 8)	1,275
Orange East Outrigger (Level 4 – Level 8)	750
Orange LRT Outrigger (Level 4 – Level 8)	360
Orange Vertical Expansion (Level 9 and Level 10)	1,250
Total	**3,635**

NOTE:
LRT – Light Rail Transit
SOURCE: Kimley-Horn and Associates, Inc., 2022.

Based on the forecast increase in activity at T2, the additional stalls provided by the planned expansions are not sufficient to meet the requirements. New parking developments, in addition to the planned expansions of the existing parking structures, were evaluated to meet the total Airport parking demand. Parking alternatives were developed based on:

- Meets parking program requirements
- Walking distance to terminal processor
- Connectivity to existing ramps
- Impacts to existing facilities

Each alternative described in the following subsections was valued against the evaluation criteria in **Table 4-8**. Each criteria element was rated on a scale of 1 to 5 (unsatisfactory to satisfactory).

Table 4-8: Terminal 2 Parking Evaluation Matrix

	Alternative 2.D	Alternative 2.E	Alternative 2.F
Meets Parking Program Requirements	1	5	5
Walking Distance to Terminal Processor	5	3	3
Connectivity to Existing Ramps	5	1	3
Impacts to Existing Facilities	5	2	5
Total	**16**	**11**	**16**

NOTE:
Evaluation criteria are ranked on a scale of 1 to 5 (unsatisfactory to satisfactory). A higher value represents a more desirable alternative.
SOURCE: Kimley-Horn and Associates, Inc., 2022.

Alternative 2.D – Existing Structure Expansion

Alternative 2.D proposes only expanding the existing ramps to the extent possible. While this alternative does not require new land area to be dedicated for parking functions, the alternative does not meet program requirements.

Alternative 2.E – East Parking Expansion

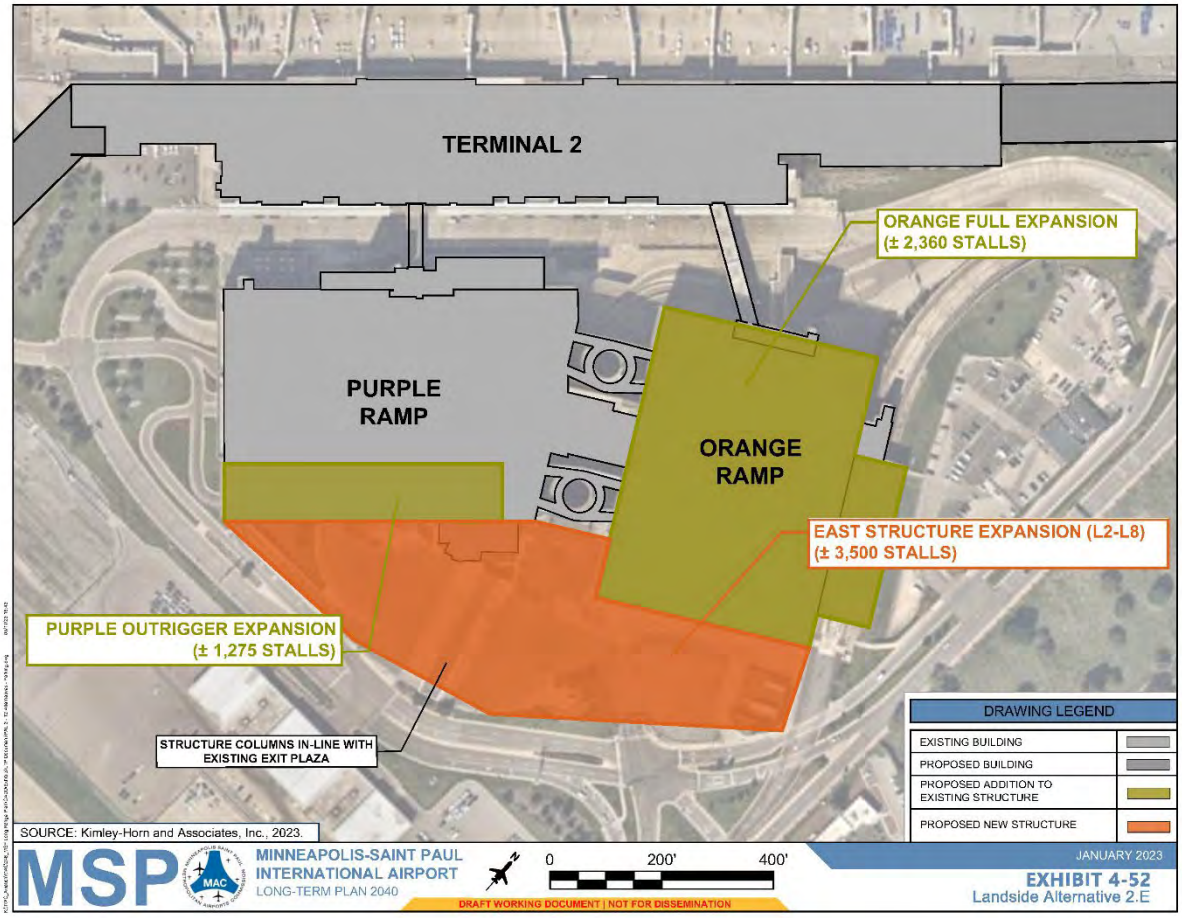
Alternative 2.E, illustrated on **Exhibit 4-52**, proposes a new parking structure to the east of the existing Purple and Orange Ramps, in addition to expanding the existing ramps to the extent possible. The new parking structure would be located above the existing exit plaza and connected to both the Orange and Purple Ramps. A structure spanning Levels 2 through 8 would provide approximately 3,500 stalls. Assuming the terminal processor remains in its current location, an east parking expansion would increase the average walking distance. Located above the existing exit plaza, the new structure would require the reconstruction of the exit plaza and temporary operations. However, the stakeholders expressed that locating the exit plaza underneath a structure is not preferable.

Alternative 2.F – North Parking Expansion

Alternative 2.F, illustrated on **Exhibit 4-53**, proposes a new parking structure to the north of the existing Orange Ramp, in addition to expanding the existing ramps to the extent possible. The new parking structure would be located on the north side of the light rail station, but it would connect via bridges to the Orange Ramp. A structure spanning Levels 2 through 10 would provide approximately 2,900 stalls. The ground level would only be accessible via 34th Avenue, so it would likely have an alternative function.

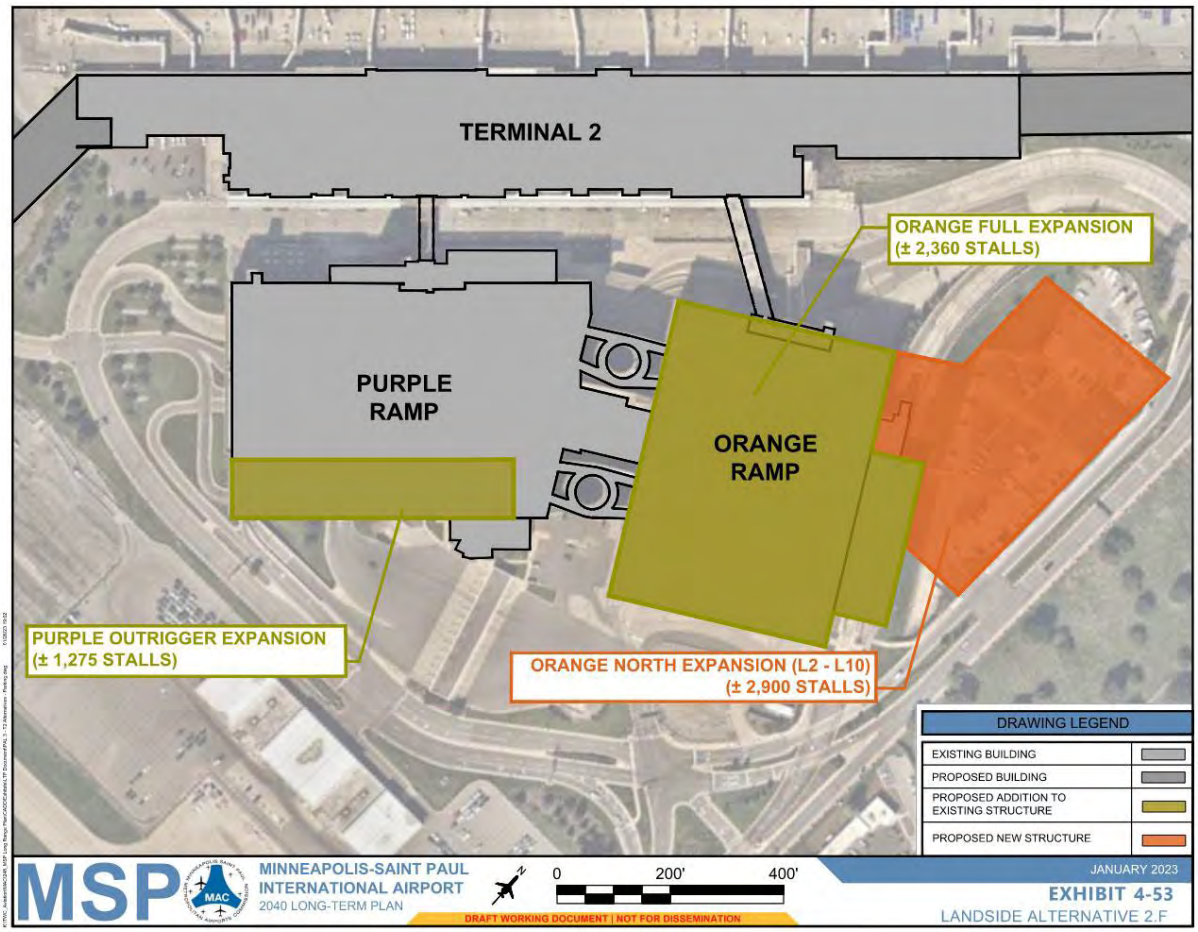
Alternative 2.F was selected as the preferred T2 parking development alternative. Though ranking the same as Alternative 2.F, Alternative 2.D does not meet the parking program requirements. Therefore, it was not considered in the selection of a preferred T2 parking development alternative.

Exhibit 4-52: Alternative 2.E



SOURCE: Kimley-Horn and Associates, Inc., 2023.

Exhibit 4-53: Alternative 2.F



SOURCE: Kimley-Horn and Associates, Inc., 2023.

4.6.5 Landside Refinement Summary

While a preferred landside alternative was not selected for T1, Alternative 1.A was rated the highest by the stakeholders. Therefore, additional plan-view graphics (see **Exhibits 4-54** through **4-60**) for each level at T1 were developed using Alternative 1.A. Similarly, additional plan-view graphics for T2 (see **Exhibits 4-61** through **4-67**) were developed for each level using the preferred Alternatives 2.B and 2.F. Both T1 and T2 layouts should be treated as potential layouts, where general concept and feel are meeting the requirements of the LTP objectives, but additional refinements and coordinating a preliminary design setting are still warranted beyond what the LTP can accomplish.

Table 4-9 presents the parking stall counts at the end of the planning horizon. With a total on-Airport parking requirement of 33,200 stalls by PAL 3, the proposed developments will accommodate the projected parking requirements.

Table 4-9: Proposed Parking Facilities

Facility	Spaces
Terminal 1	**18,050**
Blue Ramp (Levels 2–9)	3,400
Red Ramp (Levels 2–9)	3,759
Silver Ramp (Levels 6–11)	3,394
USPS Site Ramp (Levels 6–11)	3,200
Green/Gold Ramp Parking Redevelopment (Levels 1–9)	4,300
Quick Ride Ramp (Levels 1–2)	**1,704**
Terminal 2	**15,205**
Orange Ramp (Levels 1, M, 2–10)	7,028
Orange Ramp North Expansion (Levels 2–10)	2,900
Purple Ramp (Levels 2–8)	5,277
Total	**34,959**

NOTE:
USPS – U.S. Postal Service
SOURCE: Kimley-Horn and Associates, Inc., 2022.

Exhibit 4-54: Landside Potential Terminal 1 Development – Basement Level

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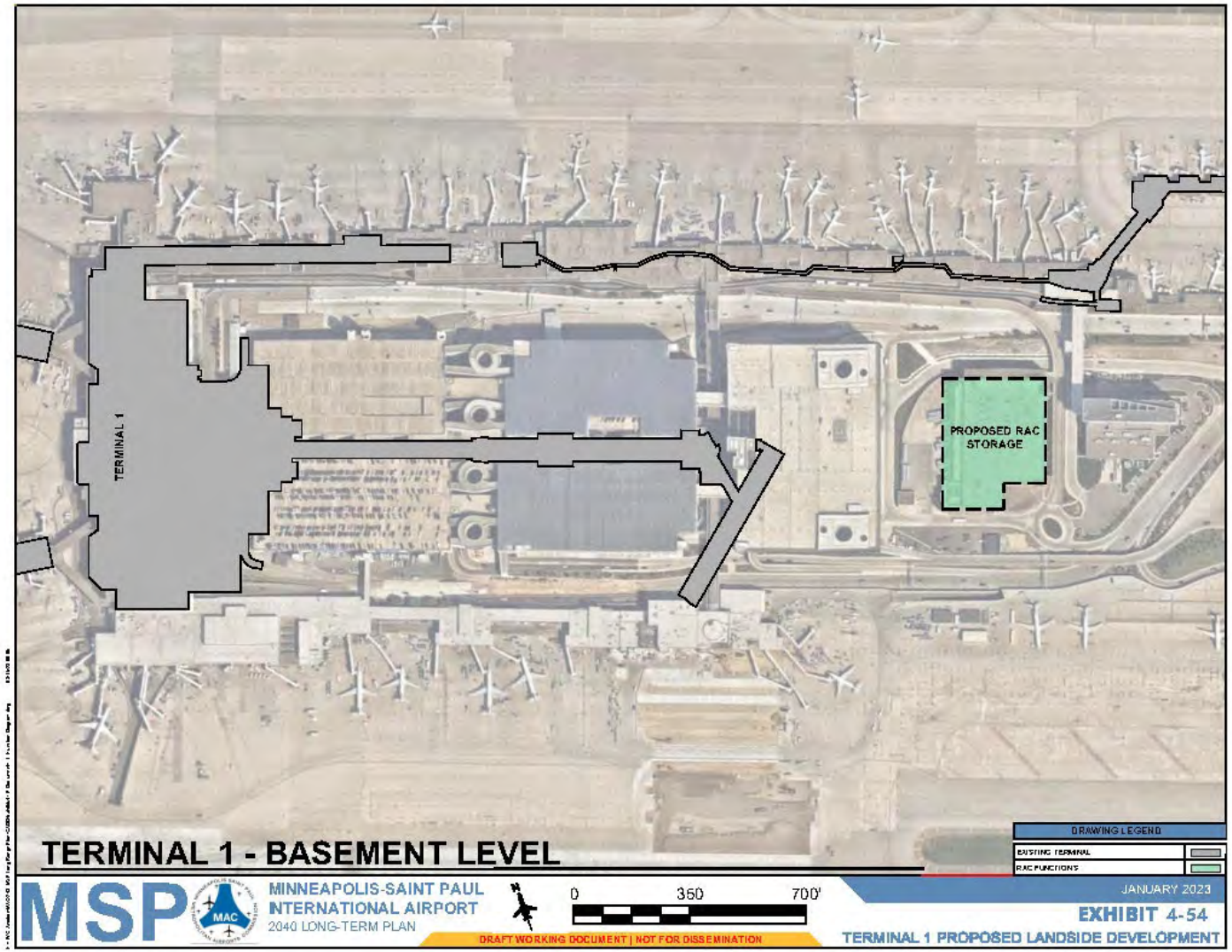

