Appendix H. Phoenix Sky Harbor International Airport – Airspace Analysis

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Executive Summary

A study was conducted to investigate and provide an overview of the airspace situation for Runway 7R-25L at Phoenix Sky Harbor International Airport (PHX) based on Federal Aviation Administration (FAA) criteria and imaginary surfaces for compliance with current clearance standards as they pertain to the Interstate 10 (I-10)/Interstate 17 (I-17) Split interchange (Split).

The following FAA imaginary surfaces were investigated as part of this study:

- Runway Protection Zone (RPZ) Surface
- Part 77 Runway Surface
- One Engine Inoperative (OEI) Surface
- Departure (DEP) Surface
- Inner Approach and Transitional Obstacle Free Zone
- Precision Final Approach
- Threshold Siting Surface

Upon review of the noted imaginary surfaces, it was determined that the surfaces most significant and worthy of further discussion are the RPZ, Part 77 Runway, OEI, DEP and Threshold Siting Surfaces.

Runway Protection Zone Surface

The RPZ is a trapezoidal-shaped area at ground level that begins beyond the end of the runway to enhance the safety and protection of people and property on the ground. The RPZ limits what type of objects (fixed by aeronautical function) may be placed within the RPZ. The RPZ imaginary surface for Runway 7R end starts 200 feet from the runway threshold point and is 2,500 feet in length with a maximum outer width of 1,750 feet and an inner width of 1,000 feet (see Figure H-1). The elevation of the RPZ is the same as the terrain it overlays.

The RPZ is divided into two sections:

- Central Portion, which has a width of 800 feet
- Controlled Activity Area, which consists of trapezoidal-shaped wings adjacent to the RPZ Central Portion

A small segment of the I-10 main line and larger portion of the I-17 fly-over ramp are located within the footprint of the Central Portion of the RPZ. A significant portion of the I-10 main line is within the Controlled Activity Area. Based on similar situations in other parts of the country, precedent-setting examples exist that may allow us to negotiate a resolution with FAA in which the Split can remain within the RPZ.

The FAA has outlined a process (RPZ Alternatives Analysis) through which projects violating the RPZ acceptable land use guidelines can be examined on a case-by-case basis. The FAA Regional Office, Airport District Office and airport sponsor must be involved in developing the RPZ Alternatives Analysis document, which would then be reviewed by FAA headquarters before FAA approval would be given. An RPZ Alternatives Analysis must have the following elements:

- Alternatives must be identified that avoid incompatible land use within the RPZ, minimize the impact of incompatible land use within the RPZ and mitigate the risk to people and property on the ground.
- RPZ Alternatives Analysis documentation should include:
  - description of each alternative
  - full cost estimate for each alternative
  - practicability assessments for each alternative
  - identification of a preferred alternative
  - identification of all federal, State and local transportation agencies involved
  - analysis of specific portions and percentages of the RPZ affected
  - analysis of (and issues regarding) sponsor control of land within the RPZ
  - any other relevant factors for FAA headquarters' consideration

FAA currently offers only interim guidance on acceptable uses within the RPZ. A final advisory circular was scheduled to be released in 2014; however, the release was delayed and an anticipated release date is not available. It is unknown what changes to the interim RPZ guidance may occur in the final version.

Title 14 Part 77 Runway Surface

The Part 77 surfaces were established to provide an expected minimum level of safety and clear areas around each runway. The Part 77 notification surfaces surrounding each runway provide for established airspace clearance in accordance with FAA standards for all airports. The dimensions of these surfaces are based on the type of runway and the type of approach ultimately planned for the airport. The imaginary surfaces and the dimension for Runway 7R-25L used for this study are defined below and are depicted in Figure H-2 for reference.

Primary Surface. The primary surface is rectangular, is centered on the runway, extends 200 feet beyond each end of the runway and has a width that varies according to airport-specific criteria. The elevation of the primary surface corresponds to the elevation of the nearest point of the runway centerline. The width of the primary surface for Runway 7R-25L is 500 feet.

Approach Surface. The approach surface is centered on the extended runway centerline, starting at each end of the primary surface (200 feet beyond each end of the runway), and has a width equal to that of the primary surface. Approach surfaces slope upward and outward from the runway end at a 50:1 ratio for the first 10,000 feet.

Inner Approach Surface. The inner approach surface is located to the sides of the approach surface and slopes upward perpendicular to the runway at 7:1.

