# Chapter 4 -

# Taxiway A Analysis

## INTRODUCTION

Charles M. Schulz–Sonoma County Airport (STS) is seeking to perform needed pavement rehabilitation on Taxiway A addressing signs of pavement deterioration. This working paper evaluates Taxiway A and its connector taxiway geometry, describing potential alternatives with emphasis on near-term engineering design. This paper will be integrated into the final Airport Layout Plan (ALP) Update Narrative Report and may be used in an engineering design justification report.

## TAXIWAY SYSTEM (BACKGROUND)

Taxiways enable aircraft to move between the various functional areas on an airfield. The taxiway system at STS has been assessed in terms of design standards and guidelines intended to enhance safety and pilot situational awareness; the efficiency of the system and its effects on airfield capacity; and taxiway design standards that apply to setbacks.

### Taxiway Design Standards

Similar to runways, the aircraft design group (ADG) determines separation distance required between taxiways and runways, other taxiways, taxilanes, and objects. Taxiway design also depends on the dimensions of aircraft undercarriage. The taxiway design group (TDG) is based on the landing gear configuration, and considers the gear type, width, length, and relation to the cockpit. The TDG determines the taxiways width, edge safety margin, shoulder width, and fillet dimensions.

Both runways at STS are designed for air carrier use. Therefore, all taxiways in the movement area at STS are also designed for air carrier use. As determined by existing and projected daily flight schedules, the forecast chapter shows regular use (over 500 annual operations) by the Embraer 175, Boeing 737-800, and the Airbus 320. Regional jets such as the Bombardier CRJ 700 and 900 models also use STS regularly. Occasionally,
Alaska Airlines (operated by Horizon Airlines) operates the Bombardier Q400 at STS. The largest aircraft, in terms of wingspan and approach speed, that regularly use STS are shown in **Table 4-1** below. The critical aircraft is the Boeing 737-800 (ADG III), and all taxiways in the movement area at STS are TDG 3.

**Table 4-1: Airplane and Taxiway Design Codes**

| Aircraft Model | Airplane Design Group (ADG) | Taxiway Design Group (TDG) |
|---|---|---|
| **Embraer 175** | III | 3 |
| **Boeing 737-800** | III | 3 |
| **Airbus 320** | III | 3 |
| **Bombardier CRJ 700** | II | 2 |
| **Bombardier CRJ 900** | III | 2 |
| **Bombardier Q400** | III | 5 |

Source: FAA Aircraft Characteristic Database, Version 2, October 2018

## Taxiway Width

Taxiway A's current width is 60 feet of pavement with 15-foot gravel shoulders, which exceeds the TDG 3 design standard of 50 feet of pavement with 20-foot shoulders. Alternatives below for Taxiway A consider both 50- and 60-foot-wide taxiway construction.

For many years the critical aircraft had been the Q-400, an aircraft that has unusually wide main gears for its size. The Q-400 is categorized as a TDG 5 aircraft, and the standard width for TDG 5 is 75 feet, which exceeds the current width of Taxiway A. Operations of the Q-400 are down at STS, but it remains in Alaska Airline's fleet. How the disruption caused by COVID-19 will affect Alaska Airline's service to STS when flights resume is uncertain. The potential remains for increased operations by the Q-400 at STS at any time. Retaining the current Taxiway A width, 60 feet, at least for the near term, gives STS the capability to accommodate the aircraft type that has served there the longest.

## Taxiway Fillets

Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13A (AC-13A), *Airport Design* provides guidance on taxiway fillets at intersections based on the TDG. Fillets are designed at curves and intersections for cockpit over centerline steering to enable rapid movement of traffic with minimal risk of aircraft excursions from the pavement surface. Some alternatives below incorporate TDG III standard fillets at taxiway connector intersections. In most cases, the fillets encroach on undisturbed land with potential wetlands and may in some cases, increase the amount of environmental review.

## Taxiway Shoulders

The required shoulder width for TDG 3 is 20 feet. AC-13A recommends paved shoulders for taxiways and taxilanes accommodating ADG-III aircraft. Soil and turf not suitable for pavement requires a stabilized or low-cost paved surface.

Existing shoulders on Taxiway A are generally 15 feet wide. However, the paved shoulder edge is not well defined the full length of Taxiway A, and in some areas the paved shoulder appears to be less than 10 feet from the edge of Taxiway A. In these areas, the remaining shoulder area may be stabilized with compacted gravel.

Some alternatives below propose standard shoulders on Taxiway A as part of rehabilitation. For the full length of Taxiway A, it may be possible to reduce the taxiway to the standard width of 50 feet, with 20-foot shoulders, while remaining in the existing taxiway/shoulder footprint. Some shoulder areas on Taxiway A may require more pavement or stabilization, and some shoulder areas (near Taxiway A5 intersection) are delineated as a wetland. Field investigation will be needed to resolve this wetland. Once an alternative is selected for Taxiway A rehabilitation, shoulder areas should be considered as part of that project.

## TAXIWAY DESIGN METHOD

While taxiway setbacks, widths, and fillet design are based on ADG and TDG, taxiway design geometry is based on practices to reduce incursions and increase visual awareness for pilots. FAA airfield design standards for taxiways are defined in AC-13A. AC-13A was updated in 2014 and revised and expanded upon taxiway geometry standards with the purpose of limiting runway incursions. Existing non-standard taxiway designs are illustrated and described below.