Exhibit 4-55: Landside Potential Terminal 1 Development – Level 1

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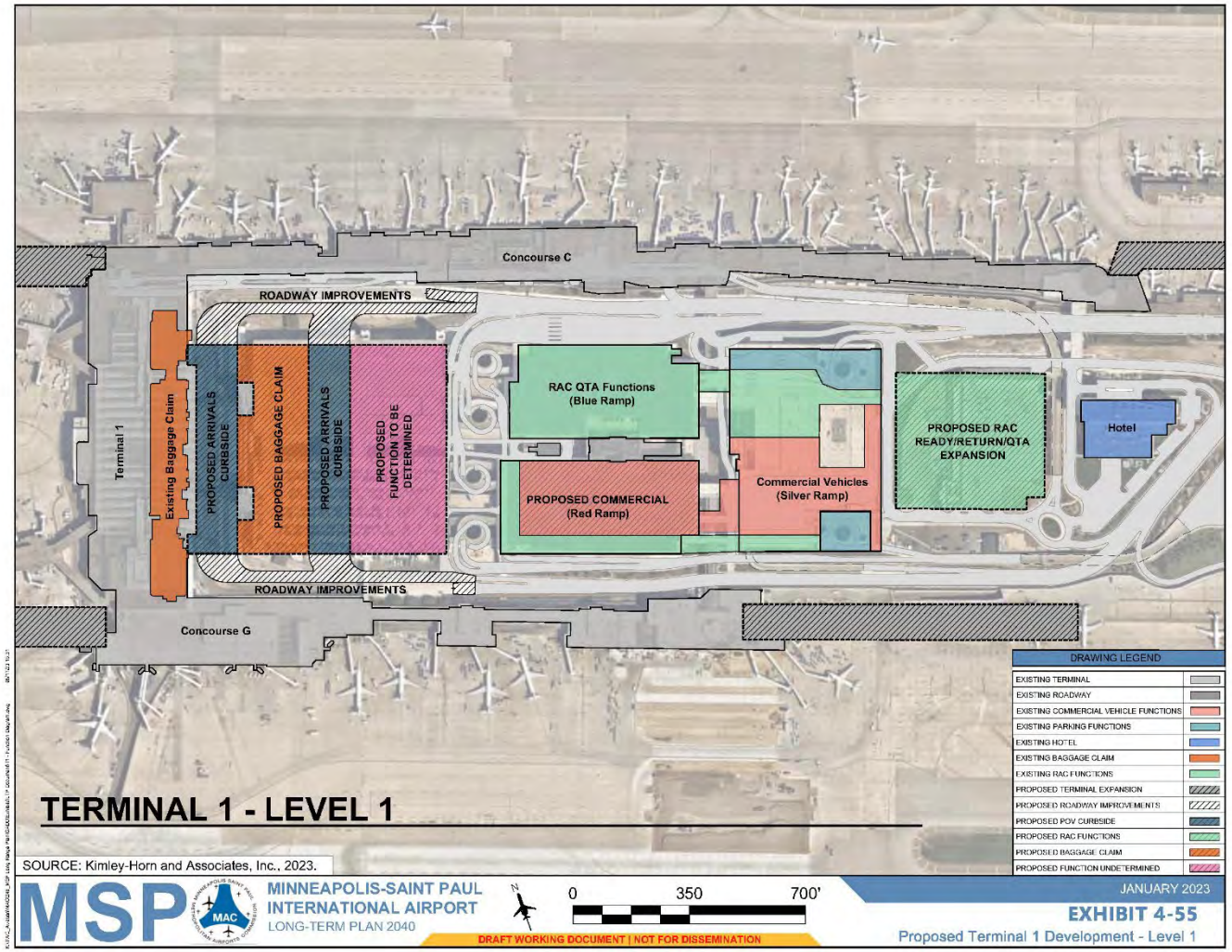

Exhibit 4-56: Landside Potential Terminal 1 Development – Level 2

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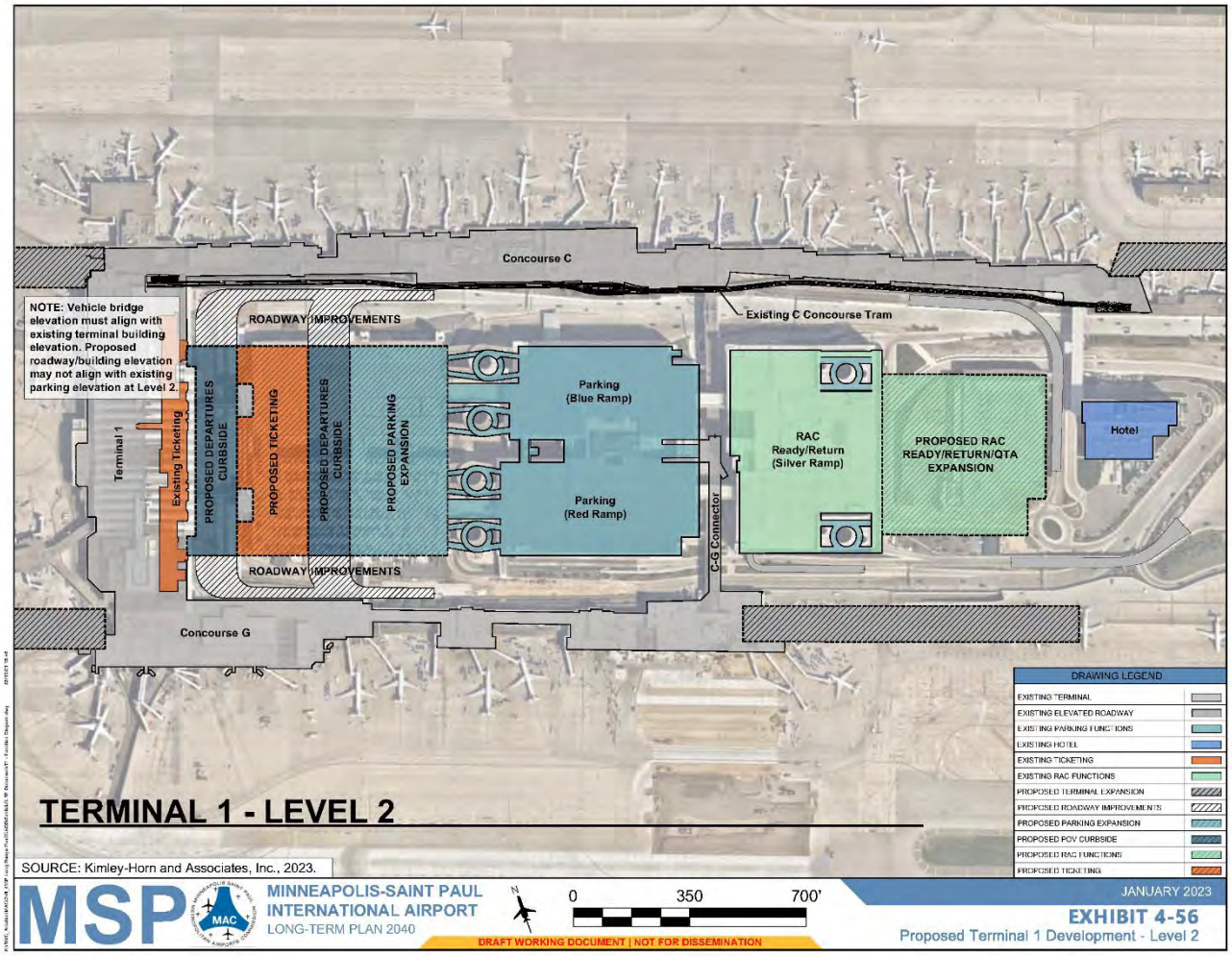

Exhibit 4-57: Landside Potential Terminal 1 Development – Level 3

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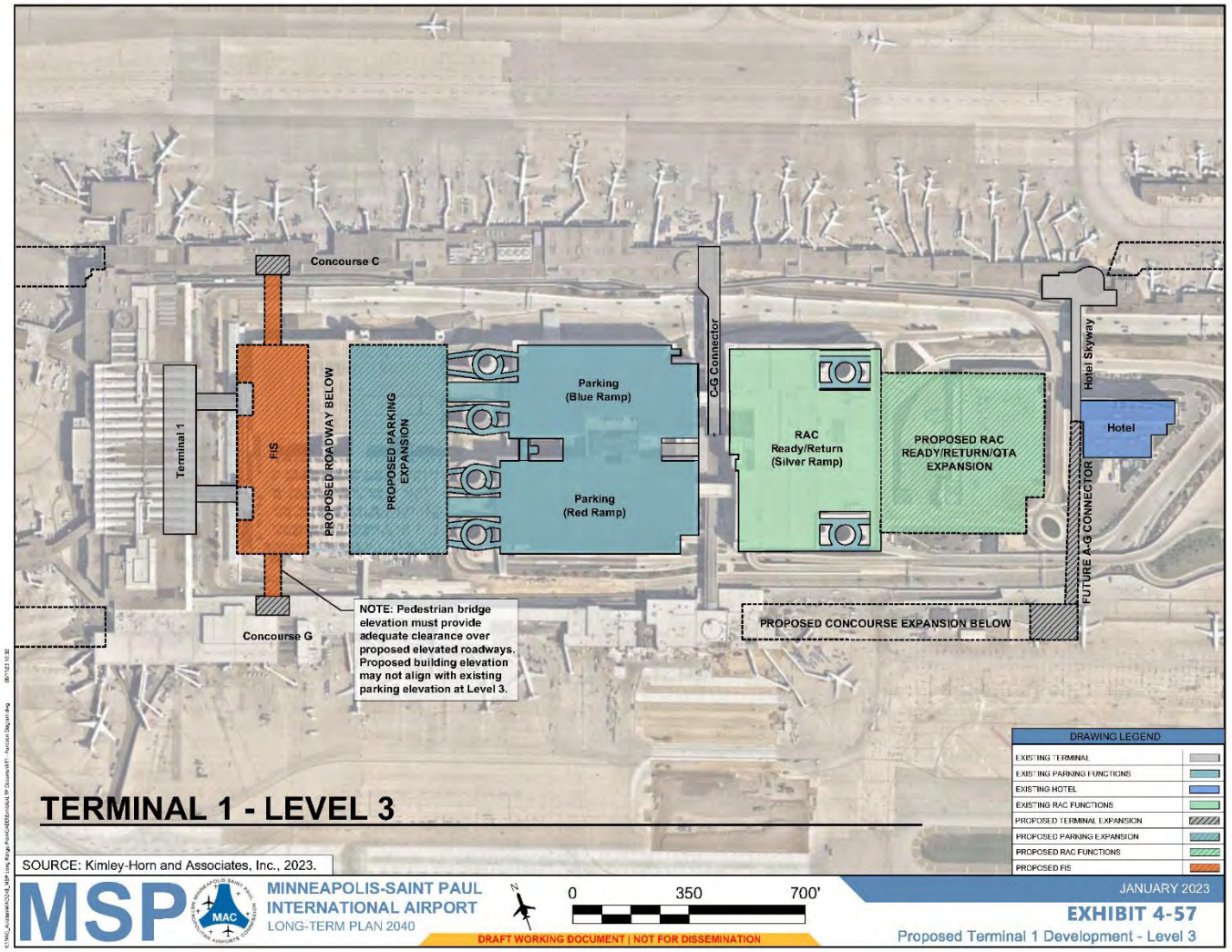

Exhibit 4-58: Landside Potential Terminal 1 Development – Levels 4 through 5

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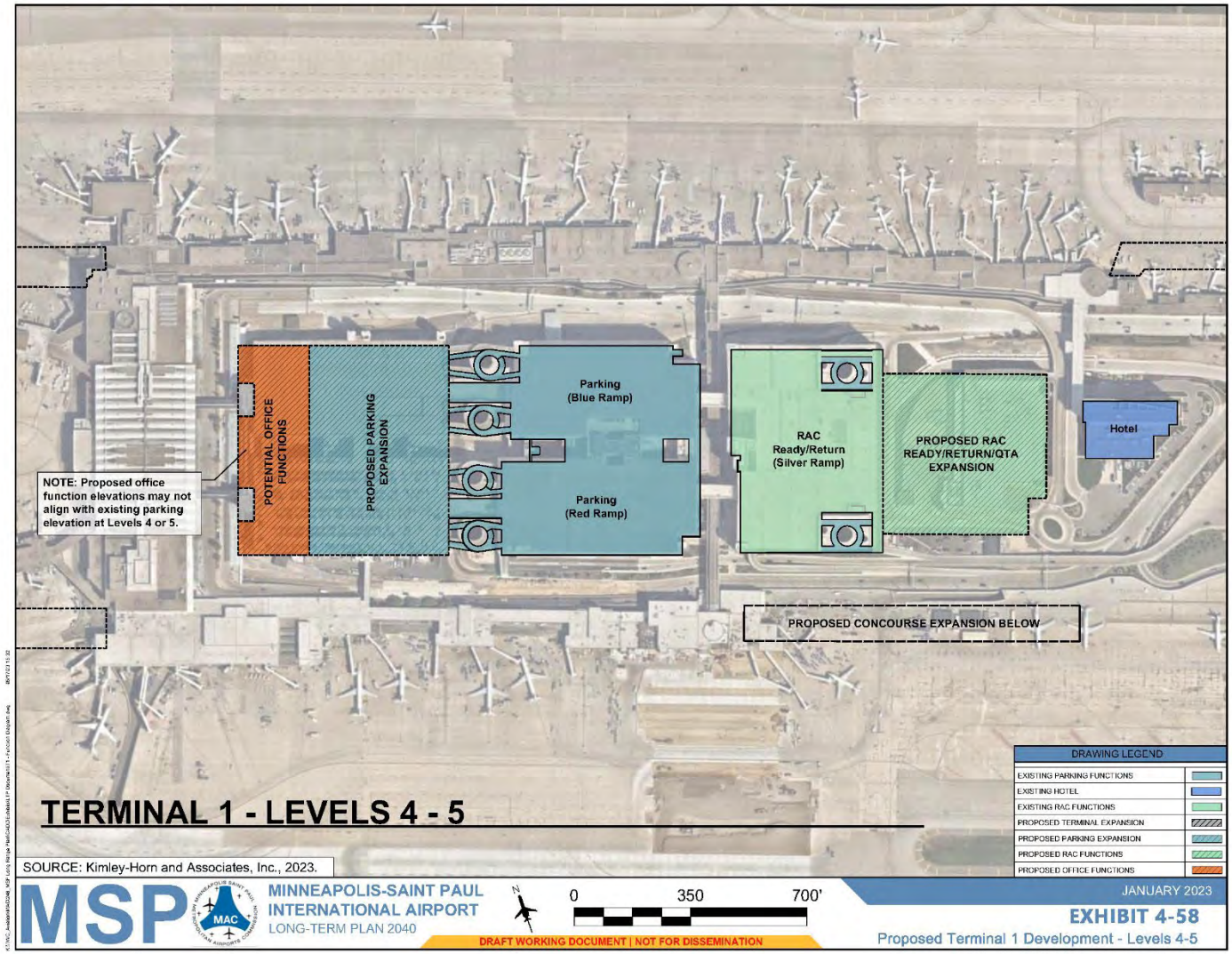

Exhibit 4-59: Landside Potential Terminal 1 Development – Levels 6 through 9

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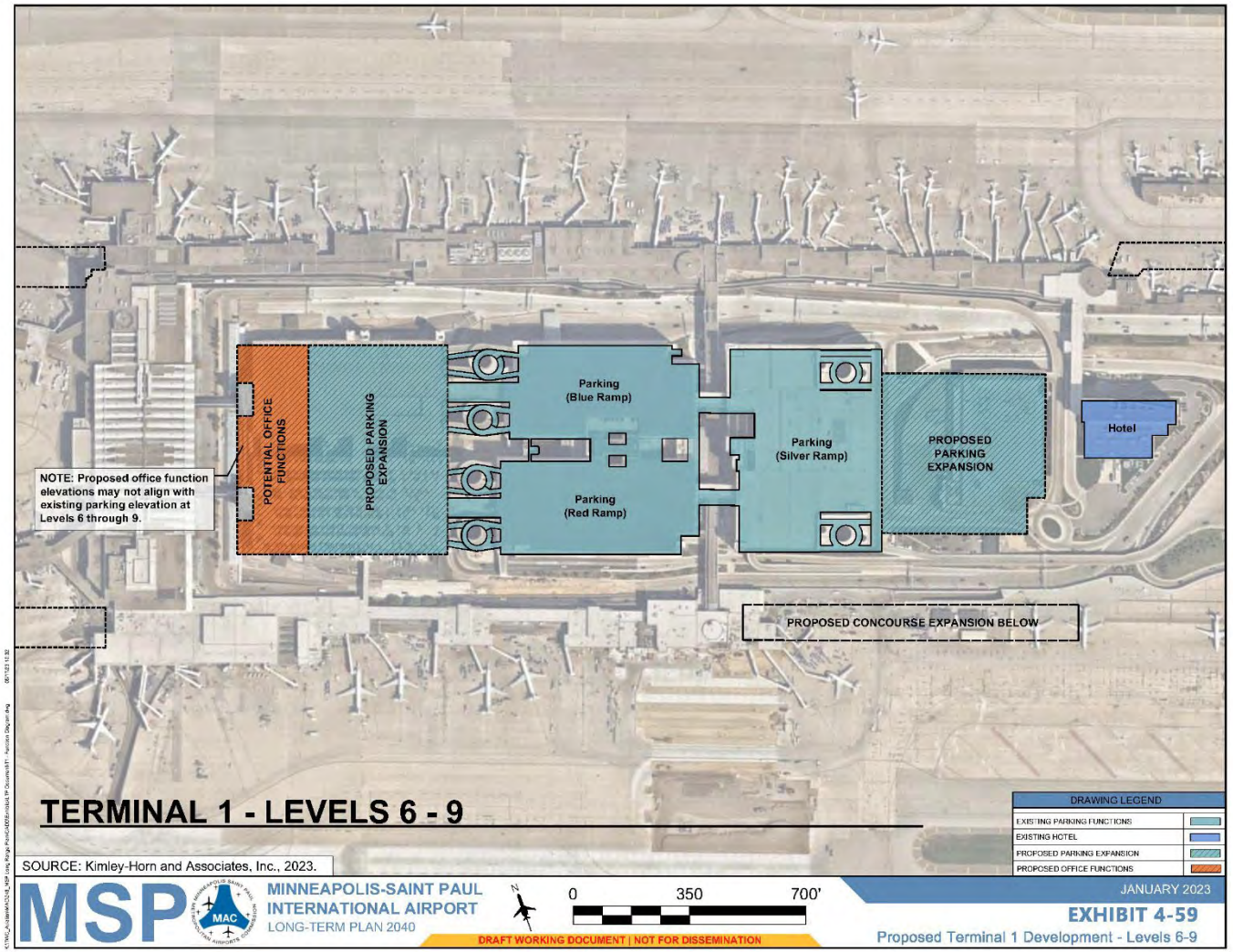

