Technical note

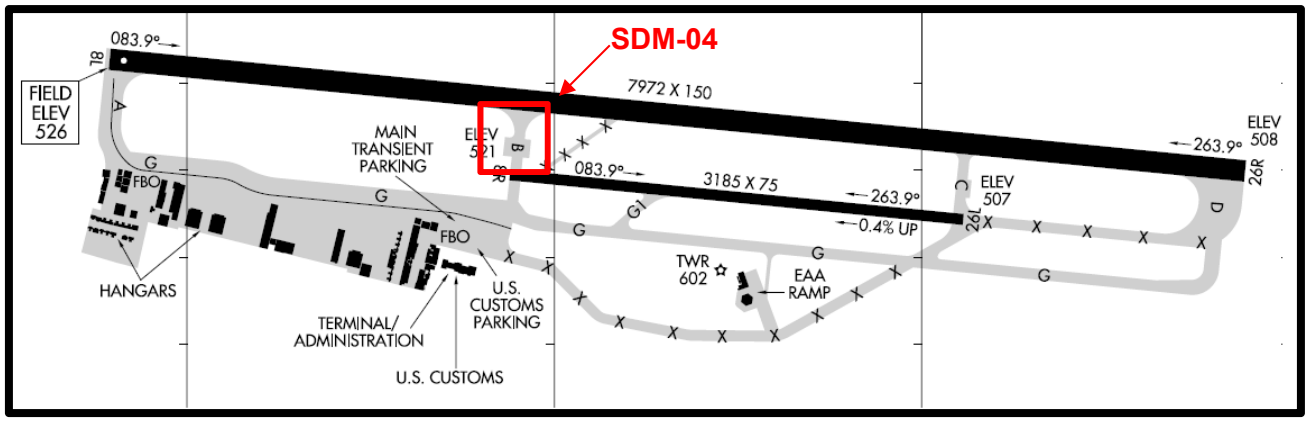
Project:	SDM ALP Update	**To:**	City of San Diego
Subject:	RIM SDM-04	**From:**	Anna Marron, Atkins
Date:	Oct 19, 2018	**CC:**	C&S Companies

RIM SDM-04

In 2015 the Federal Aviation Administration (FAA) completed a study of runway incursions and their geographic locations, the Runway Incursion Mitigation (RIM) program was created to identify and study the nature of locations at airports where risk factors might contribute to a runway incursion, and develop strategies for airports to mitigate risks at these locations. Short taxiway stubs between runways, like that located on Taxiway B between Runways 8L-26R and 8R-26L at SDM, have been identified as problematic geometry and likely to create increased risk of runway incursions. The RIM program, updated in 2017, identified that short taxiway stubs between two runways resulted in 4.4% of deviations recorded between 2007-2016.

Between 2012 and 2017, 4 recorded deviation events occurred on Taxiway B between Runways 8L- 26R and 8R-26L at SDM. Due to the occurrence of multiple runway incursion deviation events at this location, it has been added to the RIM program location inventory as of September 10, 2018, and identified as location SDM-04. Recognition of this location within the RIM program is intended to encourage cooperation with the airport sponsor and the FAA to establish effective mitigation strategies to reduce runway incursion risks. RIM location SDM-04 is depicted in **Figure 1**.

Figure 1. SDM Layout & Location of SDM-04



Source: SDM Airport Diagram, FAA, October 11, 2018; RIM Program Preliminary Inventory or Airport Locations, September 11, 2018

This existing condition of SDM-04 is depicted in greater detail in **Figure 2.** The designation of this area as a RIM location is likely driven by the centerline separation of 516 feet between the parallel runways at SDM, resulting in a short taxiway distance between the runways, as well as existing non-standard bypass/run-up areas located on the east and west sides of this portion of Taxiway B. This RIM location is currently equipped with enhanced taxiway centerline markings between the hold bars, as well as elevated runway guard lighting. The following sections of this note outline various industry standard RIM mitigation strategies to reduce runway incursion incidents at SDM-04.

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Figure 2. SDM-04 Existing Conditions

Source: Google Earth Imagery, 2017

Geometry Improvement Strategy - Removal of Taxiway B Pavement

Geometry improvements are highly effective for reducing runway incursion risk. The removal of Taxiway B and all associated pavement between the Runway 8R threshold and Runway 8L-26R is depicted in **Figure 3**. The removal of portions of Taxiway B at SDM-04 would eliminate the ability of aircraft to cross runway environments at this location, mitigating the risk of runway incursions at SDM-04.