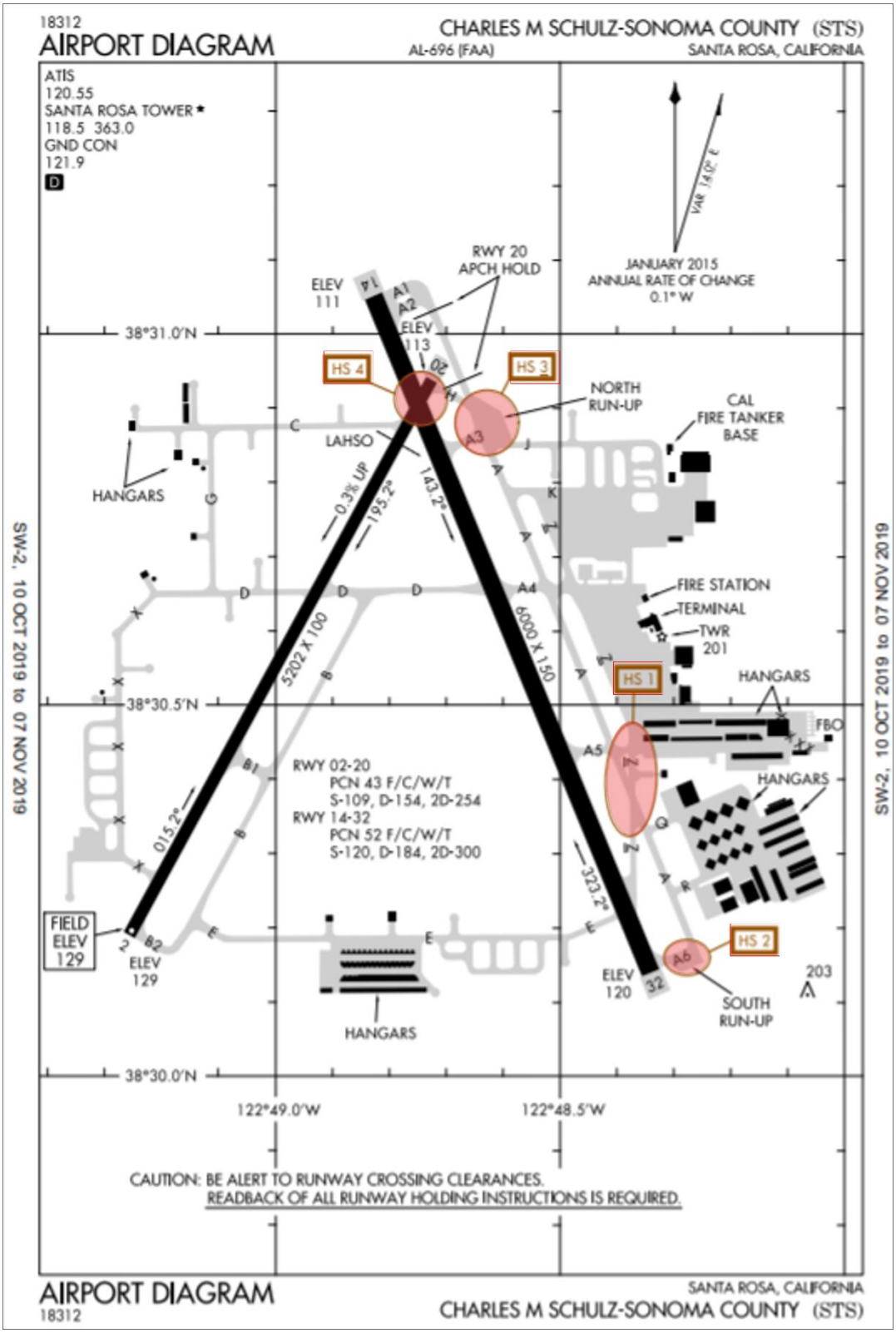
### FAA Designated Hot Spots

The FAA has designated four hot spots at STS, which are published in its Airports Facility Directory. A hot spot is a location in an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary. The following four hot spots (**Figure 4-1**) were identified:

- **Hot Spot 1:** Complex intersection in close proximity to Runway 14/32. Aircraft approaching Taxiway A from the Apron C, Apron D, or Taxiway Z sometimes fail to turn onto Taxiway A and instead enter Runway 14/32 without approval.
- **Hot Spot 2:** Run-up apron at Taxiway A6 is not visible from the air traffic control tower (ATCT). Conversations with the ATCT staff revealed that only the southeast corner of the run-up apron is blind to the ATCT.
- **Hot Spot 3:** Run-up area east of Taxiway A and Taxiway H intersection in close proximity of Runway 20 approach. The hold area causes pilot confusion.
- **Hot Spot 4:** Wrong runway departure risk. Pilots cleared for takeoff on Runway 20 sometimes turn onto and depart Runway 14. Failing to verify heading and alignment with proper runway prior to departure.

Hot spot 4 was previously addressed in the Runway 20 Runway Incursion Mitigation (RIM) analysis. Hot spots 1, 2, and 3 are addressed below in Taxiway A Alternative Evaluation.

**Figure 4-1: Airports Facility Directory Hot Spots**




Source: Airports Facility Directory, Oct 10 – November 7, 2019

## Non-Standard Design

Design guidelines in AC-13A recommend taxiway layouts that enhance safety by discouraging runway incursions. Taxiways at STS were found to not conform with the following design recommendations. These are highlighted on **Figure 4-2**.

**Taxiways A4, A5, C, and Z – Acute Angle Exit and Increasing Visibility**: Right-angle intersections between taxiways and runways provide the best visibility to the left and right for a pilot. At airports with large jet activity, acute angle, or high speed, runway exits enhance airport capacity and increase efficiency in runway use but should not be used as runway entrance or as crossing points. A right-angle turn at the end of a parallel taxiway is a clear indication of approaching a runway. When the design peak hour is less than 30 operations, a right-angled exit taxiway in the proper location will achieve an efficient flow of traffic.

**Taxiway A-A5-Z Intersection and Taxiway C-Runway 2/20 Intersection – Complex Intersection**: Taxiways should not coincide with the intersection of two runways. Taxiways configured with multiple taxiway and runway intersections in a single area create large expanses of pavement. These expanses make it difficult to provide proper signs, marking, and lighting. This is also identified as hot spot 1 in **Figure 4-1** above.