Exhibit 4-60: Landside Potential Terminal 1 Development – Levels 10 through 11

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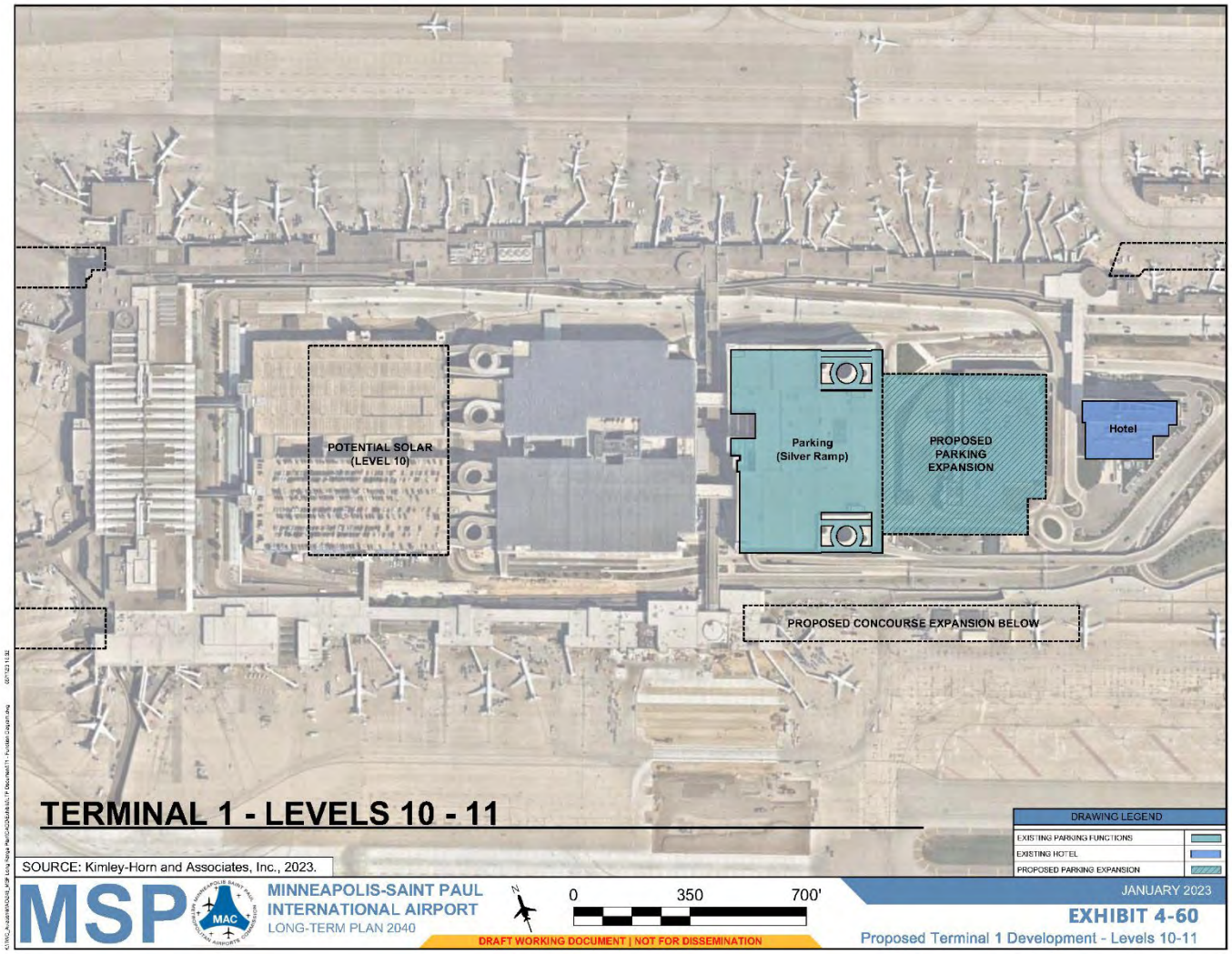

Exhibit 4-61: Landside Potential Terminal 2 Development – Level 1

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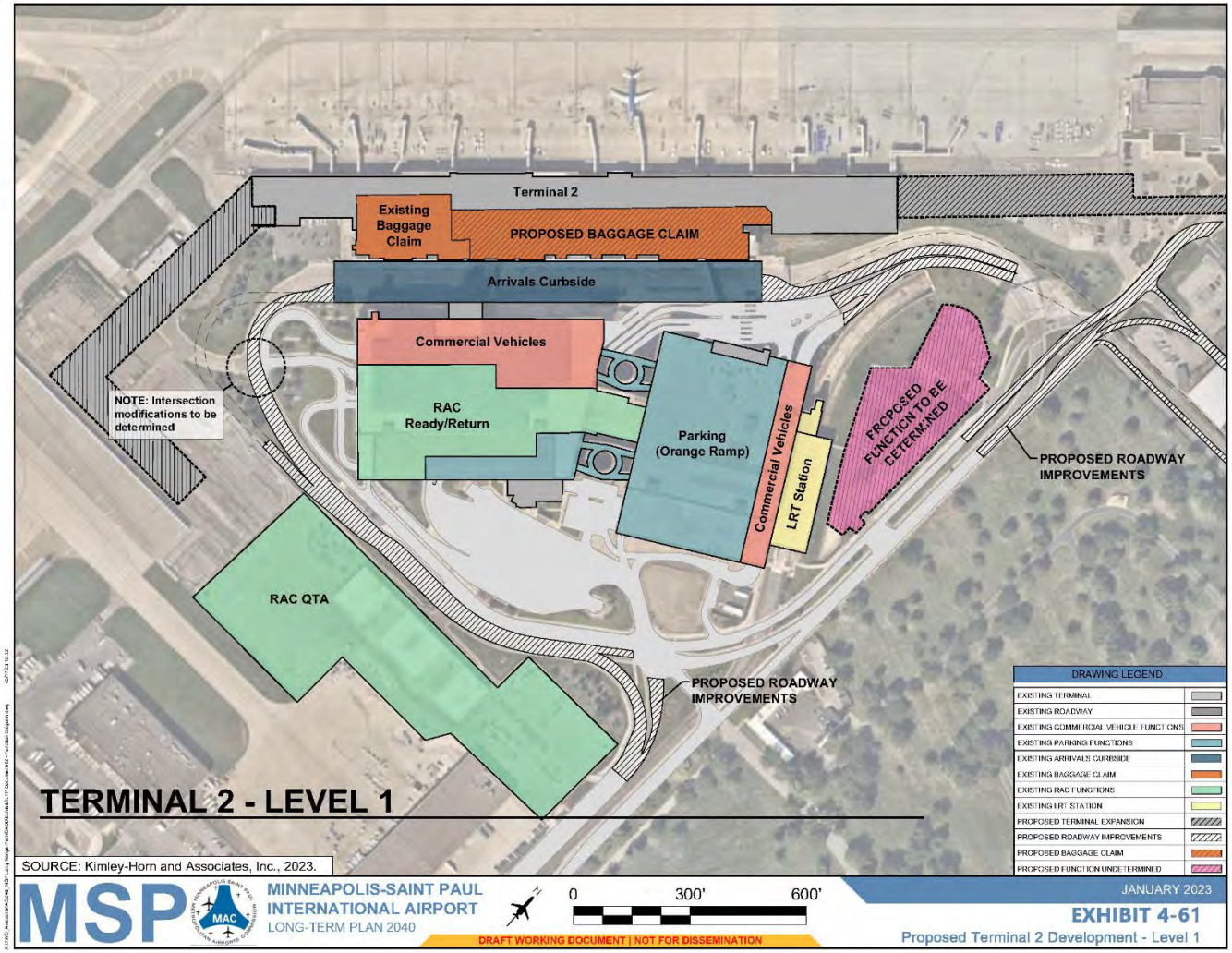

Exhibit 4-62: Landside Potential Terminal 2 Development – Mezzanine Level

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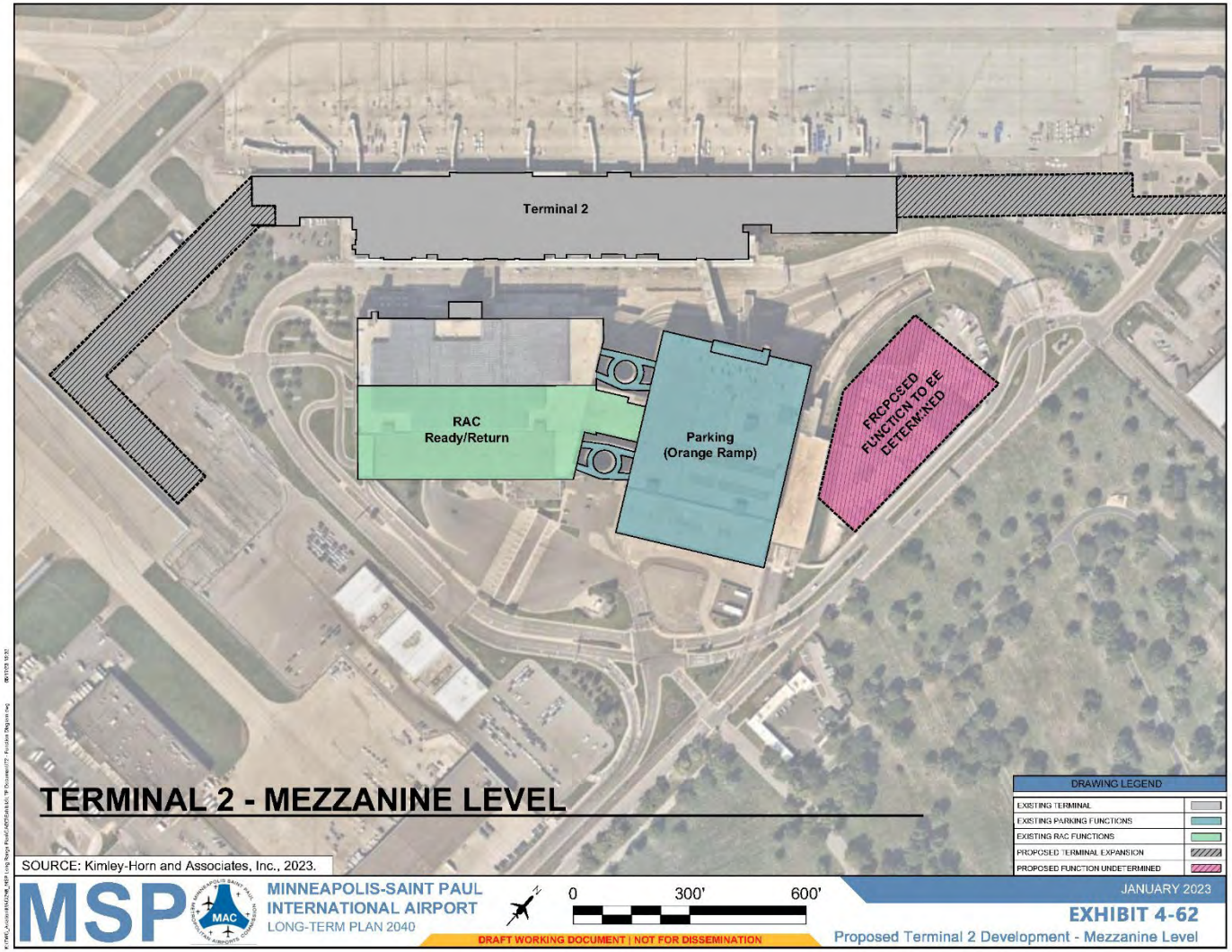

Exhibit 4-63: Landside Potential Terminal 2 Development – Level 2

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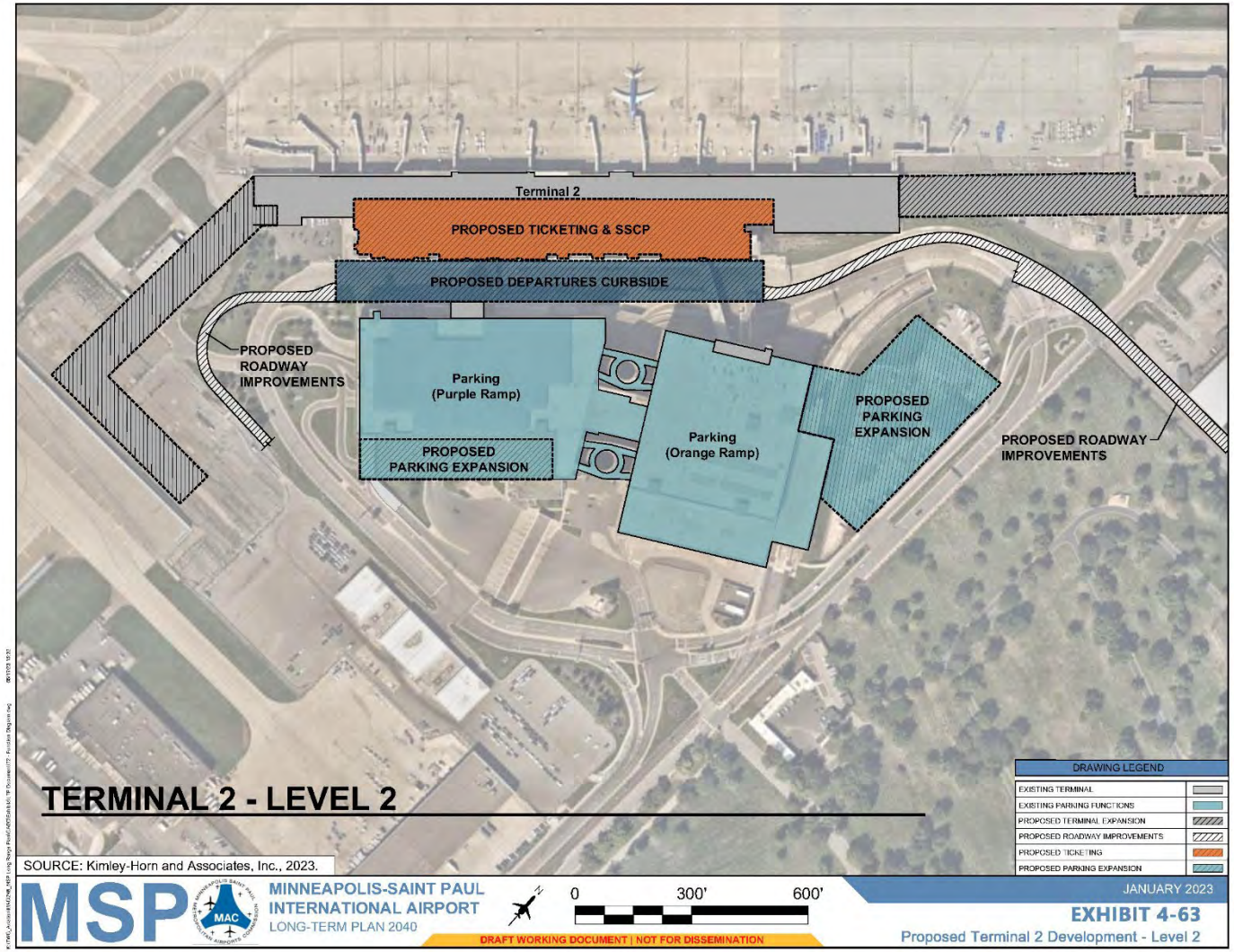

Exhibit 4-64: Landside Potential Terminal 2 Development – Level 3

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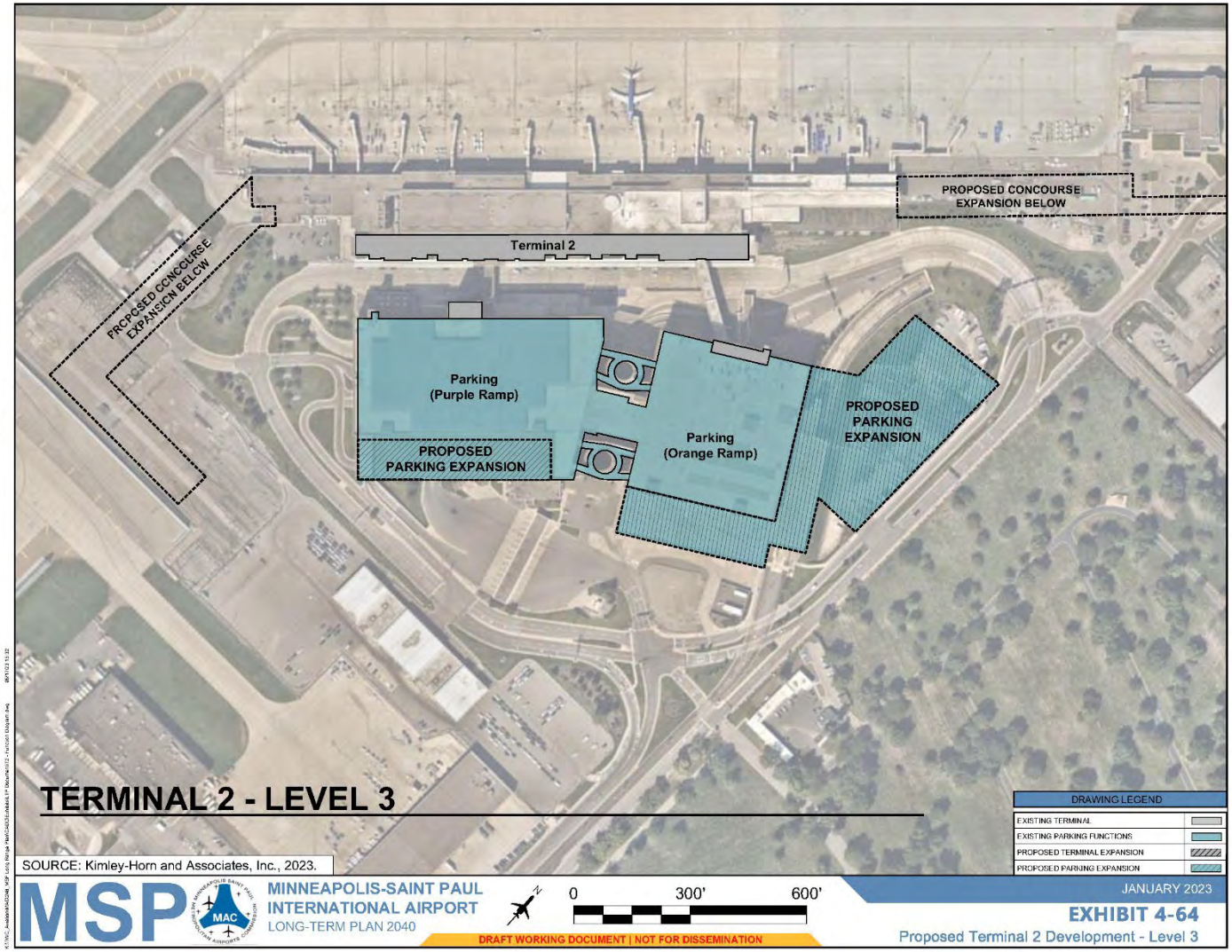