Transitional Surface. The transitional surface is a sloping 7:1 surface that extends outward and upward at right angles to the runway centerline from the sides of the primary surface.

In an ideal situation, all Part 77 surfaces surrounding airports are kept clear of infringements; however, this is rarely the case, with many instances where Part 77 surfaces are violated. Currently, with regard to Runway 7R-25L, there are several penetrations of the Part 77 airspace, with the most significant being median high-mast lighting for I-10. These penetrations were identified during the original design of Runway 7R-25L and were marked with obstruction lights. Any changes to the Spine corridor within the limits of Runway 7R-25L Part 77 surfaces will include an evaluation of how to eliminate or mitigate the existing penetrations into the aircraft airspace safety surfaces.

One Engine Inoperative Surface

The OEI surface provides pilots a predetermined departure path off a runway with the best available obstruction information for location and height within the intended takeoff corridor. The OEI is much narrower than the departure surface, but allows pilots to determine how much of a turn off the extended runway centerline would provide the least obstructed flight path in the event of an engine failure during departure.

This information is critical when an engine suddenly becomes inactive for an aircraft on a takeoff role, as it rotates off the runway. The aircraft, with less takeoff power, will then correspondingly have a lower-than-intended climb gradient, which could place it closer to obstacles within the flight path.

The OEI is not a clearance surface for hazardous objects; however, it is an FAA Flight Standards Division requirement for all air carriers to develop escape routes in the event of an engine failure during takeoff. While the onus for developing flight procedures for an OEI operation falls to the individual airlines, the City of Phoenix Aviation Department has specifically requested that this criterion be included as part of the airspace study.

The OEI surface, shown in Figure H-3, starts at the ground elevation of the runway threshold with a width of 400 feet and extends outward at a positive slope of 62.5:1. This initial segment extends to the airport property boundary. Beyond the airport boundary, the OEI surface expands to 600 feet wide and extends an additional 2,300 feet. The surface ultimately extends from the runway threshold to a total length of 32,000 feet.

Departure Surface

The DEP surface is tied to instrument takeoff procedures for each runway end. This surface is physically wider and longer than the RPZ. It starts at the Runway Threshold point and slopes outward and upward at a positive ratio of 40:1. The DEP surface base is 1,000 feet wide and the sides of the trapezoid flare out at a 15-degree angle. The first 2 nautical miles of this surface extend straight out from the runway centerline (Figure H-4).