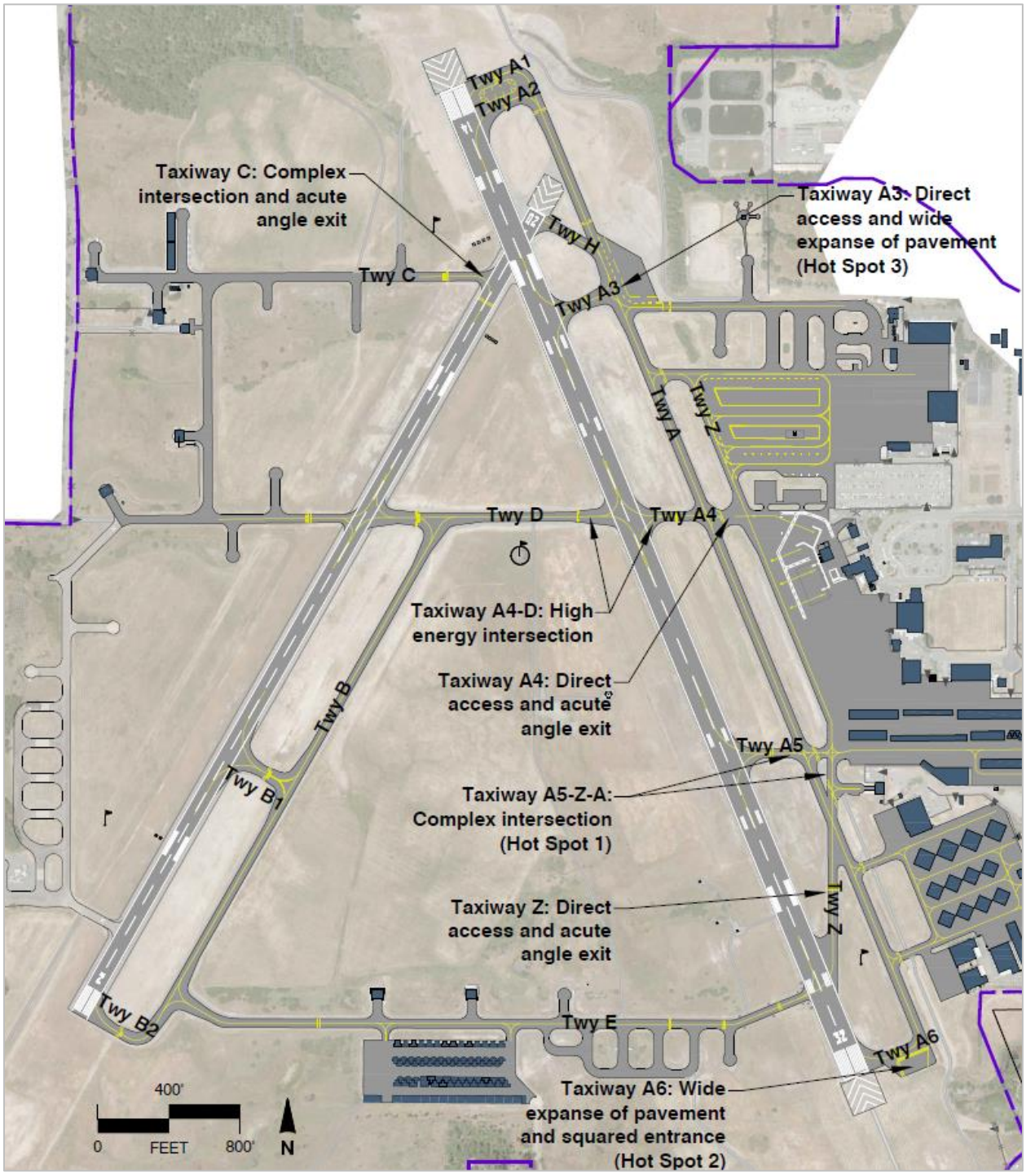
**Taxiway A6 – Squared Entrance Taxiway**: It is recommended that the outer edge of an entrance taxiway be curved. A squared corner may be confused for a runway end. Above, this is also identified as hot spot 2, because the line of sight from the ATCT is blocked to the southeast corner of the runup apron.

**Taxiways A3 and A6 – Wide Expanses of Pavement**: Taxiway to runway interface encompassing wide expanses of pavement is not recommended. Above, this is also identified as hot spot 3 (Taxiway A3).

**Taxiways A3, A4, and Z – Direct Access**: Taxiway design that leads directly from an apron to a runway without requiring a turn is discouraged.

**Taxiway A4-D intersection – High Energy Intersections**: Intersections in the middle third of the runways are discouraged. By limiting runway crossings to the outer thirds of the runway, the portion of the runway where a pilot can least maneuver to avoid a collision is kept clear.

**Figure 4-2: Non-Standard Taxiway Geometry**



# TAXIWAY A ALTERNATIVE EVALUATION

The goals for ultimate Taxiway A design as part of the Airport Layout Plan (ALP) Update are to correct the non-standard design issues presented above to also meet the taxiway design standards for the critical aircraft using STS. Concurrent with this ALP Update, STS is seeking to perform needed pavement rehabilitation on Taxiway A south of Taxiway A3. Taxiway A, north of Taxiway A3 is generally in good condition and any rehabilitation with this section is under consideration with changes associated with Runway 20 RIM analysis.

Rehabilitation of Taxiway A is a high priority for STS because it is the busiest taxiway, and the signs of deterioration observed will continue while STS awaits approvals and possible environmental processes. STS intended to start engineering design for the rehabilitation in 2015 as recommended in STS's Airport Pavement Management Program. To address these signs of deterioration, initial engineering indicates a combination of slurry seal, mill and overlay as well as sections of pavement removal and replacement. If rehabilitation is delayed by ALP approval and environmental review, the condition of Taxiway A may continue to degrade and create safety hazards or ultimately impact safe operations.

FAA guidance directs that a taxiway be designed and constructed to meet FAA design standards during any reconstruction. This includes meeting TDG requirements for width and fillets and meeting geometry standards to limit incursions.

Complicating the matter is the ALP of record does not show geometry corrections to Taxiway A. Ideally reconstruction of Taxiway A would be used as an opportunity to correct nonstandard designs associated with Taxiway A and its connector taxiways. However, the 2013 approved ALP was completed prior to new taxiway design standards released in changes to AC-13A. The 2013 ALP does not include design changes on Taxiway A needed to:

- Eliminate oblique-angle taxiways
- Provide fillets meeting current standards
- Relocate taxiways that directly connect aprons to the runway
- Provide standard taxiway widths

The ALP update currently underway will address all of these issues, but it is likely that the updated ALP will not receive FAA approval before late 2020. Awaiting approval would further delay the needed rehabilitation.