Exhibit 4-65: Landside Potential Terminal 2 Development – Level 4

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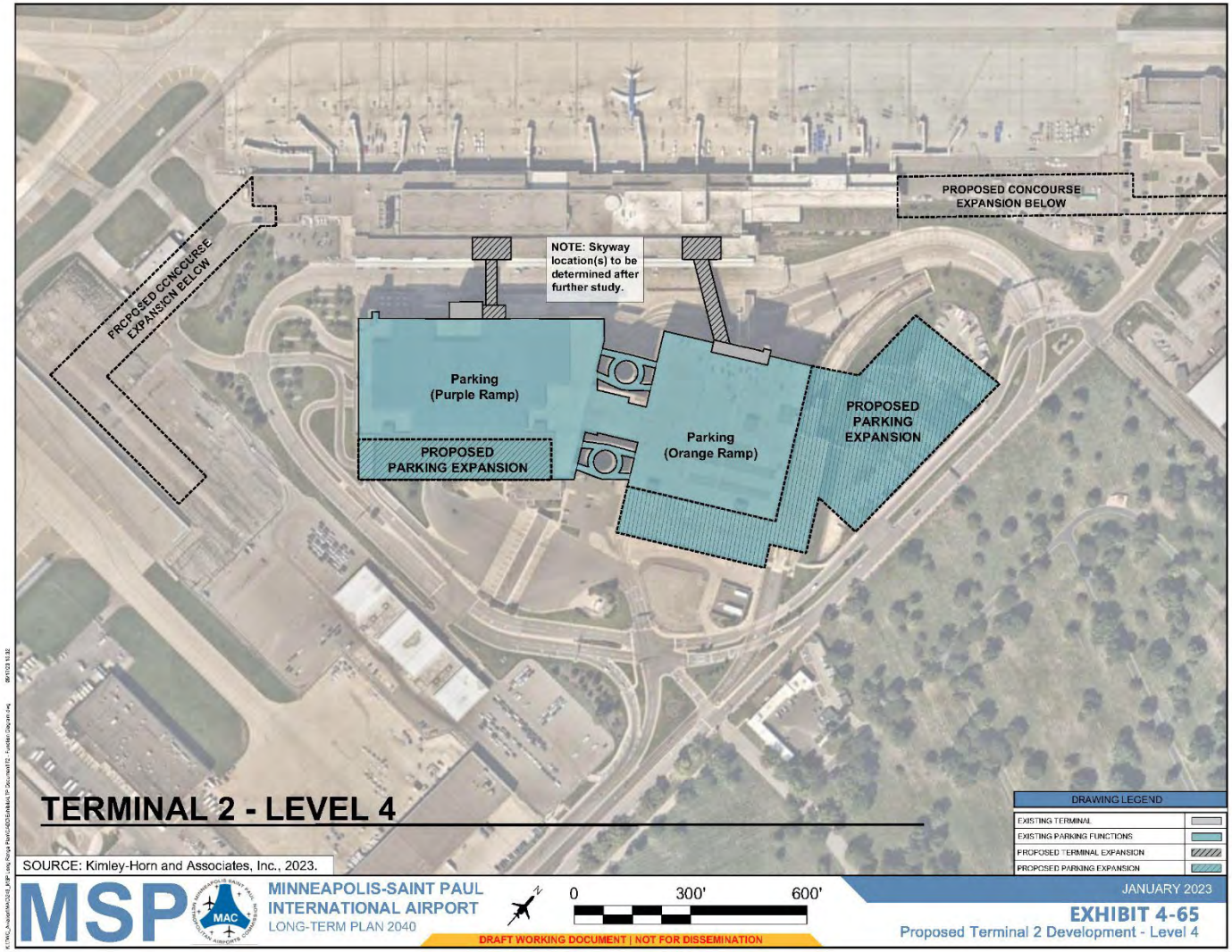

Exhibit 4-66: Landside Potential Terminal 2 Development – Levels 5 through 8

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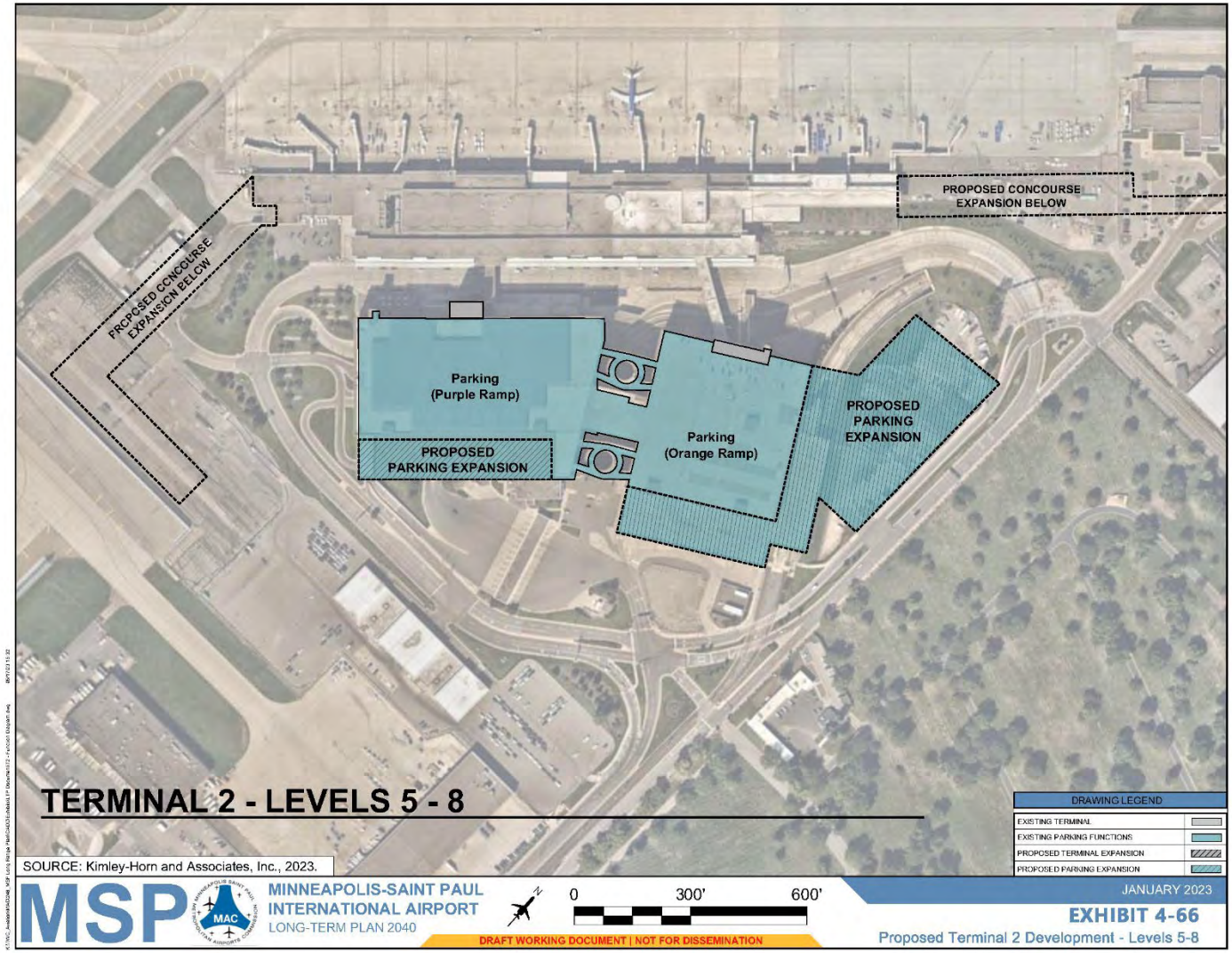

Exhibit 4-67: Landside Potential Terminal 2 Development – Levels 9 through 10

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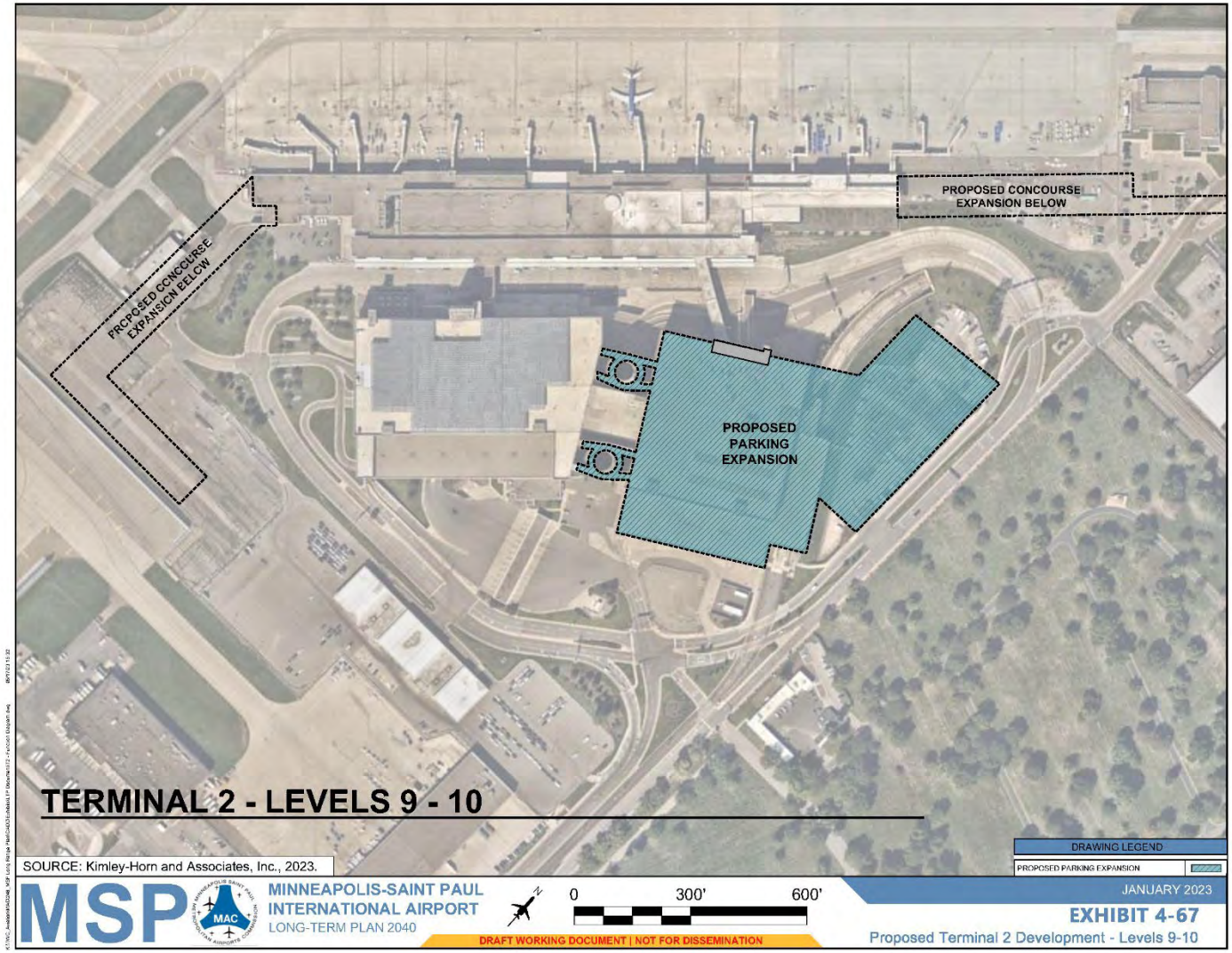

4.7 PREFERRED ALTERNATIVE

The preferred alternative balances future airside, landside, and terminal needs while acknowledging the airport is geographically constrained. The alternative development process first focused on the terminal footprint, as landside elements would be directly tied to potential terminal expansion, which would in turn impact airside operations. The preliminary terminal layouts that were created focused on:

1. FIS function and location between T1 and T2; and
2. Gate expansion capabilities that would not overly burden airside functions. Expansion opportunities were considered on the basis of airline preferential gating (one airline using one contact gate) or common-use gating (multiple airlines operating out of one gate).

The three basic terminal alternatives were:

- Alternative 1A: Single FIS at T1; Preferential gating
- Alternative 2A: Single FIS at T2; Common-use gating
- Alternative 3A: FIS at both T1 and T2; Preferential gating

From there, airside and landside elements were incorporated into the terminal alternatives.

An extensive stakeholder engagement process was conducted to share and solicit feedback on the three alternatives. The project team conducted more than 15 meetings with airlines, tenants, agencies, MAC operational staff, MAC senior leadership, the LTP Stakeholder Advisory Panel (SAP), and members of the public. Stakeholder input was used to refine the concepts and inform decision-making for the preferred alternative.

Alternative 3.1A was selected as the preferred development alternative. This alternative incorporates multiple elements from each of the three preliminary consolidated alternatives and addresses the balance between airside, landside, and terminal functions. Preferred Alternative 3.1A, shown on **Exhibit 4-68**, assumes FIS function remains at both T1 and T2 and balances the need for both preferential gating at T1 and a strategy to continue implementing common-use gating at T2.

This alternative addresses the concerns of airport congestion in the landside, terminal, and airside through a series of projects. Landside projects at both terminals – as well as the surrounding feeder roadways – were developed to reduce traffic congestion around the airport and at curbside areas. Parking will be expanded to accommodate the forecasted demand and acknowledge the need for reconstructing end-of-life T1 parking facilities (Green/Gold).

Terminal projects are also intended to address increased demand for narrowbody aircraft parking (ADG III) while maintaining an optimal level of service for passengers.

Airfield modifications were identified to improve efficiency in aircraft ground maneuvering, specifically in areas where current design standards have been prohibitive, and to reduce runway crossings for aircraft accessing Runway 17-35. Projects include reconfiguring taxiways, expanding deicing and RON aircraft aprons, and relocating and expanding some support facilities.

A phased high-level implementation strategy was developed to categorize near-term, mid-term, and long-term projects. Phasing was determined by need and targeted demand.

Near-term projects are primarily focused on increasing capability of existing facilities while creating areas for development staging.

Mid-term projects are focused on increasing the capability of the Airport to accommodate projected demand.

Long-term projects provide additional expansion for demand and increasing operational flexibility through inter-terminal connectivity.

The division between Near-, Mid-, and Long-Term term development plans was established to characterize development that has a higher likelihood of justification and implementation within the 2040 planning cycle. However, it is important to recognize that the division in these windows of development is approximate and dynamic and will be subject to change as the MAC begins to implement the LTP. Needs and opportunities may evolve, and many supporting projects would also be needed to fully implement this program.