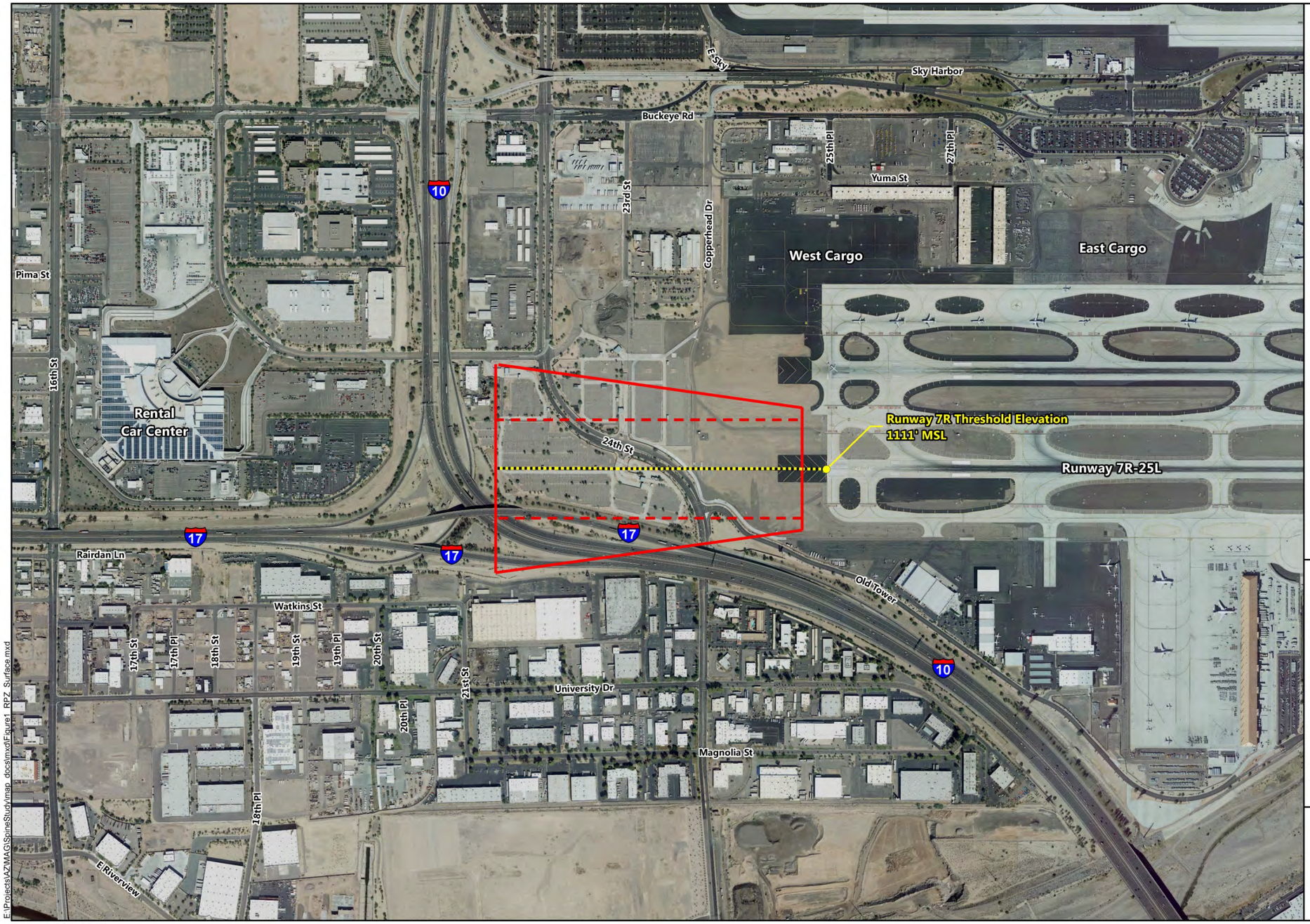
This surface appears to contain two significant penetrations by freeway high-mast light standards. These obstructions are currently identified with FAA-approved L-810 Obstruction Lights. Future development should avoid affecting the DEP surface to meet the airspace surface threshold criteria.

Threshold Siting Surface

The Threshold Siting Surface (TSS) is associated with runway end siting requirements. The threshold for Runway 7R is defined as the beginning of the runway pavement, meaning there is no displacement of the threshold. The TSS consists of an approach surface that depends on the type of instrumentation associated with runway. It should be noted that the approach surface for the TSS is completely different than the approach surface defined in Part 77.

The TSS is designed to protect the use of the runway with regard to both visual and instrument meteorological conditions near the airport. The surface typically has a trapezoidal shape that extends away from the runway along the centerline and at a specific slope, expressed in horizontal feet by vertical feet. The TSS, shown in Figure H-5, starts at the ground elevation and 200 feet prior to the runway threshold. The surface begins with a width of 800 feet and expands upward and outward at a rate of 34:1 for a total length of 10,000 feet, where the surface width is 3,800 feet.

Figure H-1 Sky Harbor International Airport RPZ Surface (Runway 7R)



SPINE Corridor Master Plan

Figure H-1
Sky Harbor International Airport RPZ Surface (Runway 7R)

- Extended Runway Center Line
- Runway Protection Zone (RPZ)
- RPZ Central Portion