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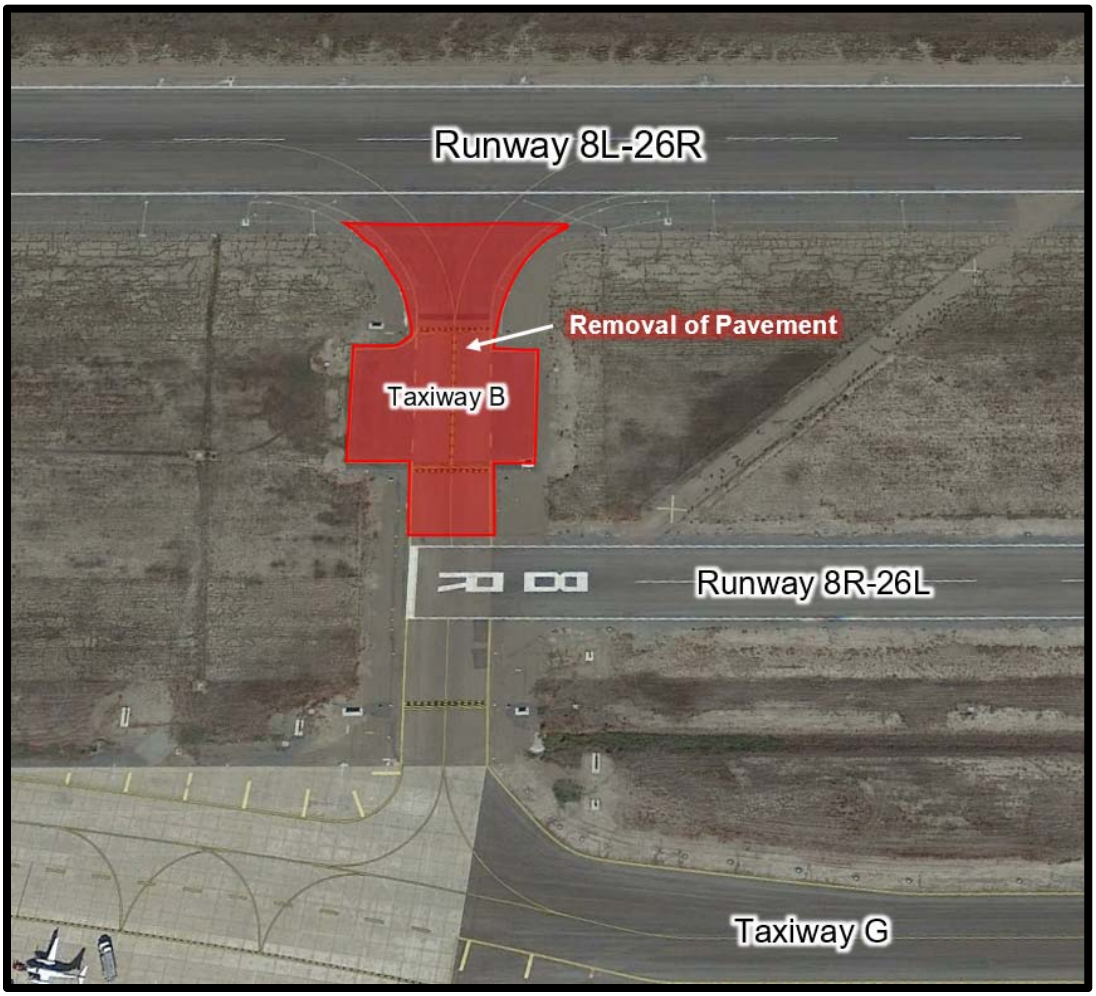
Figure 3. Geometric Strategy – Taxiway Removal



Source: Google Earth Imagery, 2017

Taxiway B Removal Strategy - Impacts to Capacity

While a taxiway pavement removal strategy would mitigate runway incursion risk in this location, it is important to note that this measure is likely to generate increases in Runway Occupancy Time (ROT), and reductions in Annual Service Volume (ASV).

ROT is an expression of the time an aircraft occupies an individual runway environment for any given operation. ROT is heavily affected by the number of entrance and exit taxiways available to operating aircraft. Therefore, relocation, addition, or removal of any entrance or exit taxiway should consider ROT to minimize negative impacts to airfield capacity. In addition to ROT, taxiway entrance and exit locations are also important factors in determining the overall capacity of an airport's runway system.