Exhibit 4-68: Preferred Development Alternative 3.1A

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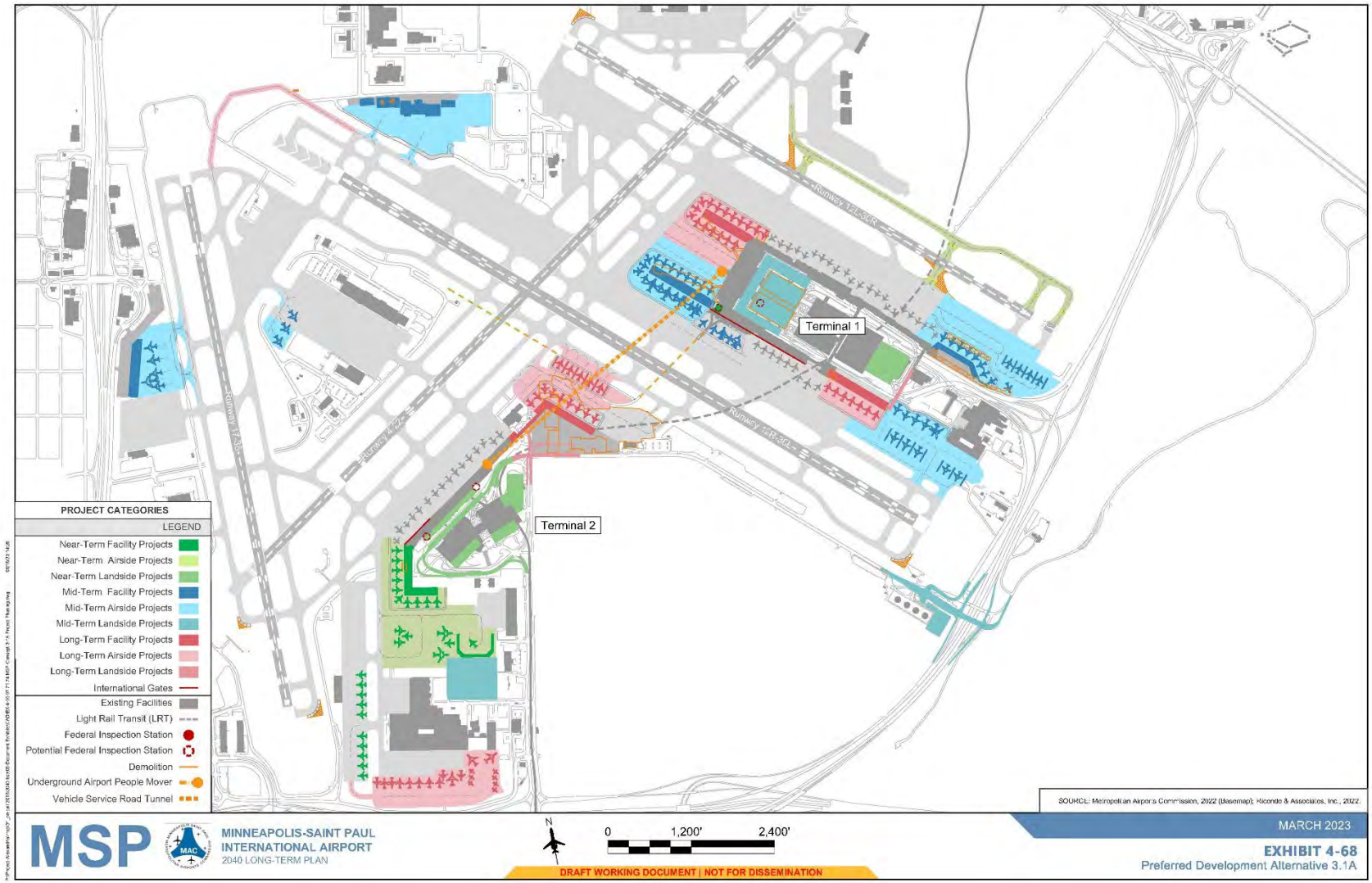

4.7.1 Near-Term Preferred Development Alternative 3.1A

The near-term preferred development alternative features several key developmental alterations to the terminal area complex, as listed in **Table 4-10** and shown on **Exhibit 4-69**. The following subsections review the near-term projects in detail.

Table 4-10: Near-Term Projects

Project #	Project Description
1-1	Existing T1 FIS Facility Enhancements
1-2	T2 South Terminal Expansion
1-3	Taxiway Edge Geometry
1-4	Runway 12L-30R Partial Parallel Taxiway and Taxiway P3 Reconfiguration
1-5	Ground Runup Enclosure (GRE) Relocation and RON Apron Construction
1-6	U.S. Postal Service (USPS) Site Redevelopment
1-7	Orange Ramp North Expansion and Outrigger Expansions
1-8	Orange and Purple Ramps Vertical Expansion
1-9	T2 Curb Frontage Improvements

NOTES:
T1 – Terminal 1; FIS – Federal Inspection Services; GRE – Ground Runup Enclosure; RON – Remain Overnight
SOURCE: Ricondo & Associates, Inc., December 2022.

4.7.1.1 Project 1-1: T1 Federal Inspection Services Facility Enhancements

The T1 FIS facility enhancement project within the existing Concourse G facility will allow for support of additional international gates. The project involves the addition of approximately 2,600 square feet of passenger screening and queuing area. Space adjacent to the existing FIS facility will need to be relocated to accommodate the enhancements. A new sterile circulation corridor will be added to connect additional international gates. The sterile circulation should not impact the existing facilities.

The T1 FIS facility enhancement project does not have any enabling projects. **Exhibit 4-70** shows the location of the T1 FIS facility expansion project.

Exhibit 4-69: Near-Term Preferred Development Alternative 3.1A

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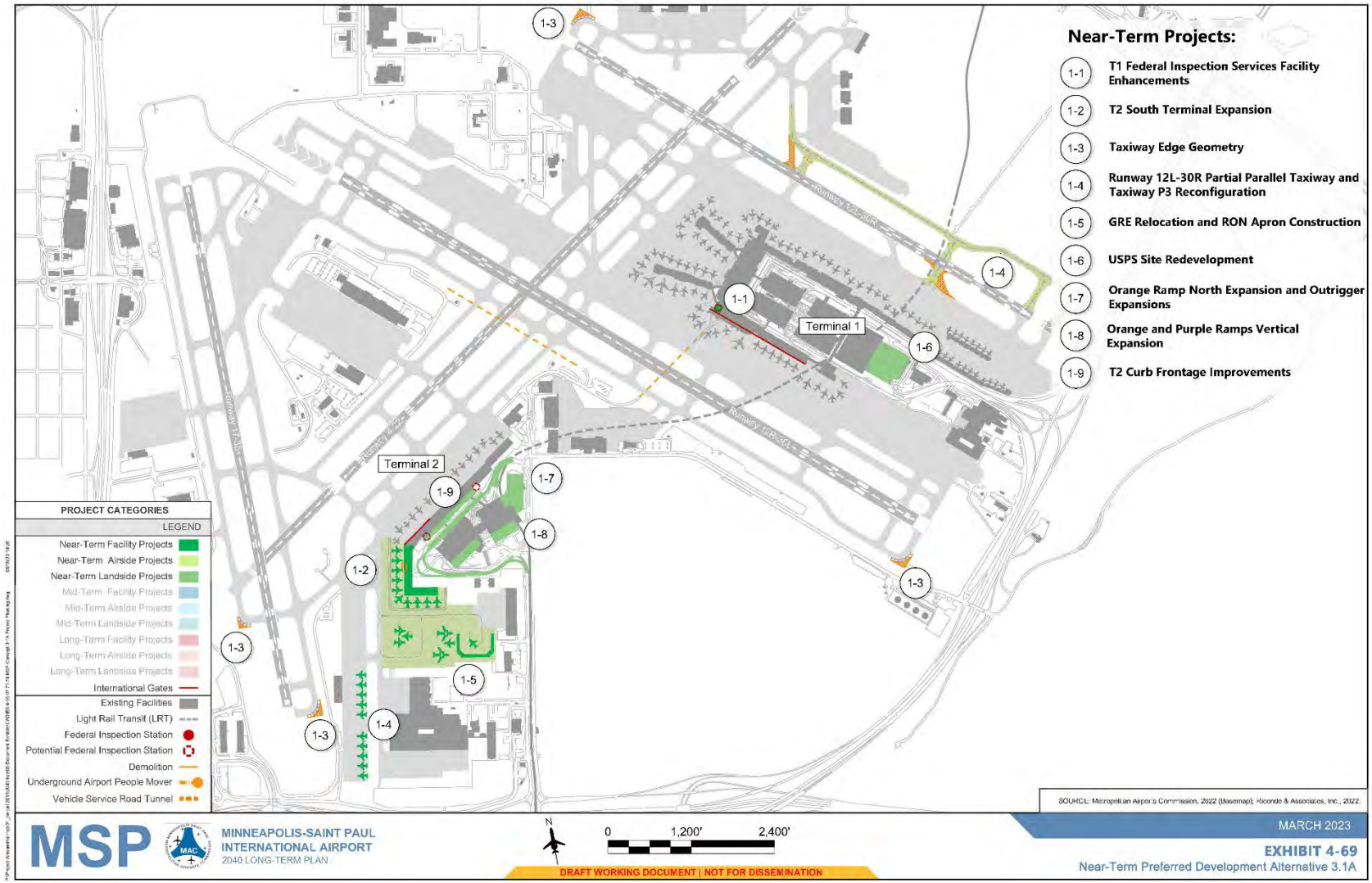

Exhibit 4-70: Existing Terminal 1 Federal Inspection Services Enhancement

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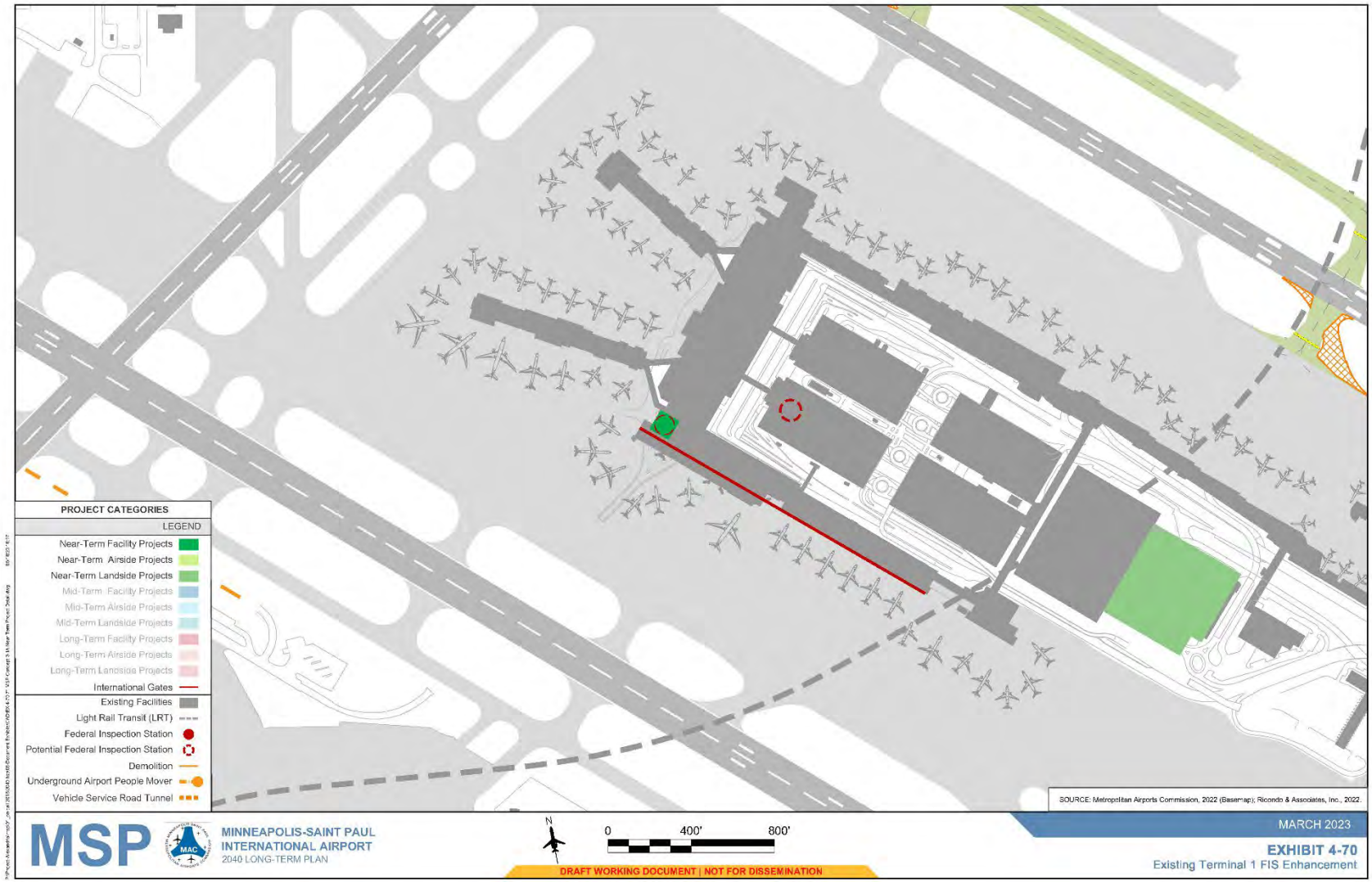

4.7.1.2 Project 1-2: T2 South Terminal Expansion

The south concourse expansion is a two-level single-loaded concourse consisting of 11 ADG III contact gates. The phasing of the south concourse expansion occurs in the near-term in order to provide surplus gates for staging future terminal projects. The additional gates will minimize gate relocations during future terminal construction projects. This project was brought forward in previous LTP efforts and was approved in the 2013 EA.

The future building is approximately 220,000 square feet. Level 2 contains holdrooms, public circulation, concessions, restrooms, and access to the contact gates. Level 1 contains Airport support, airline support, mechanical and storage. The adjacent future apron is approximately 440,000 square feet of pavement that will be used for aircraft parking and GSE circulation and storage. The concourse extends south from the existing T2 and then continues west, encroaching on the existing QTA facility. In addition, the concourse expansion impacts a flight kitchen south of the existing T2.

The south concourse expansion requires the realignment of Taxiway S2, which subsequently affects the existing GRE. The south concourse expansion project would be constructed in conjunction with the GRE relocation and RON apron construction, as discussed for Project 1-5.

The enabling projects for the development of the expansion include:

- Relocate the flight kitchen.
- Relocate the GRE (see **Section 4.6.1.5**).
- Relocate the QTA facility.
- Realign Taxiway S2 (see **Section 4.6.1.5**).
- Move/add baggage makeup in T2.

Exhibit 4-71 shows the new T2 South expansion in detail.

Exhibit 4-71: New T2 South Expansion

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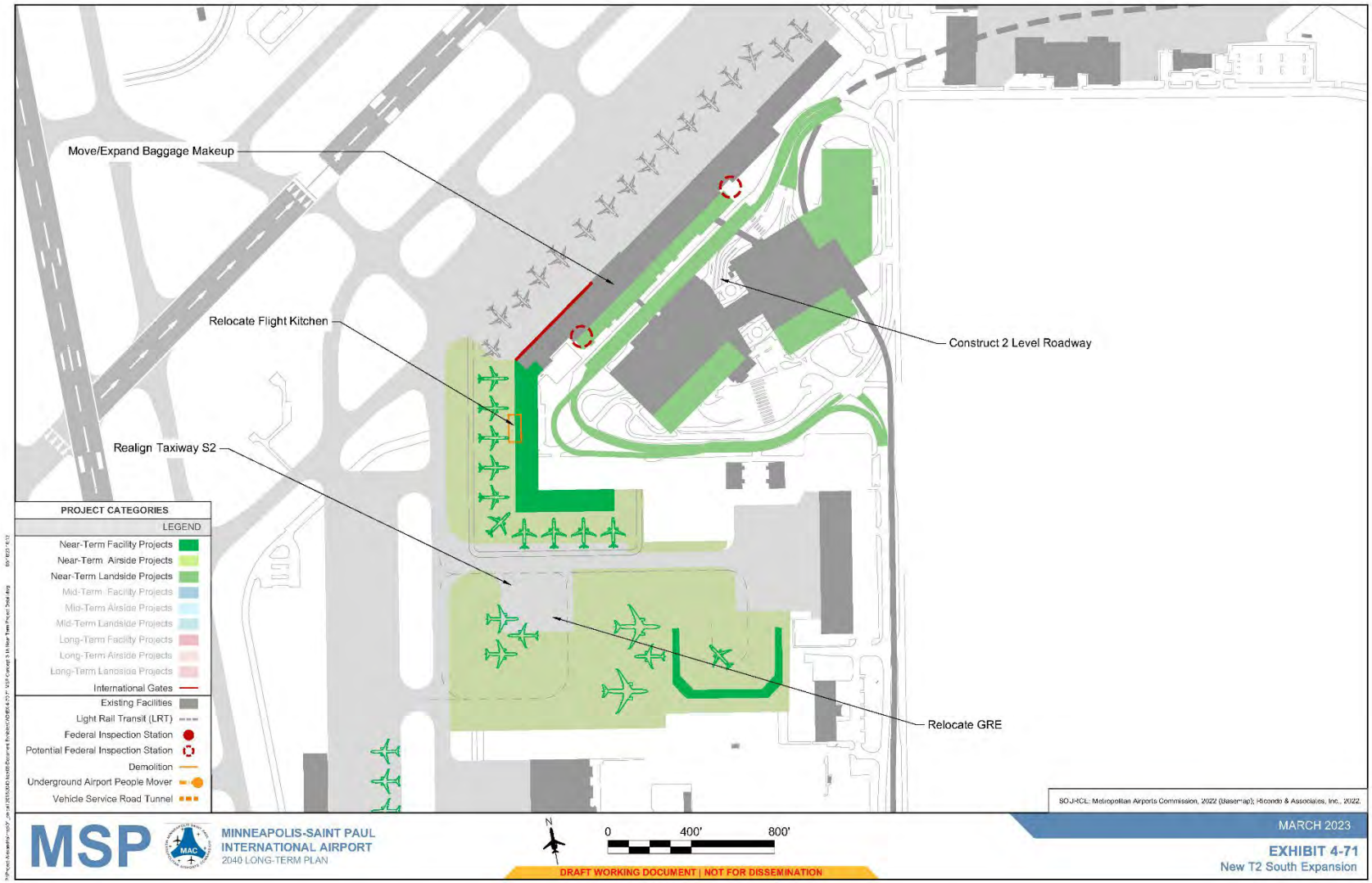

4.7.1.3 Project 1-3: Taxiway Edge Geometry

The taxiway edge geometry project will remove the existing 90-degree edge of pavement corners at the ends of Taxiway R and Taxiway R10, Taxiway W and Taxiway W1, Taxiway K and Taxiway K1, and Taxiway L and Taxiway L1. Approximately 40,000 square feet of pavement will be removed and replaced with loam and seed to create a rounded edge of pavement. Revising the edge of pavement from a 90-degree corner to a rounded corner increases visibility of the taxiway and distinguishes it from the runway for pilots on approach, reducing the chances of a wrong-surface landing. The taxiway edge geometry improvements do not have any enabling projects.