NORTH

0 0.5 1 1.5
Miles

Map Area

Date: April 2016
Source: Jcob

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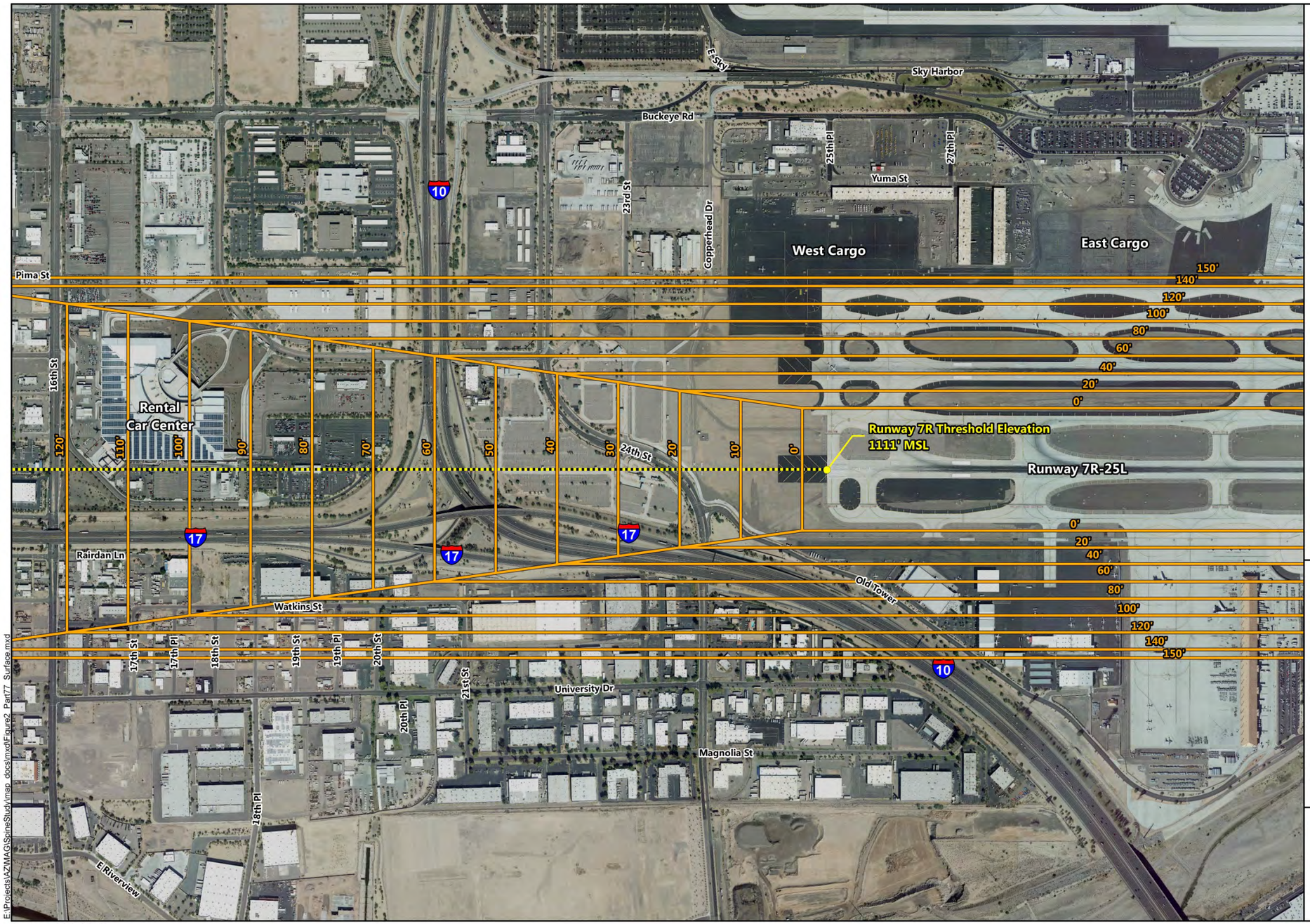
Source: FAA, HDR

Map Last Updated: 4/27/2016

Figure H-2 Sky Harbor International Airport Part 77 Surface (Runway 7R-25L)



SPINE Corridor Master Plan

Figure H-2
Sky Harbor International Airport Part 77 Surface (Runway 7R-25L)

Extended Runway Center Line

Part 77 Runway Surface

20' Height of Part 77 Surface Above Elevation of Runway 7R Threshold

NORTH

0 0.5 1 1.5 Miles

Map Area

Date: April 2016
Source: Jcob

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E:\Projects\AZ\MAG\SpineStudy\map_docs\mxd\Figure2_Part77_Surface.mxd

Source: FAA, HDR

Map Last Updated: 4/27/2016

Figure H-3 Sky Harbor International Airport One Engine Inoperative Surface (Runway 25L)

SPINE Corridor Master Plan

Figure H-3
Sky Harbor International Airport One Engine Inoperative Surface (Runway 25L)

Extended Runway Center Line

One Engine Inoperative Surface

20' Height of One Engine Inoperative Surface Above Elevation of Runway 7R Threshold