The impact of the removal of portions of Taxiway B can be evaluated using metrics provided in AC 150/5300-13A, Airport Design. This AC states that "In general, each 100-foot (30 m) reduction of the distance from the threshold to the exit taxiway reduces the runway occupancy time by approximately 0.75 second for each aircraft using the exit". By removing access to Taxiway B as an exit for aircraft

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utilizing Runway 8L, aircraft will be required to travel an additional 3,085 feet on Runway 8L before reaching Taxiway C to exit the runway environment. This equates to an additional 23 seconds of ROT per operation for aircraft which would have selected Taxiway B to exit Runway 8L-26R.

AC 150/5060-5, Airport Capacity and Delay, identifies the process for determining airfield capacity, expressed as ASV. ASV is defined as a reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, weather conditions, etc., that would be encountered over a year's time. ASV calculations were completed for the existing conditions at SDM as part of the recent Airport Master Plan Update. Number and location of runway exits, expressed as Runway Exit Factor, are factored into the ASV calculations to account for ROT impacts to overall airfield capacity.

The removal of Taxiway B as an exit for operations on Runway 8L-26R would have significant impacts to the ASV at SDM. Removing the ability for aircraft to use Taxiway B when operating on Runway 8L-26R would effectively reduce the taxiway exit factor for Runway 8L to zero which would significantly impact airfield capacity, reducing the ASV by 22,411. Removing portions of Taxiway B would significantly increase runway occupancy time and cause a substantial decrease to the Airport's existing capacity. It is recommended that this mitigation strategy not be pursued for improvements to SDM-04.

Geometric Standardization – Run-up / Bypass Pavement Removal

The nonstandard run-up/bypass areas present on Taxiway B between Runway 8L-26R and 8R-26L present a nonstandard taxiway configuration which may impact pilot perception of the taxiway to runway interface present at this location. This geometric standardization strategy proposes the removal of the excess pavement present for run-up and bypass at the SDM-04 RIM location to present pilots with a more typical taxiway to runway interface. **Figure 4** identifies the nonstandard bypass pavement proposed to be removed in this strategy.

Signage Marking and Lighting

The FAA also considers RIM mitigation strategies to increase pilot situational awareness such as signage, marking, and lighting at identified RIM Locations. Currently, site SDM-04 already has some typical RIM mitigation strategies deployed including enhanced taxiway centerline marking and elevated runway guard lights. However, additional mitigation strategies should be considered for this location to increase situational awareness, including Surface Painted Holding Position Signs (SPHPS).

Surface Painted Holding Position Signs (SPHPS)

Surface painted signs provide supplemental visual cues that alert pilots and vehicle drivers of an upcoming holding position location and the associated runway designators relating to the said holding point. The addition of surface painted holding position signs with appropriate reflectivity would improve pilot situational awareness in this location. These markings provide better visual cues to help identify the presence of a mandatory hold location.

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SPHPS are surface painted signs which are mandatory on the left side of the taxiway centerline for Taxiway Design Groups (TDGs) 3-7, and centered over the taxiway centerline for TDG-1A, TDG-1B, and TDG-2. Given the width of Taxiway B of 75 feet in this location, SPHPS are proposed for both left and right sides of the Taxiway B centerline for additional visibility.

Figure 4. Removal of Non-Standard Bypass / Run-Up Areas

Source: Google Earth Imagery, 2017

Pilot Education Strategy– Hot Spot Identification

Hot Spot Designation can be an effective RIM mitigation strategy to educate and inform pilots of areas of potential risk. Hot Spot identification is a similar but separate program to the RIM Program intended solely to identify and inform airport users of areas on an airfield movement area with a history of runway incursions. By identifying Hot Spots in the FAA's U.S. Chart Supplements, and on Airport Diagrams, it is easier for users of an airport to plan the safest possible path of movement in and around that airport to obtain awareness of areas with higher risk of incursion.

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Currently, SDM-04 is not identified via a Hot Spot designation to inform pilots of the historical risk of incursion. It is recommended that SDM-04 be identified as a Hot Spot in the FAA Hot Spots List, and on the Airport Diagram to increase pilot awareness of the increased risk of incursion.

Recommended RIM Strategy for SDM-04

The following is a recommended combination of RIM mitigation strategies including geometric improvements, marking improvements, and pilot education to improve standardization and increase pilot situational awareness at SDM-04 while preserving airfield capacity.

- Geometric Improvement Strategy - Removal of nonstandard bypass/run-up pavement
- Marking Improvement Strategy - Addition of Surface Painted Holding Position Signage (SPHPS)
- Pilot Education Strategy – Designation of SDM-04 as Hot Spot