4.7.1.4 Project 1-4: Runway 12L-30R Partial Parallel Taxiway and Taxiway P3 Reconfiguration

Existing Taxiways P and Q are wingspan restricted for simultaneous use by ADG III aircraft. When aircraft larger than ADG III occupy Taxiway P, Taxiway Q must remain sterile. A partial parallel taxiway north of Runway 12L-30R will allow unrestricted ADG IV and V aircraft access to or from the Runway 30R approach end with full design conformity and improve airfield efficiency.

4.7.1.5 Project 1-5: Ground Runup Enclosure (GRE) Relocation and Remain-Overnight Apron Construction

The south expansion of T2 requires the existing GRE to be relocated. The GRE will be relocated approximately 1,200 feet to the east, and approximately 1 million square feet of new apron pavement will be constructed for the relocated GRE and new RON parking positions. The GRE relocation and RON apron construction project requires that the existing flight kitchen building be vacated and demolished.

4.7.1.6 Project 1-6: U.S. Postal Service Site Redevelopment

The USPS site redevelopment is an enabling project in the near-term. This project provides replacement public parking to accommodate parking displaced during Green/Gold Ramp demolition in the mid-term. The USPS site redevelopment project will construct a new rental car QTA facility and public parking structure on the footprint of the existing USPS site. The proposed QTA facility will occupy multiple levels to meet the T1 demand. The remaining 10 levels of the structured-level cast-in-place post-tensioned concrete structure will be used for public parking operations. The new structure should provide connectivity to the existing ready/return functions on Levels 2 through 5 of the Silver Ramp and the parking functions on Levels 6 through 11. The cross section of the proposed structure is provided in **Exhibit 4-42**.

The enabling projects for the redevelopment of the USPS site include buying out the USPS lease, demolishing the existing USPS industrial buildings and CSB, and demolishing two levels of the concrete parking structure (located above the USPS building).

4.7.1.7 Project 1-7: Orange Ramp North Expansion and Outrigger Expansions

The Orange Ramp north expansion comprises a structured-level cast-in-place post-tensioned concrete parking structure located to the north of the existing Orange Ramp. The nine-level structure will connect directly to the existing Orange Ramp via pedestrian and vehicular bridges on each level. The exact functions that will reside in the new structure have not been determined; however, parking functions will occupy the majority of the new structure. EV charging infrastructure should be incorporated into the parking ramp. The parking expansion at T2, in

addition to the USPS site redevelopment, will bolster the Airport's parking capacity to enable the demolition of the Green/Gold Ramp.

This project will also include vertical outrigger expansions for the Orange Ramp, which consist of:

- Five levels of cast-in-place post-tensioned concrete parking structure for the Orange Ramp LRT outrigger expansion
- Five levels of cast-in-place post-tensioned concrete parking structure for the Orange Ramp east outrigger expansion

The Orange Ramp north expansion is recommended before other Orange Ramp vertical expansions due to radar shadow issues on the existing Orange Ramp site. The radar issues must be rectified to the satisfaction of the FAA before vertical expansion is feasible. The Orange Ramp north expansion project does not have any significant enabling projects. Existing construction staging operations require relocation prior to site development. However, due to the project's proximity to the existing LRT and T2 station, extensive coordination with Metro Transit will be required.

4.7.1.8 Project 1-8: Orange and Purple Ramps Vertical Expansion

The Orange and Purple Ramps at T2 can expand vertically on the existing ramp footprint. The vertical expansions for Project 3-9 include:

- Two levels of cast-in-place post-tensioned concrete parking structure for the entire Orange Ramp footprint
- Seven levels of cast-in-place post-tensioned concrete parking structure for the Purple Ramp outrigger expansion

This project will also include raising the helices between the Purple and Orange Ramps to Level 10 to provide access to the new Orange Ramp levels. Enabling projects for the vertical expansions include:

- Modify the Orange Ramp structure to provide additional bearing pressure and axial capacity for the columns.
- Relocate an aircraft NAVAID on the airside to prevent signal disruptions.

The enabling projects include the relocation of the ASR or upgrade/relocation to ASR 11.

4.7.1.9 Project 1-9: 34th Avenue and East 70th Street Reconstruction

This project consists of the construction of a new elevated departures roadway and at-grade arrivals roadway at T2. The new roadways will address curbside deficiencies and will be offset from the terminal building to provide the requested clearances from APD. The existing Purple Ramp and Orange Ramp skyways will be reconstructed to provide the necessary vertical clearance. The intersection of 34th Avenue and East 70th Street will also be reconstructed as part of this project to improve intersection capacity. An elevated roadway from Post Road will pass over the existing intersection to improve throughput, while maintaining access to the existing ARFF facility. A flyover from 34th Avenue will provide a recirculation option to the terminal. The enabling projects for the two-level roadway system and intersection reconstruction include the enhancements related to Project 3-4, relocating the RAC CSB, and reconstructing the TH 5 and Post Road intersection.

4.7.2 Mid-Term Preferred Development Alternative 3.1A

The mid-term preferred development alternative features several key developmental alterations to the terminal area complex, as listed in **Table 4-11** and shown on **Exhibit 4-72**. The following subsections review the mid-term projects in detail.

Table 4-11: Mid-Term Projects

Project #	Project Description
2-1	Reconstruct Concourse A, Demolish Concourse B
2-2	Reconstruct Concourse F
2-3	Central Cargo Apron Expansion
2-4	Runway 30L Remain Overnight (RON) Apron and Deice Pad Reconfiguration
2-5	West Cargo Apron and Facility
2-6	Fixed Base Operator (FBO) Relocation
2-7	Runway 12R-30L Tunnel Reconstruction and Taxiway B Realignment
2-8	Runway 30R Deice Pad Reconfiguration
2-9	Terminal 1 Two-Level Roadway Reconstruction
2-10	Green/Gold Ramp Redevelopment with New Federal Inspection Service (FIS) Facility
2-11	34th Avenue Parking Development
2-12	TH 5 Interchange Reconstruction

NOTES:
RON – Remain Overnight; FBO – Fixed Base Operator; FIS – Federal Inspection Services; SSCP – Security Screening Checkpoint
SOURCE: Ricondo & Associates, Inc., December 2022.

Exhibit 4-72: Mid-Term Preferred Development Alternative 3.1A

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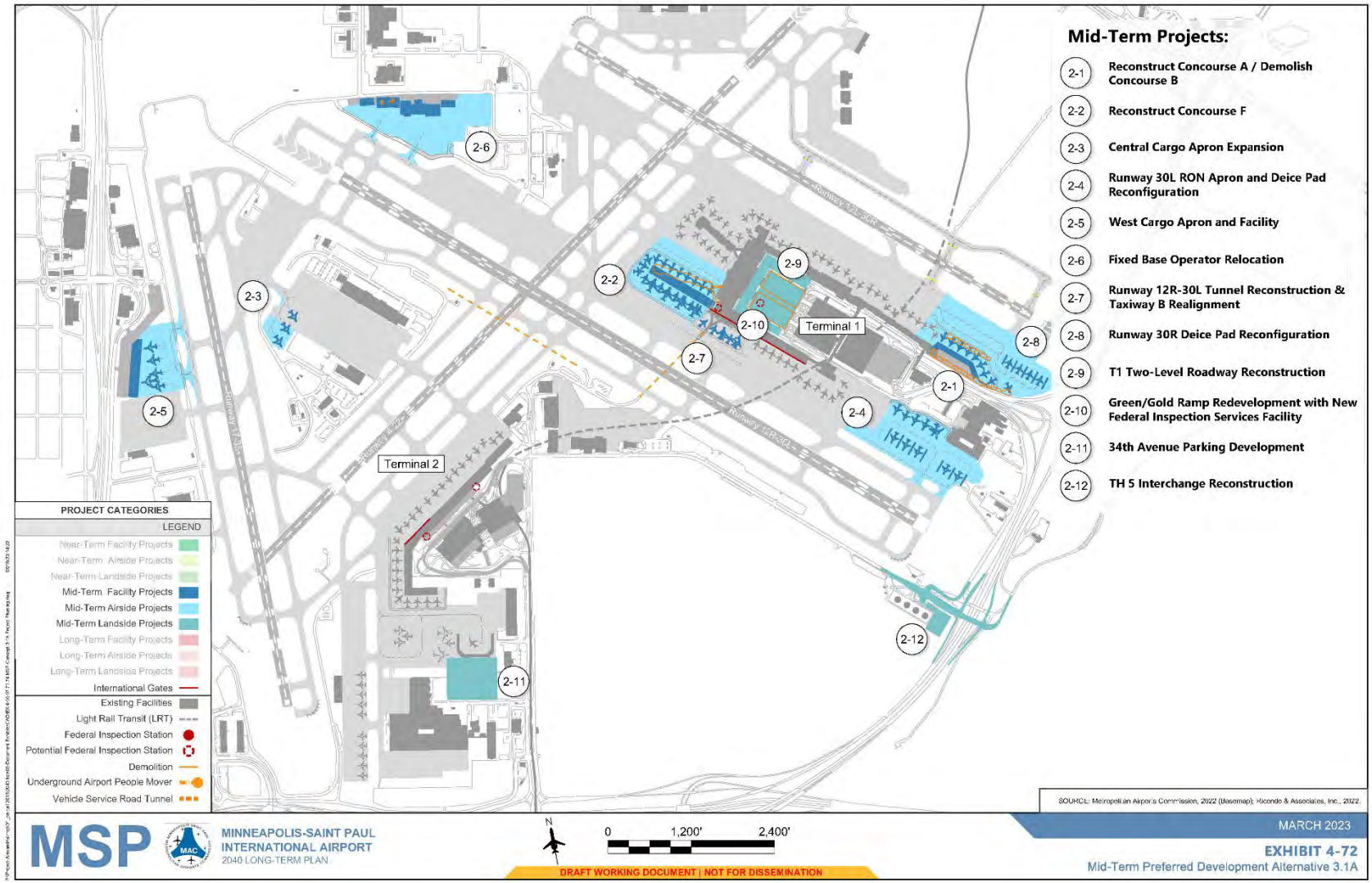

4.7.2.1 Project 2-1: Reconstruct Concourse A; Demolish Concourse B

The reconstructed Concourse A requires the demolition/redevelopment of the existing Concourse A and Concourse B facilities. Concourse B is a satellite concourse that will be replaced with apron pavement infill and dual ADG III taxilanes to improve aircraft flows around the new concourse and deice pad. The adjacent deice pad will be reconfigured, as discussed in Project 2-8. Concourse A will be redeveloped as a single-loaded ADG III–capable facility.

The future building is approximately 140,000 square feet. Level 2 contains holdrooms, public circulation, concessions, restrooms, and access to the contact gates. Level 1 contains Airport support, airline support, mechanical and storage. The adjacent future pavement will be used for aircraft parking, GSE circulation, and storage.

The configuration of the reconstructed Concourse A facility provides additional landside development opportunities south of the future concourse.

The enabling projects for the development of the new Concourse A include:

- Demolish/redevelop Concourse A.
- Demolish Concourse B.
- Reconfigure the deice pad (see **Section 4.7.2.8**).

Exhibit 4-73 shows the Reconstructed Concourse A project in detail.

4.7.2.2 Project 2-2: Reconstruct Concourse F

The reconstructed Concourse F is a three-level double-loaded concourse consisting of 19 ADG III contact gates. The new Concourse F provides 4 ADG V multiple aircraft ramp system (MARS) gates that could potentially serve international flights. However, the primary focus of these ADG V aircraft gates would be the seasonal domestic routes in which airlines up gauge their aircraft size.

The reconstructed Concourse F requires the demolition of the existing Concourse F facility, which will be replaced with apron pavement infill. The configuration of the new concourse will align with the existing Concourse G flight line, creating a contiguous structure to improve aircraft gate alignment and additional aircraft maneuvering capability around the terminal area.

The future building is approximately 250,000 square feet. Level 3 contains a sterile corridor connected to the T1 FIS facilities. This sterile corridor will be used by the four MARS gates. Level 2 contains holdrooms, public circulation, concessions, restrooms, and access to the contact gates. Level 1 contains Airport support, airline support, mechanical and storage. The adjacent future pavement will be used for aircraft parking, GSE circulation, and storage.

A single ADG III taxilane will be provided north of the reconstructed Concourse F to serve both the new concourse and the existing Concourse E. The reconstructed Concourse E construction, discussed for Project 3-3, allows the space between future Concourse F and future Concourse E to accommodate triple ADG III taxilanes. **Exhibit 4-74** shows the new Concourse F project in detail.

Exhibit 4-73: Reconstruct Concourse A, Demolish Concourse B

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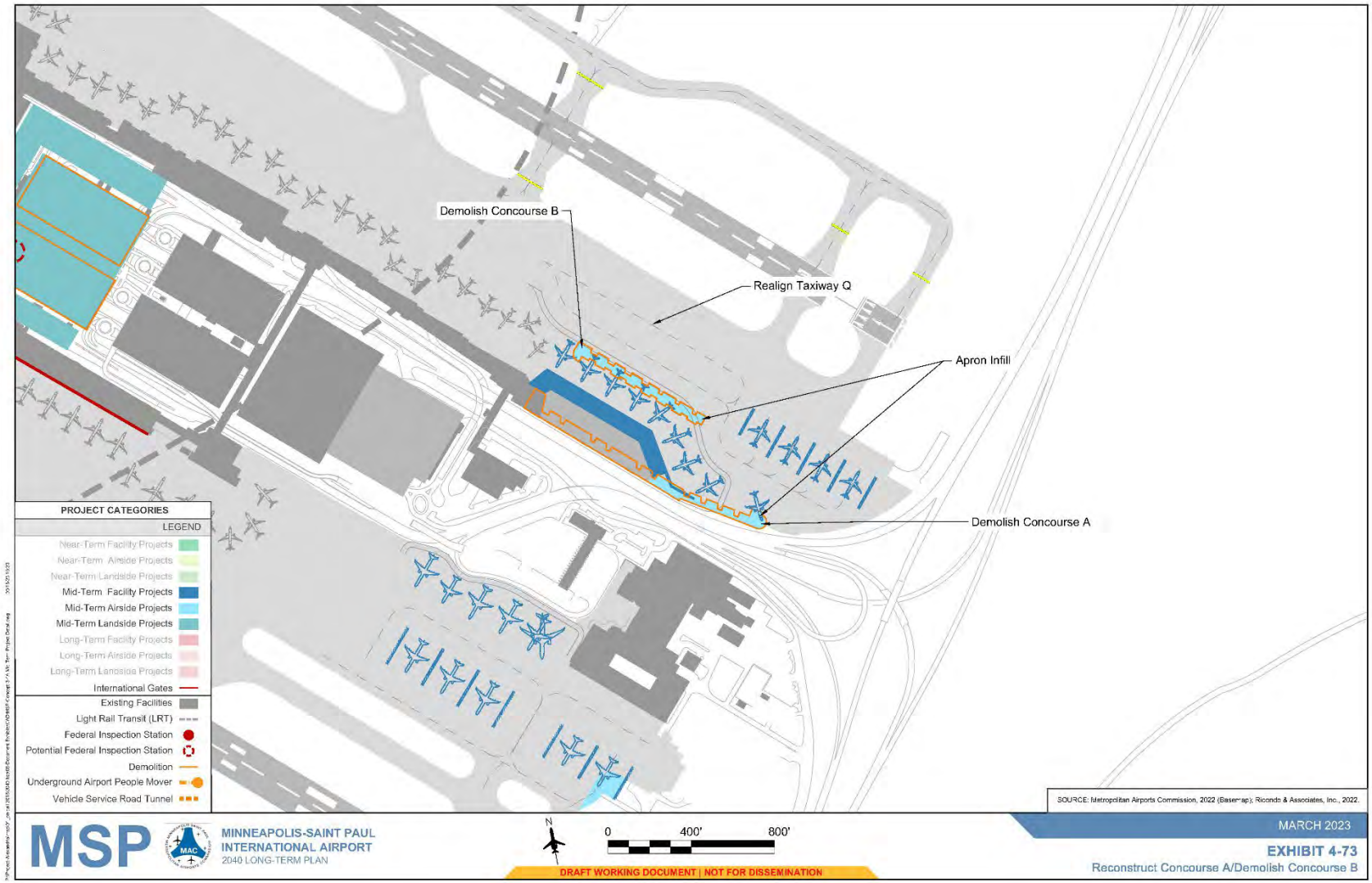

4.7.2.3 Project 2-3: Central Cargo Apron Expansion

The Central Cargo Apron, specifically the UPS apron, will be expanded to allow for the addition of two parking stalls for UPS. The apron expansion is approximately 133,000 square feet, located on the western end of the existing UPS apron. The Central Cargo Apron expansion project has no enabling projects.