The alternatives presented in this section provide an ultimate taxiway design that meets standards and is proposed to be included on the ALP. This section also describes alternative design options for near-term solutions for Taxiway A rehabilitation. These different options are driven by environmental impacts and implementation. The proposed alternatives show various impacts to existing pavements, lighting, signage, and sensitive environmental areas at STS. Depending on impacts to areas currently unpaved, the proposed taxiway geometry design changes may require environmental analysis such as a National Environmental Policy Act (NEPA) environmental assessment (EA).

## Environmental Interests

Typically, a pavement rehabilitation project will qualify for a Categorical Exclusion (CATEX). If the taxiway rehabilitation project was limited to the existing footprint of Taxiway A, with a slurry seal and reconstruction of the failing section near Taxiway A4, it would likely qualify for a CATEX. However, realigning the connector taxiways will impact formally delineated wetlands in the infield areas between Taxiway A and Runway 14/32 as well as habitat for protected species. The formal wetland delineation approved by the U.S Army Corps of Engineers (USACE) is 10 years old. The field investigations upon which the delineations are based were completed as part of preparation of an EA for the Runway Safety Area. This will need to be updated prior to review of any project that might impact wetlands. Optimally this would be undertaken prior to beginning preparation of the EA. Wetlands shown in alternative designs are from a 2019 wetland mapping update.

Projects with impacts to wetlands require permits from the USACE. Nationwide permits are issued by USACE when impacts are under a specific threshold. These permits can be processed more quickly than Individual Permits. The Individual Permit process must be used when projects have more than minimal impacts.

Realignment of each connector taxiway, individually, would likely qualify for a Nationwide Permit. However, if all of the nonstandard conditions were constructed in one project, it appears that an Individual Permit would be required. Correcting the nonstandard conditions in several projects could be considered segmentation.

Essentially all of the unpaved portions of the Airport are considered habitat for the California tiger salamander, a designated endangered species. Additionally, the US Fish and Wildlife Service (USFWS) considers all wetlands on STS to be habitat for Burke's goldfields, a protected plant species. This judgement was accepted without challenge during the Runway 14 safety area project because of schedule requirements. Any impacts to a protected species would make modifications to the connector taxiways ineligible for a CATEX. An Environmental Assessment (EA) would need to be prepared.

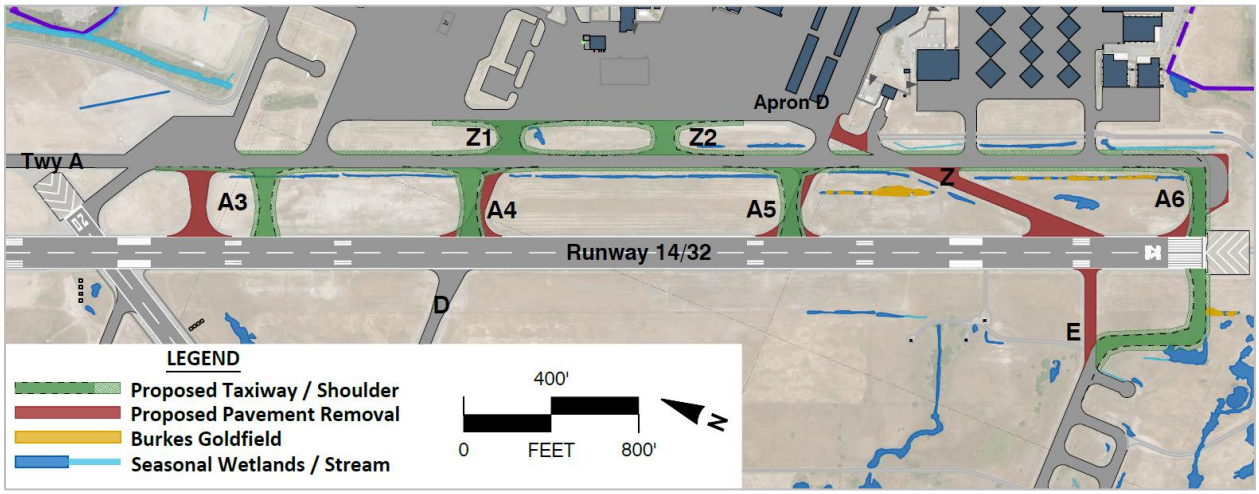
Preparation of an EA commonly requires at least 18 months and could not start until the updated ALP was approved. Therefore, scheduling the modification of the connector taxiways to be completed at the same time as the proposed slurry seal and isolated pavement removal and replacement would delay engineering design three to four years. This would mean that the needed repairs would not occur for four to five years.

Currently mitigation credits for impacts to Burke's goldfields cost $1.1 million per acre. The mitigation ratio is currently 3:1. This effectively triples the per acre cost. These mitigation costs, along with permitting costs, would need to be included in project budgets for the connector taxiways. Further, the California Department of Fish and Wildlife (CDFW) considers any impacts to wetlands in an area where Burke's goldfields have been found to be a "take" of the species. A 2081 permit is required for this take, and requires a $20,000 fee in addition to mitigation. Negotiations associated with the take permit commonly take about one year and may run concurrently to the EA, however this process is open to delays with CDFW.

## ALTERNATIVE 1: STANDARD DESIGN

Alternative 1 (**Figure 4-3**) shows taxiway design that conforms to AC-13A standards with: incorporates standard geometry design and fillets for TDG 3 taxiways, reconfigured connectors, reduces the width of Taxiway A to 50 feet and adds shoulders the length of Taxiway A. The figure includes the 2019 wetland mapping update and Burke's goldfield location data.

**Figure 4-3: Taxiway A Alternative 1**




The proposed design for individual segments described below includes the impacts that will likely determine the level of environmental analysis. After evaluation of the proposed designs, the individual taxiway segments may be selected individually for another hybrid design not shown below.

### Taxiway A3

The proposed design for Taxiway A3 is to relocate it approximately 300 feet to the south to disconnect from the hold apron area. A new Taxiway A3 is proposed to be constructed with TDG 3 fillets and 20-foot shoulders. Taxiway A3 would present wetland impacts, but no direct impacts to known locations of Burke's goldfields. The project would be subject to preparation of an EA and would require a permit from USACE.