4.7.2.4 Project 2-4: Runway 30L Remain-Overnight (RON) Apron and Deice Pad Reconfiguration

The Runway 30L deice pad will be reconfigured to accommodate larger aircraft on the deice pad. Approximately 17,000 square feet of apron pavement will be added. With the addition of this pavement and reconfiguration of the surface markings, up to five ADG III aircraft will be able to operate on the deice pad at a time. The Concourse H expansion will require reconfiguration of the RON parking positions north of the Runway 30L deice pad. No new pavement is required for this, and surface markings will be reconfigured to allow for one ADG III position, three ADG IV positions, and a final position capable of parking either an ADG IV or ADG V aircraft. The Runway 30L RON apron and deice pad reconfiguration project has no enabling projects.

4.7.2.5 Project 2-5: West Cargo Apron and Facility

The West Cargo Apron and facility project will construct a new airfield apron, cargo warehouse and sort facility, and landside trailer docking and parking lot on the existing abandoned site north of the shared Amazon / DHL apron. The new apron and facilities will meet the anticipated cargo requirements for Amazon. Approximately 621,000 square feet of new airfield apron will be constructed, which will provide parking for up to three ADG IV aircraft and one shared parking stall for either an ADG IV or ADG V aircraft. The cargo warehouse and sort facility is approximately 124,000 square feet. Approximately 285,000 square feet of landside pavement will be constructed to accommodate cargo haul vehicle docking and employee parking. The West Cargo Apron and facility project has no enabling projects.

Exhibit 4-74: Reconstruct Concourse F

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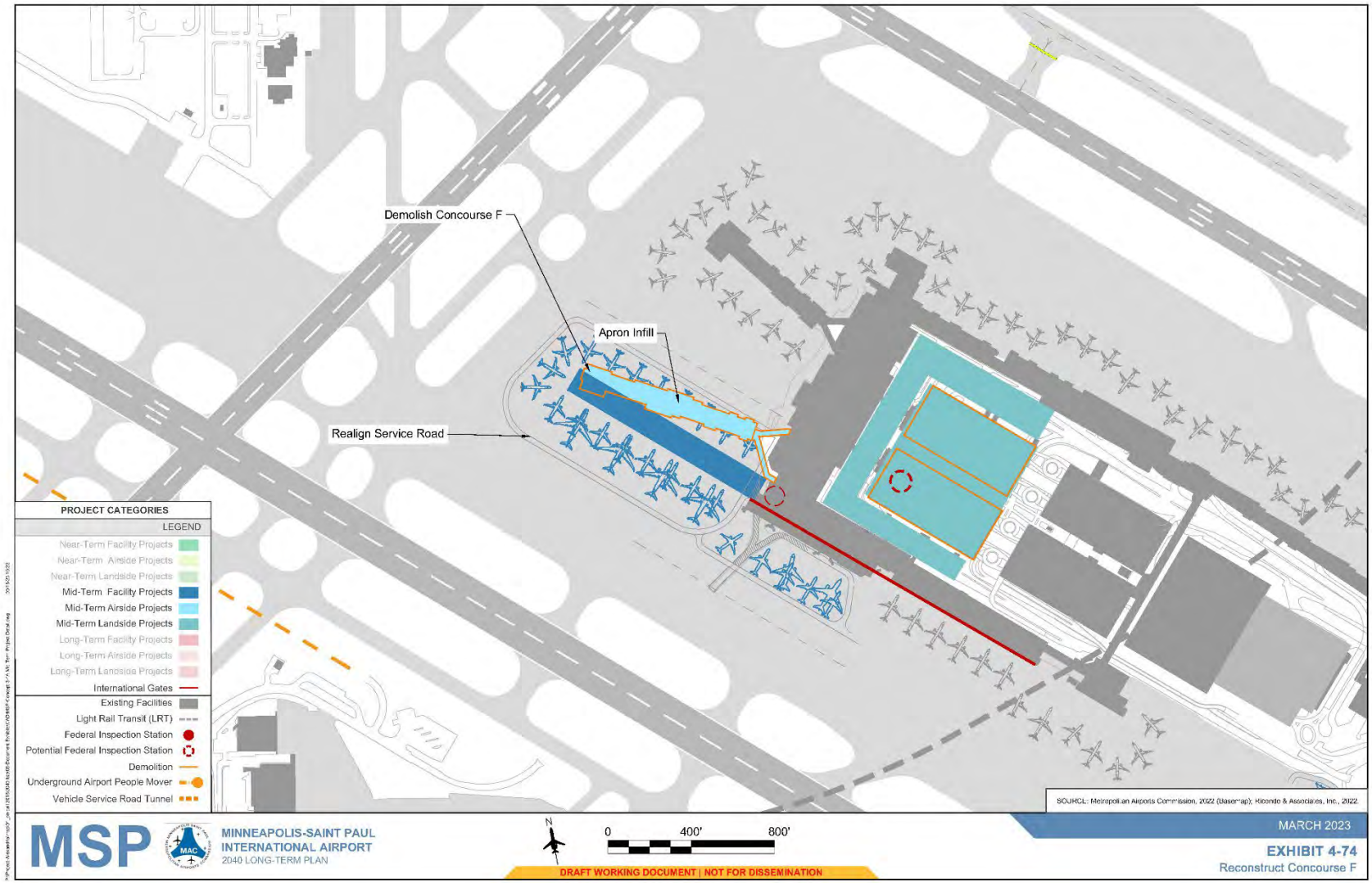

4.7.2.6 Project 2-6: Fixed Base Operator (FBO) Relocation

To accommodate the north expansion of T2, the existing FBO terminal and hangars will be relocated to the north side of the airfield, adjacent to Taxiway B. The relocated FBO apron includes a 20,000-square-foot terminal building, approximately 175,000 square feet of hangar space, approximately 956,000 square feet of new apron pavement, and approximately 129,000 square feet of landside parking. Two connections will be provided to Taxiway B, and aircraft up to ADG V will be able to access the FBO apron.

There are two enabling projects and one revision to a programmed project under design that are required for the FBO relocation. The FAA RTR/RCAG equipment and supporting facilities will need to be relocated, as well as the existing fire training facility. The preferred FBO relocation alternative also requires a revision to the proposed security center development site by relocating the parking lot access point from 32nd Avenue South from the existing driveway to the west of the old Navy building.

4.7.2.7 Project 2-7: Runway 12R-30L Tunnel Reconstruction and Taxiway B Realignment

The Runway 12R-30L tunnel reconstruction and Taxiway B realignment project will increase airfield capacity and efficiency by extending the existing VSR tunnel approximately 160 feet. The tunnel extension will allow for the alignment of Taxiway B as it crosses over the tunnel to be parallel to Taxiway A. This will remove an existing bottleneck at this location that limits the taxiing of aircraft to only one aircraft at a time on either Taxiway A or Taxiway B as they cross over the tunnel. The realignment of Taxiway B will allow simultaneous aircraft to taxi over the tunnel on Taxiway A and Taxiway B. The VSR will also need to be reconstructed to meet existing grade as it approaches Concourse F. This project is anticipated to occur concurrently with the reconstruction of Concourse F.

As an enabling project, existing gating on Concourse G will need to be revised to accommodate the reconfiguration of the VSR.

4.7.2.8 Project 2-8: Runway 30R Deice Pad Reconfiguration

The Runway 30R deice pad reconfiguration will increase the capacity of the deice pad by allowing up to four ADG III aircraft to be deiced at a time on the deice pad. The existing deice pad markings will need to be reconfigured to accommodate ADG III aircraft. Dedicated GSE and deice equipment staging areas will also be provided. No additional apron pavement is required for the deice pad reconfiguration.

As an enabling project, the existing Concourse B building will need to be demolished to allow ADG III aircraft to have access to the deice pad, since the existing taxilane accessing the deice pad is restricted to aircraft with less than an 81.5-foot wingspan.

4.7.2.9 Project 2-9: T1 Two-Level Roadway Reconstruction

The existing elevated departures and at-grade arrivals roadways will be reconstructed as the upper-level roadway structure reaches its end of life. Further study and stakeholder coordination are required to determine a preferred layout for the T1 roadways. However, the new roadways will likely be in a similar configuration to the existing roadways, but they will be offset farther from

the terminal to provide a clearance requested by the APD. The inbound and outbound roadways will also be reconstructed to be compatible with the proposed changes as part of the Green/Gold Ramp redevelopment. The new elevated roadway is also anticipated to include a canopy cover. The Green/Gold Ramp redevelopment is an enabling project to provide curbside facilities during the demolition and reconstruction of the existing curbside roadways.

4.7.2.10 Project 2-10: Green/Gold Ramp Redevelopment with New Federal Inspection Services (FIS) Facility

The Green/Gold Ramp will be demolished as the ramps are anticipated to reach their end of useful life during the planning horizon. The new structure will consist of a multi-use parking facility including parking, a centralized FIS facility, and MAC administrative space. The LTP recommends a preliminary design and alternative refinement project be completed ahead of this project to validate a preferred layout as well as goals, objectives, and timeline of the reconstruction. The redevelopment of the site will be directly dependent on the demolition of the existing Green/Gold Ramp.

The enabling projects for the demolition include the USPS site parking development and the T2 parking expansion, described in Section 4.7.1.6 and 4.7.1.7, respectively. The Green/Gold Ramp site requires close coordination with the Airport APM system programming, which will occur as a separate study. The Green/Gold Ramp site will interface with the existing Hub Tram tunnels connecting Red/Blue/Silver Ramps to T1.

4.7.2.11 Project 2-11: 34th Avenue Parking Development

The construction of a 5,000-stall cast-in-place post-tensioned concrete parking structure is proposed along 34th Avenue. The structure will serve as an employee parking facility for Delta employees. A new entrance and exit driveway will need to be constructed for access. The construction of the new ramp will require the demolition of an existing 35,000-square-foot industrial building. The 34th Avenue parking development has no enabling projects, though it is connected to the proposed RON aircraft parking area adjacent to Highway 494 in the long-term project list.

4.7.2.12 Project 2-12: TH 5 Interchange Reconstruction

A new intersection for TH 5 and Post Road is proposed to improve capacity and intersection LOS. Improvements to the intersection could include modifications to make Post Road / East 72nd Street the primary entrance to T2. Construction of the new interchange will require constructing a new bridge over TH 5, realigning Post Road and Northwest Drive, and reconfiguring the intersection. The geometry of the intersection included in the MSP 2040 LTP is based on the work completed as part of the 2010 EA. Further study and coordination with MnDOT are required for program timing and to validate the proposed interchange meets the needs of both MnDOT and MAC.

The interchange reconstruction also involves the construction of a commercial vehicle staging lot, just south of the former Super America site. There are no enabling projects at the Airport for the TH 5 interchange reconstruction. Enabling projects for the development would be developed by MnDOT.

4.7.3 Long-Term Preferred Development Alternative 3.1A

The long-term preferred development alternative features several key developmental alterations to the terminal area complex, as listed in **Table 4-12** and shown on **Exhibit 4-75**. The following subsections review the long-term projects in detail.

Table 4-12: Long-Term Projects

Project #	Project Description
3-1	New T2 North Expansion
3-2	Concourse G South Expansion
3-3	Reconstruct Concourse E
3-4	T2 Curb Frontage Improvements
3-5	T1–T2 Automated People Mover (APM) Tunnel Construction
3-6	Runway 4-22 Tunnel Reconfiguration and Deice Pad Construction
3-7	South Remain Overnight (RON) Apron Construction
3-8	Runway 12R End-Around Taxiway Construction

NOTES:
T1 – Terminal 1; T2 – Terminal 2; APM – Automated People Mover; RON – Remain Overnight
SOURCE: Ricondo & Associates, Inc., December 2022.

Exhibit 4-75: Long-Term Preferred Development Alternative 3.1A

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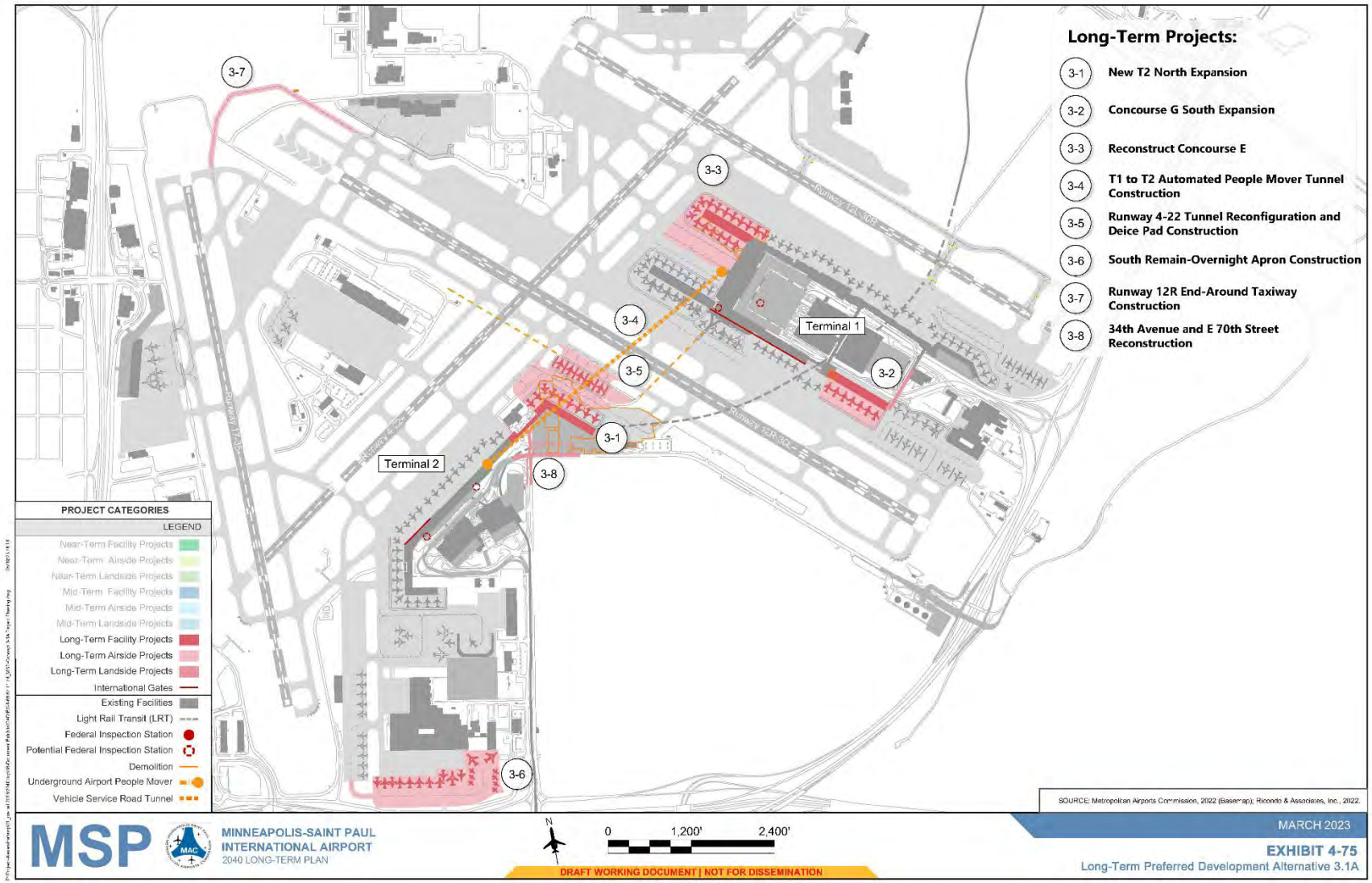

4.7.3.1 Project 3-1: New T2 North Expansion

The new T2 North expansion is a two-level single-loaded concourse consisting of nine ADG III contact gates. The phasing of the new concourse expansion occurs in the long-term due to the impact on the existing FBO facilities, which would need to be relocated prior to the north expansion of the concourse.

The new T2 North expansion requires the demolition of the existing FBO campus, which will be relocated in the mid-term phase, as discussed in Project 2-6. The configuration of the new concourse expansion extends northeast from the existing concourse, before extending southeast onto the existing FBO area. There is a passenger bridge connecting from the existing concourse to the future north expansion, spanning over the existing entry road to the ARFF facility. While the existing ARFF facility remains unimpacted by this project, a reconfiguration of the entry road will be necessary.

The future building is approximately 275,000 square feet. Level 2 contains holdrooms, public circulation, concessions, restrooms, and access to the contact gates. Level 1 contains Airport support, airline support, mechanical and storage. The adjacent future pavement will be used for aircraft parking, GSE circulation, and storage. The new North Concourse H apron will be served by a single ADG III taxilane, and it will have airfield access to Taxiway D and Taxiway W.

In conjunction with the new T2 North expansion, a new deice pad will be constructed north of the concourse expansion project. The deice pad and accompanying tunnel reconfiguration are discussed in detail for Project 3-6.

The enabling projects for the development of the new T2 North expansion include:

- Demolish the FBO campus.
- Realign the ARFF facility entry road (see **Section 4.7.3.10**).
- Realign 70th Street (see **Section 4.7.3.10**).

Exhibit 4-76 shows the new T2 North expansion project in detail.

4.7.3.2 Project 3-2: Concourse G South Expansion

The Concourse G expansion is a two-level single-loaded concourse consisting of seven ADG III contact gates. The phasing of the new concourse expansion occurs in the long-term to address the increasing demand of contact gates for aircraft operations. The concourse expansion project would require the demolition of four existing contact gates (G19, G20, G21, G22), which are clustered on the end of the existing Concourse G.

Exhibit 4-76: New T2 North Expansion

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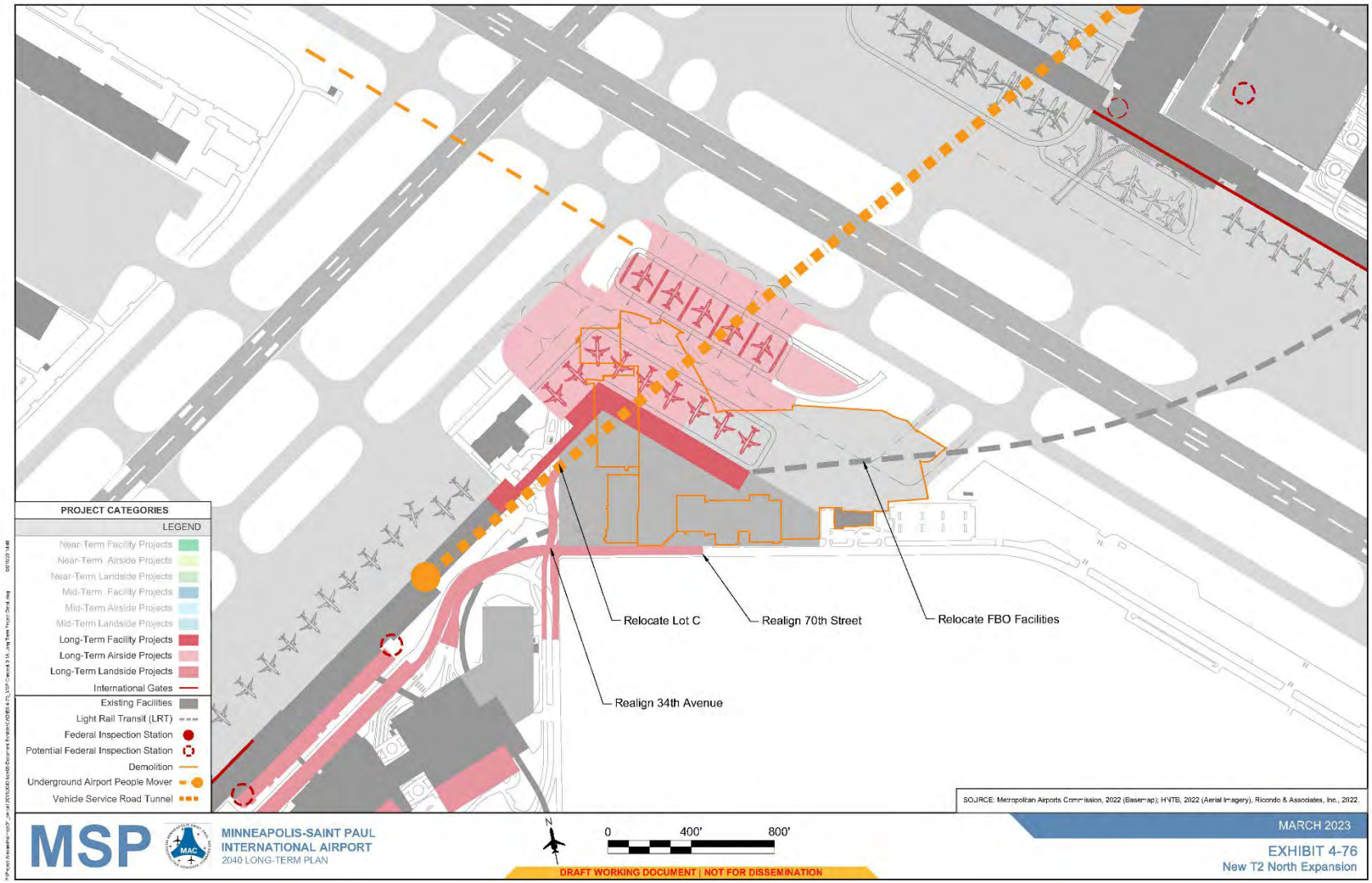

The configuration of the concourse expansion extends southeast from the existing Concourse G, ending with a new passenger bridge connection north to the existing InterContinental Hotel bridge. This new passenger bridge would tie into the existing passenger bridge that connects the hotel to Concourse A, creating a direct secure connection from Concourse G to Concourse A. The connector is approximately 30,000 square feet and extends over two existing roadways: Glumack Drive and Foshay Drive.

The future concourse building is approximately 210,000 square feet. Level 2 contains holdrooms, public circulation, concessions, restrooms, and access to the contact gates. Level 1 contains Airport support, airline support, mechanical and storage. The adjacent future pavement will be used for aircraft parking, GSE circulation, and storage. The Concourse G expansion will be adjacent to the future Runway 30L deice pad and RON apron, as discussed for Project 2-4. The following enabling project is required for the development of the Concourse G expansion: demolish the end of Concourse G. **Exhibit 4-77** shows the Concourse G expansion project in detail.

4.7.3.3 Project 3-3: Reconstruct Concourse E

The new Concourse E project is a two-level double-loaded concourse consisting of 15 ADG III contact gates. The new Concourse D project is a two-level single-loaded concourse consisting of 2 ADG III gates. There is a likelihood reconstructing Concourse E will result in absorption of existing Concourse D and will likely trigger the need to rename the concourses in T1.

The reconstructed Concourse E requires the demolition of the existing Concourses E and D facilities, which will be replaced with apron pavement infill. The configuration of the new concourse will align with the existing Concourse C flight line, creating a contiguous structure to improve aircraft gate alignment. This new concourse alignment creates additional airfield space between Concourse E and Concourse F, accommodating three ADG III taxilanes.

The future Concourse E building is approximately 185,000 square feet. Level 2 contains holdrooms, public circulation, concessions, restrooms, and access to the contact gates. Level 1 contains Airport support, airline support, mechanical and storage. The adjacent future pavement will be used for aircraft parking, GSE circulation, and storage. The future airfield between Concourse E and Concourse F allows for the improvement of aircraft maneuverability with three ADG III taxilanes, replacing the existing single ADG III taxilane currently serving this area. **Exhibit 4-78** shows the new Concourse E project in detail.

Exhibit 4-77: Concourse G South Expansion

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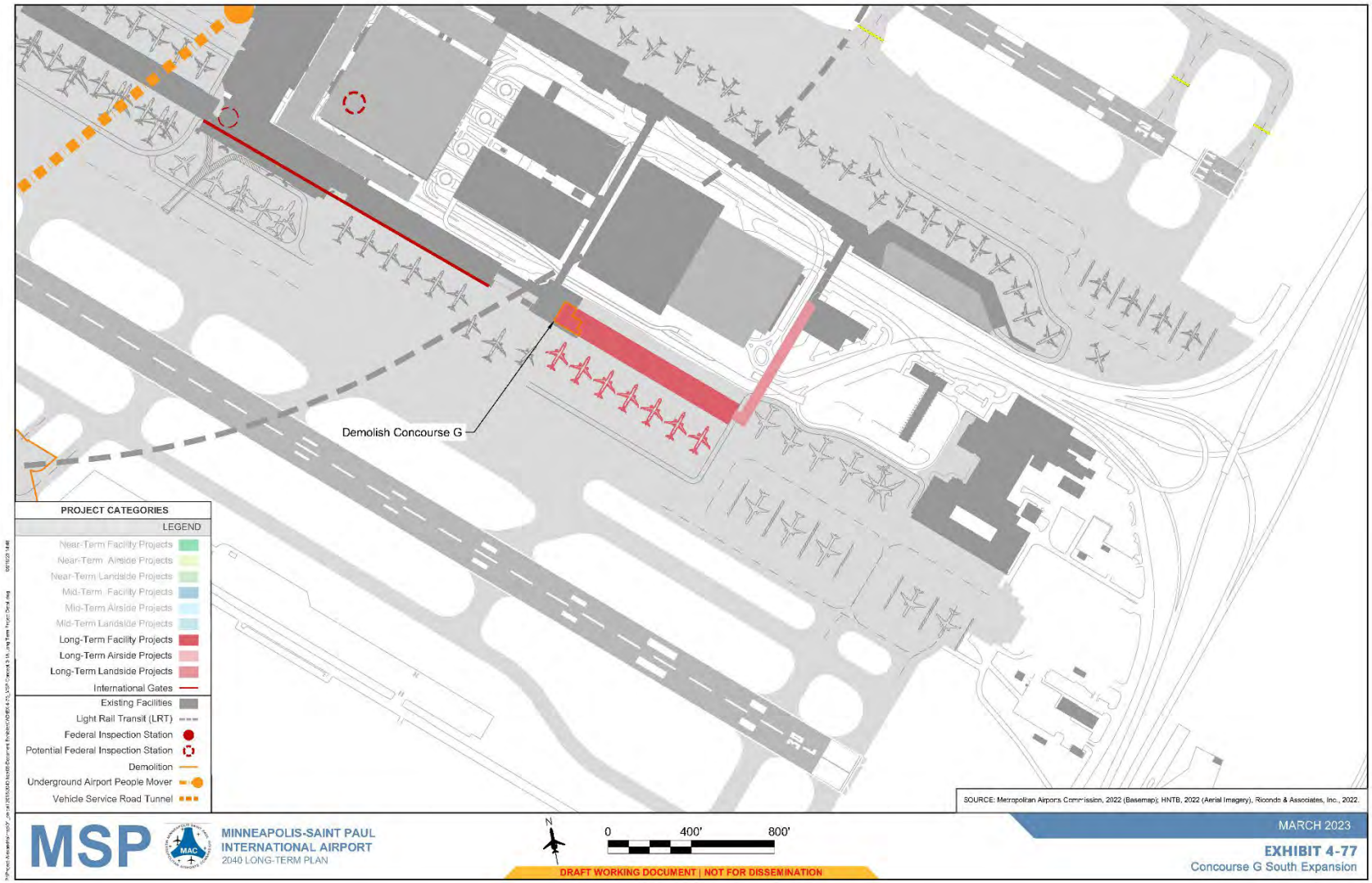

Exhibit 4-78: Reconstruct Concourse E

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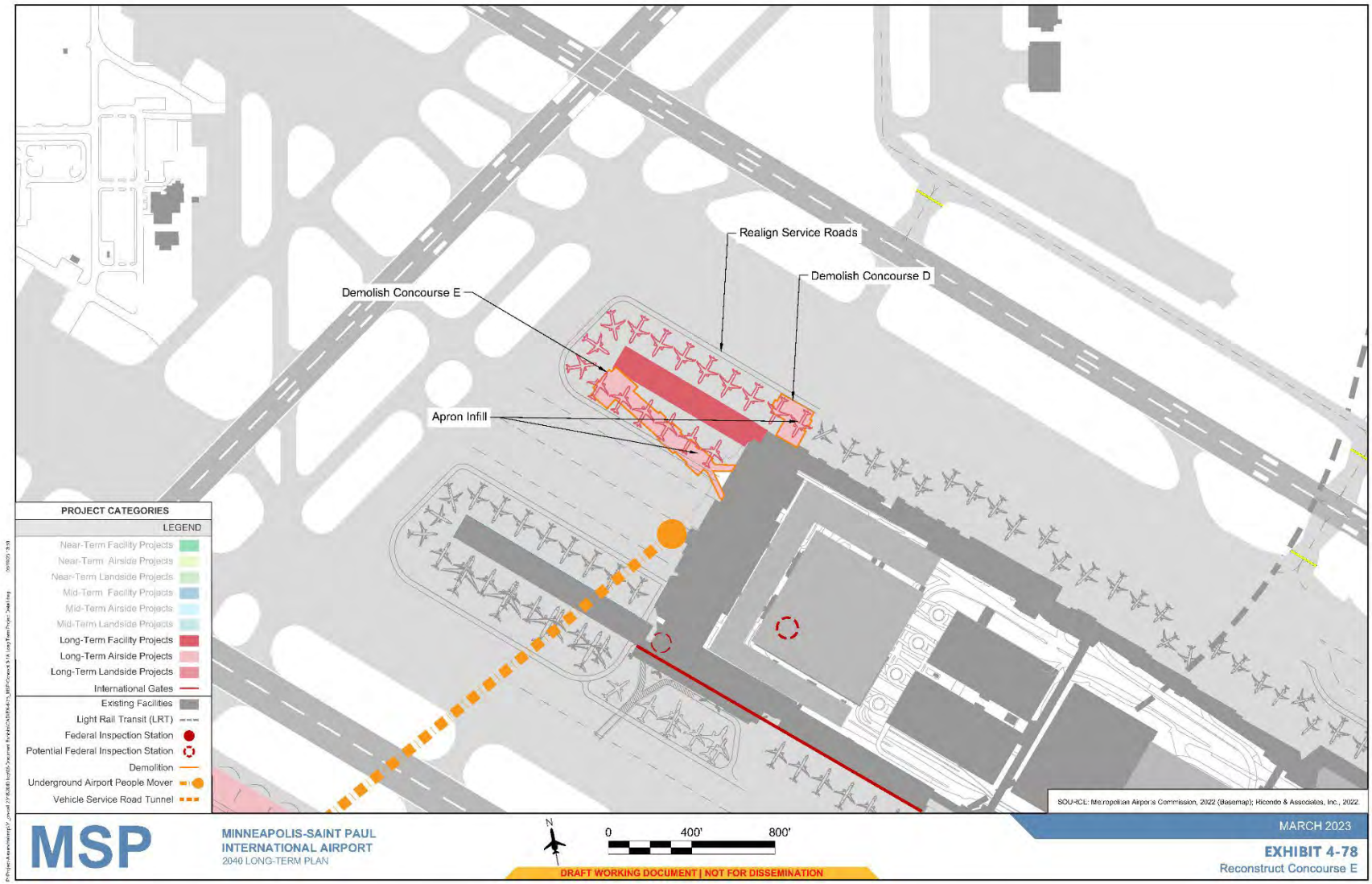

4.7.3.4 Project 3-4: T2 Curb Frontage Improvements

The project includes the need to make physical improvements to vehicle operations in front of T2, specifically addressing curb front congestion. Terminal 2 will reconfigure the second level of the existing terminal to accommodate a new two-level roadway along the curbfront of the building. The modifications include infill of some areas open to below on the second level to allow for curbside access from the second level of the roadway, reconstruction of the pedestrian tunnel to the Orange Ramp, and reconfiguration of the second level fascia to allow ingress/egress through that level. The reconfiguration will allow for optimal use of both the upper and lower curbsides for originating and destination passengers, alleviating the increased traffic on the existing single-level curbside. There are no enabling projects for the building modifications.

4.7.3.5 Project 3-5: T1 to T2 Automated People Mover (APM) Tunnel Construction

A new APM tunnel from the headhouse of T1 will connect to the new north concourse on T2. The tunnel is approximately 3,200 feet long and should accommodate two stops, one for each terminal. The stops should include passenger boarding areas, vertical circulation to the boarding level, and switchbacks for the trains. The tunnel will allow for airside connectivity for passengers between the two terminals and increases the flexibility of the terminal for interconnected operations. There are no enabling projects for the tunnel construction. Construction under Runway 12R – 30L would coincide with scheduled runway and apron rehabilitation projects.

4.7.3.6 Project 3-6: Runway 4-22 Tunnel Reconfiguration and Deice Pad Construction

The Runway 4-22 tunnel reconfiguration and deice pad project will increase the deicing capabilities of MSP by adding an additional five ADG III deice positions north of the T2 north expansion, adjacent to Taxiway W. The deice positions may also be utilized as RON parking in non-deicing conditions. The existing Runway 4-22 VSR tunnel will be extended approximately 820 feet, and the deice pad will be constructed over the extended tunnel. The Runway 4-22 VSR will connect to the Runway 12R-30L VSR. Dedicated GSE and deice equipment staging will be constructed adjacent to the deice pad. Approximately 436,000 square feet of apron will be constructed as part of this project. Enabling projects for the Runway 4-22 tunnel reconfiguration and deice pad construction project include the relocation of the VSR as part of the T2 north expansion, relocation of the FBO apron to the north side of the airfield, and relocation of an existing fueling facility at this location.

4.7.3.7 Project 3-7: South Remain-Overnight (RON) Apron Construction

The south RON apron construction project will increase the Airport's available RON parking. The exact number of additional RON spaces is dependent on the size of aircraft parked and the parking configuration (dependent or independent) on the RON apron. As shown for the preferred alternative, parking for up to 7 ADG II aircraft, 10 ADG III aircraft, and 3 ADG IV aircraft is provided. The RON apron will be approximately 1 million square feet. As an enabling project for the south RON apron construction project, relocation of the existing Delta employee parking lots to another surface lot or new parking structure is required.

4.7.3.8 Project 3-8: Runway 12R End-Around Taxiway Construction

The Runway 12R End-Around Taxiway (EAT) construction project will build a new taxiway around the approach end of Runway 12R, connecting Taxiway B to Taxiway K. The EAT will increase

airfield capacity and safety by eliminating the crossing of Runway 12R-30L by aircraft landing or departing on Runway 17-35. The EAT will be approximately 3,100 feet long and will require the construction of approximately 232,000 square feet of taxiway pavement. The EAT will be restricted to ADG IV aircraft with tail heights less than 45 feet (i.e., Boeing 757-200) so that tails do not penetrate the Runway 30L departure surface. Construction of the EAT also includes reconstruction and tunneling of the airfield perimeter road in two locations where it crosses the EAT. The EAT passes through the existing ALSF-2 of Runway 12R, which will be partially reconfigured as an enabling project for the EAT construction.