### Taxiway A4

The proposed design reconfigures Taxiway A4 to form a 90-degree angle to Runway 14/32 and Taxiway A, with TDG 3 fillets and 20-foot shoulders. The proposed Taxiway A4 incorporates the existing taxiway footprint as much as possible, with the purpose of limiting new pavement on the infield area. Taxiway A4 remains connected to Runway 14/32 at a location that provides access from Taxiway D across Runway 14/32 to Taxiway A. Reconfiguring Taxiway A4 to a right angle also disconnects this from the connector between A and Z, with two full 90-degree turns. This construction would have a small impact to wetlands, which means it would require an EA and a permit from USACE.

## Taxiway A5

The proposed design for Taxiway A5 reconfigures it to a 90-degree angle to Runway 14/32 and Taxiway A, with TDG 3 fillets and 20-foot shoulders. The proposed Taxiway A5 incorporates the existing taxiway footprint as much as possible, with the purpose of limiting new pavement on unpaved areas. This construction would have a small impact to wetlands. It may be possible to slide the realigned Taxiway A5 slightly to the north to avoid impacts to the infield area known to have Burke's goldfields. However, USFS's presumption of impacts to Burke's goldfields habitat means that an EA would be required, as well as a permit from USACE.

## North Apron Connector Taxiway

The proposed design for the Taxiway A4 connector between A and Z reconfigures the connector to a 90-degree angle to Taxiway A, and expands the connector with TDG 3 fillets and 20-foot shoulders. Since this design disconnects the connector from Taxiway A4, the connector is proposed to be named Taxiway Z1. A section of the fillet for Taxiway Z1 appears to clip a section of wetland. Therefore, an EA would be required as well as a permit from USACE.

## South Apron Connector Taxiway

A second connector between Taxiways A and Z is proposed south of Taxiway Z1, with the purpose of replacing access lost by removal of the Taxiway Z connector stub to the south. This second taxiway connector is designed to TDG 3 standards and is proposed to be named Z2. Taxiway Z2 by design appears that it may be constructed without impacting wetlands or known Burke's goldfields sites. However, because the unpaved areas are considered habitat for the California tiger salamander, and EA would be required.

## Taxiway Z

Taxiway Z is proposed to be removed between Taxiway A and Runway 14/32, with the intention of eliminating hot spot 1. The proposed design reconfigures taxiway access to the Sheriff's facility to eliminate the connection between Taxiway A and Apron D. Removal of pavement may not be immediately necessary, as markings could signify closure. Closure of Taxiway Z between Taxiway A and Runway 14/32 is dependent on the reconfiguration of Taxiway E, as described below. This taxiway closure and removal could be done without impacting wetlands or known locations of Burke's goldfields. However, because the unpaved areas are considered habitat for the California tiger salamander would be affected by pavement removal, an EA would be required.

## Taxiway A6

The proposed design for Taxiway A6 redesigns it with TDG 3 fillets and 20-foot shoulders. The run-up apron is reconfigured to correct the square corner on the run-up apron. The square corner may be marked as unusable with green paint rather than removing pavement. With the introduction of TDG 3 fillets and 20-foot shoulders, this project would impact wetlands and might impact known Burke's goldfields locations, which would trigger the State 2081 permit process. The project would impact habitat of the California tiger salamander. Preparation of an EA would be required as well as a permit from USACE.

## Taxiway E

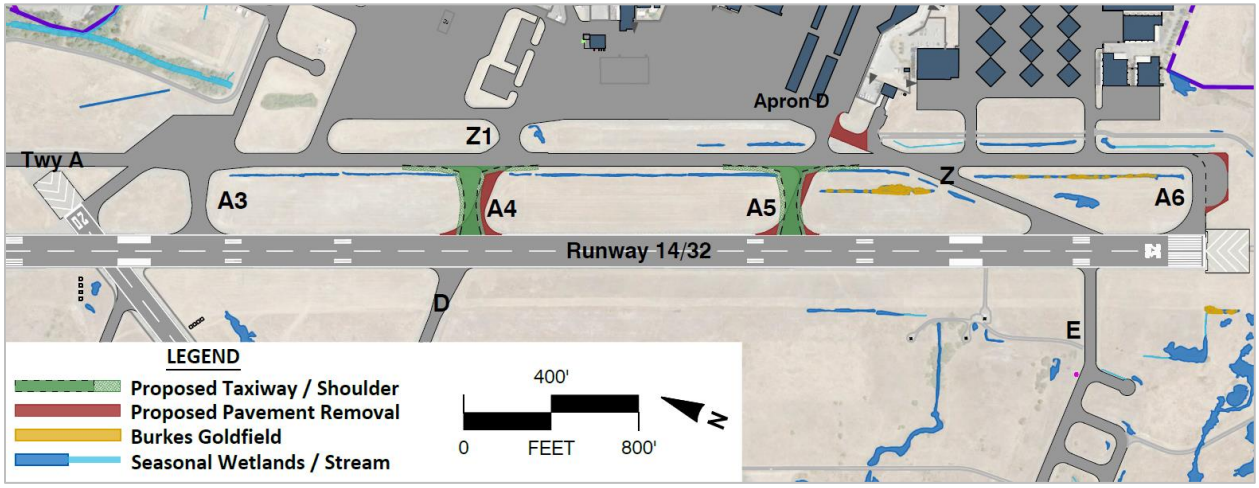
The proposed design for Taxiway E reconfigures it to connect at the threshold of Runway 32, with TDG 3 fillets and 20-foot shoulders. The project would impact habitat of the California tiger salamander and Burke's goldfields. This project would appear to have the most severe complications and likely trigger the State 2081 permit process. It is likely to have the highest mitigation costs of all individual taxiway segments associated with Taxiway A. Preparation of an EA would be required as well as a permit from USACE.

Alternative 1 would require a NEPA EA. It would require a supplement to the California Environmental Quality Act (CEQA) Environmental Impact Report (EIR). Permits would be required from the USACE, USFWS, and CDFW. Completion of the EA/EIR process would take at least 18 months, and the FAA must approve the EA prior to a grant for engineering design being issued. Once the EA is approved, permitting would take another 6 months to a year. Permits are not needed to start design, but must be in hand prior to construction. Alternative 1 has a significant potential to be delayed due to prolonged negotiations related to the take permit process with CDFW of Burke's goldfields areas.

# ALTERNATIVE 2A: HYBRID DESIGN

Alternative 2A (**Figure 4-4**) is a hybrid design that implements several elements of Alternative 1 while limiting environmental impacts with the goal of expediting design and rehabilitation of Taxiway A. This alternative proposes that Taxiway A be maintained at 60 feet wide, and that Taxiway A4 and A5 be converted to 90-degree connectors with 50-foot widths, TDG 3 fillets, and 20-foot shoulders. Modifications to eliminate hot spots would be made: eliminating the Taxiway Z connection between Taxiway A and Apron D, and correcting the square corner on Taxiway A6. These pavement areas may be marked as unusable with an "X" and green paint as opposed to removing pavement.

**Figure 4-4: Taxiway A Alternative 2A**



The hybrid design of Alternative 2A proposes modifications to hot spots and design on Taxiways A4 and A5 for the purpose of:

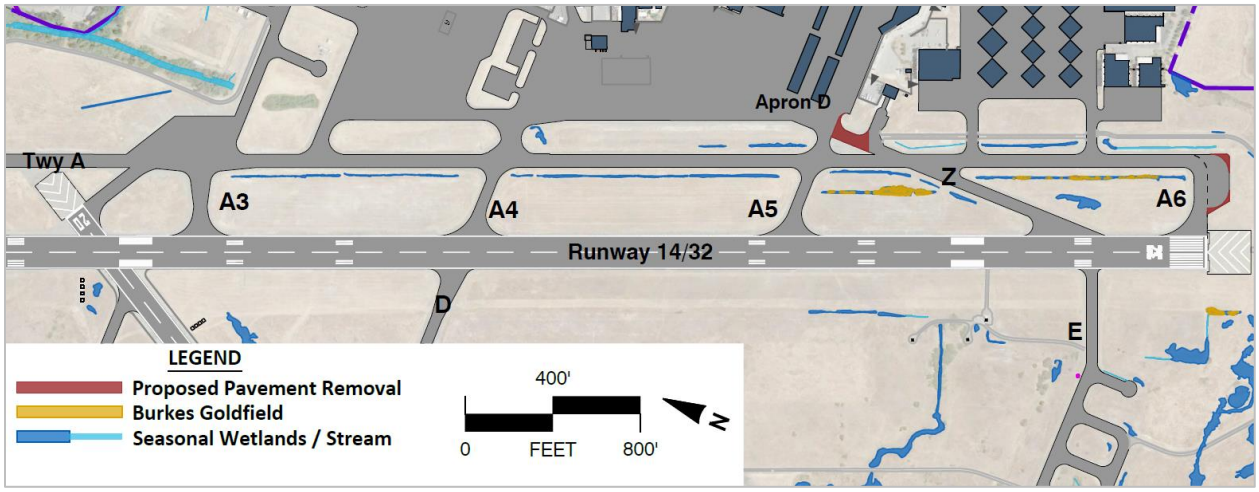
- Initiating the process of standardizing the Taxiway A system by converting Taxiways A4 and A5 to TDG 3 standards with right-angle intersections.

Alternative 2A would require a NEPA EA. It would also require a supplement to the CEQA EIR. Permits would be required from USACE, USFWS, and CDFW. Completion of the EA/EIR process would take at least 18 months, and the FAA must approve the EA prior to a grant for engineering design being issued. Permitting would take another 6 months to a year. Permits are not needed to start design, but most be in hand prior to construction.

## ALTERNATIVE 2B: COMPROMISED DESIGN

Alternative 2B (**Figure 4-5**) implements several components from Alternative 1, but fewer than Alternative 2A. Alternative 2B proposes that a 60-foot width is maintained on Taxiway A. The components include the hot spot corrections that do not require new pavement, thus not likely triggering environmental review beyond a CATEX: eliminating Taxiway Z between Taxiway A and Apron D, and eliminating a portion of the run-up apron on Taxiway A6 to correct the square corner. These pavement areas may be marked as unusable with "X" and green paint rather than removing pavement.

**Figure 4-5: Taxiway A Alternative 2B**




The compromise design of Alternative 2B proposes modifications to hot spots for the purpose of:

- Limiting environmental impacts, with Alternative 2B likely requiring a CATEX, which facilitates near-term design and rehabilitation of Taxiway A with the intention of reducing the cost for Taxiway A rehabilitation.

Alternative 2B would need an ALP update to show the areas to be removed, however this may be accomplished with a pen-and-ink approval to expedite the project.

## ALTERNATIVE 3A: IN-PLACE DESIGN AND MAINTAIN WIDTH

Alternative 3A proposes an in-place rehabilitation for Taxiway A with no new or permanently removed pavement on Taxiway A or the connectors. Alternative 3A would maintain the 60-foot width of Taxiway A and not introduce taxiway fillets at intersections, or a full-length shoulder. Alternative 3A would likely require a CATEX. This would be the least complicated alternative from the standpoint of environmental impact and design and would expedite the construction schedule. With this action, the Standard Design (Alternative 1) will still be added to the ALP for the next Taxiway A or Runway 14-32 pavement reconstruction project. Alternative 3A could begin prior to the ALP Update being approved.

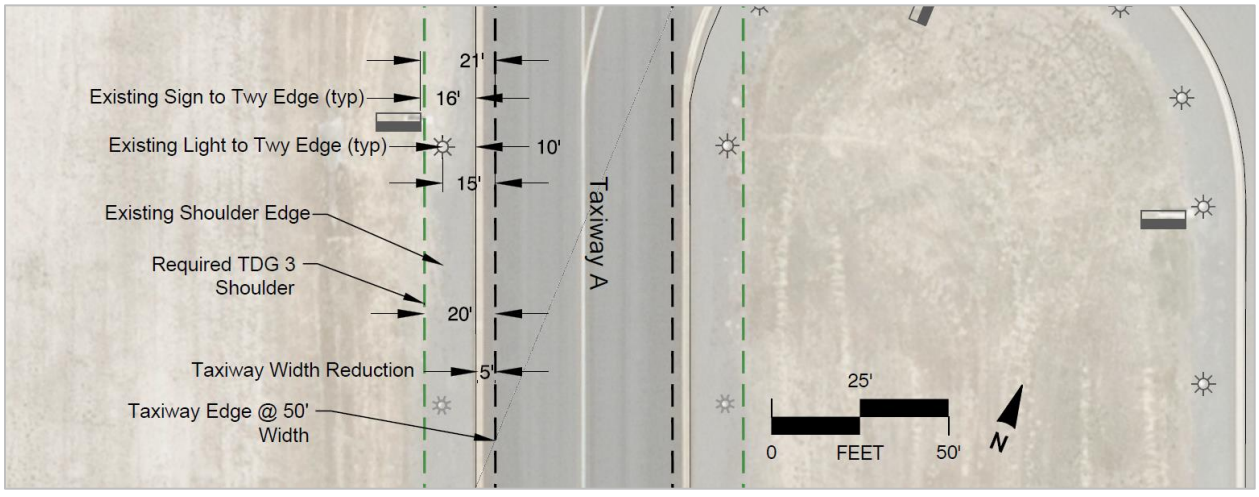
## ALTERNATIVE 3B: IN-PLACE DESIGN AND REDUCTION TO 50-FEET

Alternative 3B proposes reducing the width of Taxiway A to 50 feet with no other geometry changes, to meet TDG 3 standards. Reduction to 50 feet wide requires changes to the location of the lights and signs relative to the taxiway edge. **Figure 4-6** details a section of Taxiway A with existing light and sign locations. Taxiway edge lights are currently located 10 feet from the edge of Taxiway A.

FAA standards permit edge lights to be located between 2 and 10 feet from the edge of a taxiway, and narrowing Taxiway A to 50 feet would render the existing lighting non-standard due to their distance from the edge. Instead the edge lights would need to be relocated at least 5 feet closer to the new taxiway edge along the entire length of Taxiway A.

Signs along Taxiway A would also need to be realigned closer to the edge of the taxiway if it is narrowed. The standard for taxiway guidance signs is for the distance of the taxiway edge to the near side of the sign to be between 10 and 20 feet.

**Figure 4-6: Taxiway A Alternative 3B**

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The existing shoulders of Taxiway A are stabilized with rolled base material. It appears possible to reduce the taxiway width, shift the edge lights provide a standard should without impacting wetlands or California tiger salamander or Burke's goldfield habitat. However, it appears that some of existing sign footings extend beyond the edge of the stabilized shoulder. Relocating these signs and removing the footings may result in impacts to California tiger salamander habitat. Therefore, it is expected that an EA would be required for this alternative.

Individual taxiway connector segments are shown below in **Table 4-3** and **Table 4-4** with a thumbnail figure and data on new pavement, removed pavement, signs and lights to be displaced, and likely NEPA document for that individual taxiway.

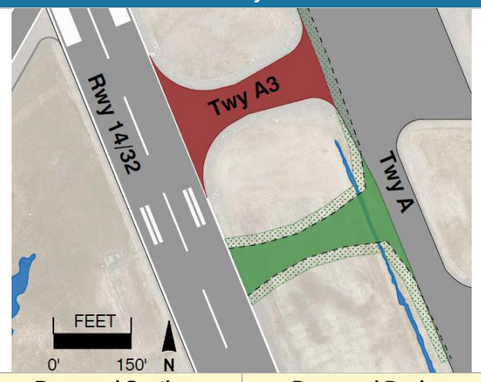
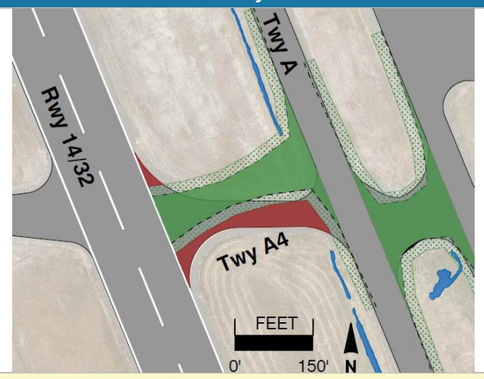
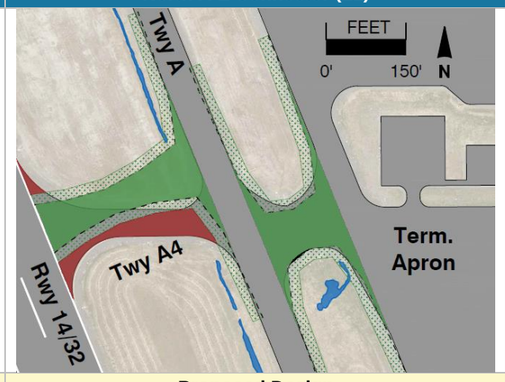
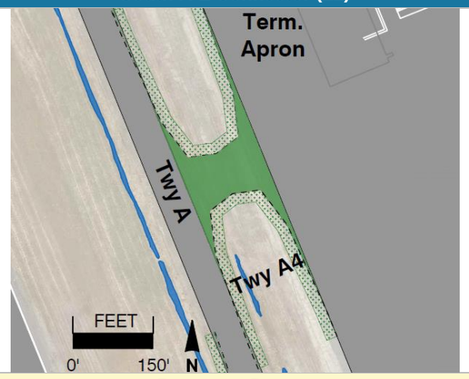
**Table 4-2: Taxiway A Alternatives Matrix**

| Alternative Number | Alt 1 | Alt 2A | Alt 2B | Alt 3A | Alt 3B |
|---|---|---|---|---|---|
| **Alternative Name** | **Standard Design** | **Hybrid Design** | **Compromised Design** | **In-Place Design & Maintain Width** | **In-Place Design & Reduce to 50-feet** |
| **Alternative Features** | • Complies with 13A<br>• 50-foot taxiways<br>• Hot Spot Correction:<br>– *Twy A3 relocation*<br>– *Eliminate Z (full)*<br>– *Round corner on A6*<br>• TDG compliance on A3, A4, A5 and A6 (width and fillets)<br>• Connector taxiway corrections | • 60-foot Taxiway A<br>• 50-foot connectors<br>• TDG compliance on A4 and A5 (width and fillets)<br>• Hot Spot Correction<br>– *Eliminate Z (east of A)*<br>– *Round corner on A6*<br>• No Change to A3 design or location | • 60-foot Taxiway A<br>• 50-foot connectors<br>• Hot Spot Correction<br>– *Eliminate Z (east of A)*<br>– *Round corner on A6*<br>• Maximize existing pavement<br>• Minimize environmental impacts | • In place rehab<br>• 60-foot Taxiway A<br>• No new or permanently removed pavement | • Reduce Twy A to 50 feet full length<br>• Lights and signs to be realigned to new edge<br>• Option: Include 20-foot standard shoulder |
| **Full AC-13A Compliance** | Full | Partial | Partial | No | No |
| **Hot Spot Correction** | Full | Partial | Partial | No | No |
| **New Pavement (SF)** | 126,600 | 28,750 | None | None | None |
| **Perm. Removed Pavement (SF)** | 133,330 | 28,330 | 13,100 | None | None |
| **New Shoulder (SF)** | 143,000[1] | 25,820 | None | None | 10,000[1] |
| **Lights Displaced (No.)** | 125 | 46 | None | None | 92 |
| **Signs Displaced (No.)** | 26 | 8 | None | None | 14 |
| **NEPA Document[2]** | EA | EA | CATEX | CATEX | EA |
| **Planning to Design Timeline** | 3-4 Years | 3-4 Years | 2 Years[3] | 6 Months | 3-4 Years |
| **Limits of Disturbance** | Edge of 20-foot shoulders | Edge of 20-foot shoulders | Edge of 20-foot shoulders | Existing edge of Taxiway A | Edge of 20-foot shoulders[1] |

1. Does not include stabilization or pavement outside of existing Taxiway A shoulder edge where needed.
2. NEPA document based on assumption that any impact to a wetland is also an impact to habitat for Burke's goldfields, and all unpaved portions of the Airport are considered habitat for the California tiger salamander.
3. Potential for Alt 2B to be implemented with pen-and-ink ALP update which may shorten the timeline.

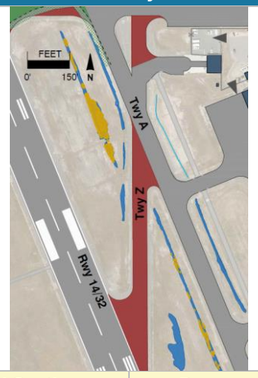
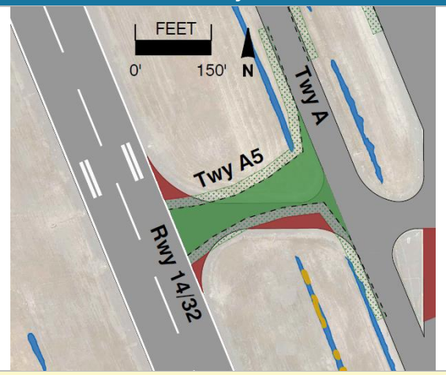
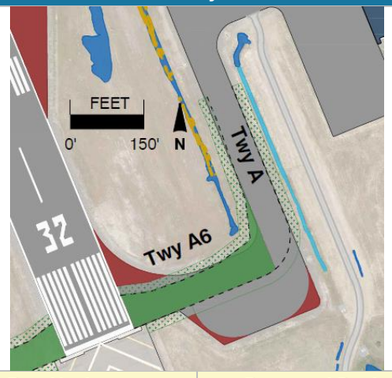
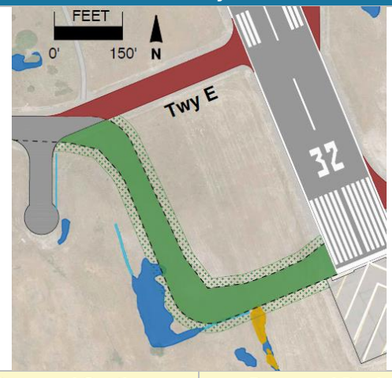
Notes: Add Standard Design (Alternative 1) to ALP for next Taxiway A rehabilitation.
Pavement square footages (SF), lights, and sign totals are approximate.

**Table 4-3: Individual Taxiway Connector Segments (A3, A4, Z1, Z2)**

| Taxiway Connector | Taxiway A3 | | Taxiway A4 | North A-Z Connector (Z1) | South A-Z Connector (Z2) |
|---|---|---|---|---|---|
| Detail |  | |  |  |  |
| | **Removed Section** | **Proposed Design** | **Proposed Design** | **Proposed Design** | **Proposed Design** |
| **New Pavement (SF)** | None | 24,800 | 1,700 | 21,800 | 16,600 |
| **Removed Pavement (SF)** | 29,000 | None | None | None | 10,050 |
| **New Shoulder (SF)** | None | 18,000 | 24,800 | 26,850 | 13,600 |
| **Lights Displaced (No.)** | 19 | 10 | 10 | 4 | 23 |
| **Signs Displaced (No.)** | 6 | None | 1 | None | 3 |
| **NEPA Document**[1] | EA | EA | EA | EA | EA |

Pavement square footages (SF), lights, and sign totals are approximate.
1 NEPA document based on assumption that any impact to a wetland is also an impact to habitat for Burke's goldfields, and all unpaved portions of the Airport are considered habitat for the California tiger salamander.

**Table 4-4: Individual Taxiway Connector Segments (Z, A5, A6, E)**

| Taxiway Connector | Taxiway Z | | Taxiway A5 | Taxiway A6 | | Taxiway E | |
|---|---|---|---|---|---|---|---|
| Detail |  | |  |  | |  | |
| | **Removed Section** | **Proposed Design** | **Proposed Design** | **Run-Up Apron** | **Proposed Design** | **Removed Section** | **Proposed Design** |
| **New Pavement (SF)** | None | 10,600 | 12,150 | None | 1,600 | None | 47,950 |
| **Removed Pavement (SF)** | 52,450 | None | 5,180 | 2,500 | 3,800 | 19,750 | None |
| **New Shoulder (SF)** | None | None | 12,220 | None | 16,300 | None | 30,700 |
| **Lights Displaced (No.)** | 3 | None | 23 | None | 22 | 10 | 1 |
| **Signs Displaced (No.)** | 4 | None | 5 | None | 5 | 2 | None |
| **NEPA Document**[1] | EA | EA | EA | CATEX | EA | EA | EA |

Pavement square footages (SF), lights, and sign totals are approximate.
1 NEPA document based on assumption that any impact to a wetland is also an impact to habitat for Burke's goldfields, and all unpaved portions of the Airport are considered habitat for the California tiger salamander.