NORTH

0 0.5 1 1.5
Miles

Map Area

Date: April 2016
Source: Jcob

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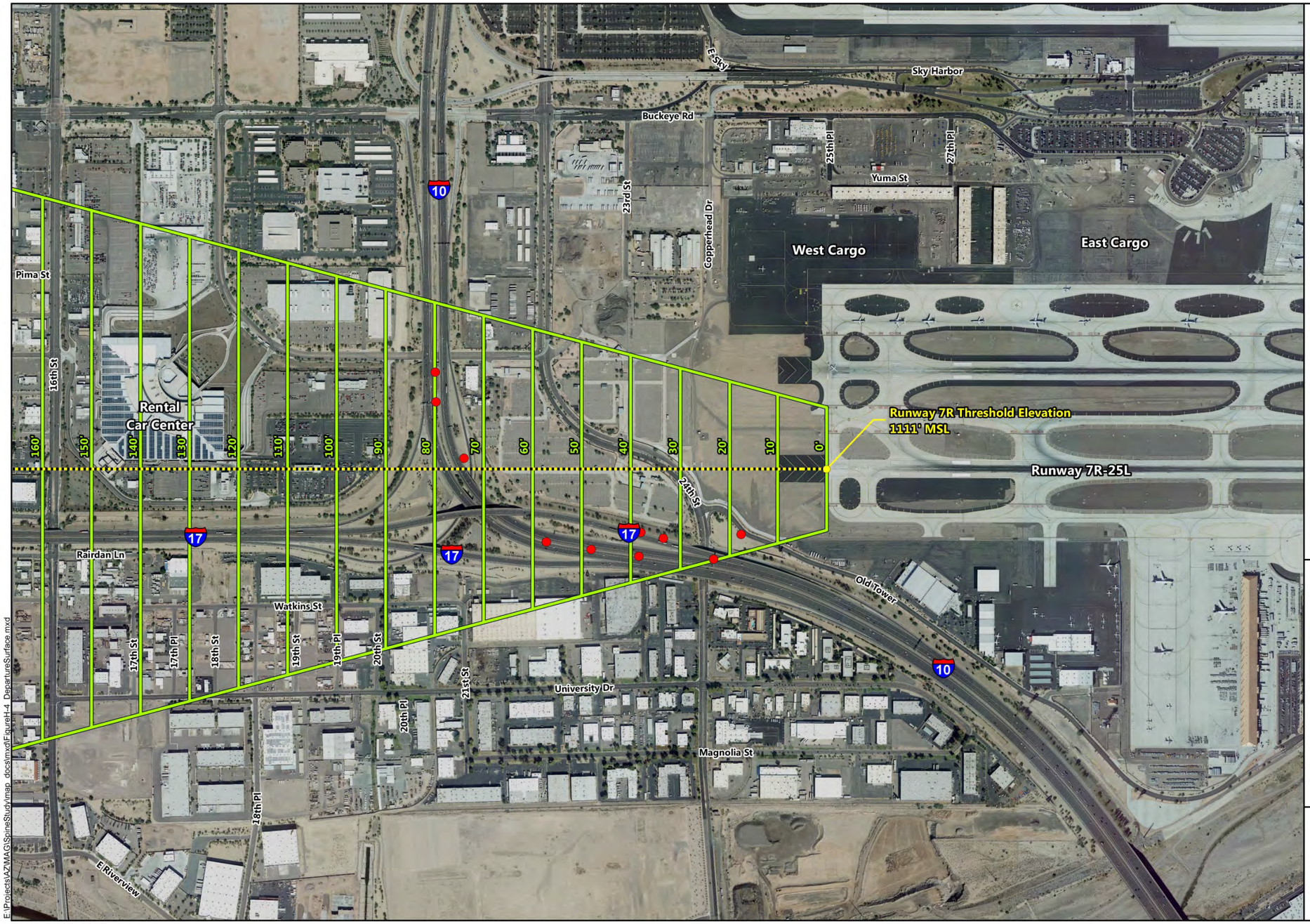
Source: FAA, HDR

Map Last Updated: 4/27/2016

Figure H-4 Sky Harbor International Airport Departure Surface (Runway 25L)



Source: FAA, HDR

SPINE Corridor Master Plan

Figure H-4
Sky Harbor International Airport Departure Surface (Runway 25L)

- Aviation Obstruction
- Extended Runway Center Line
- Runway 25L Departure Surface
- 20' Height of Departure Surface Above Elevation of Runway 7R Threshold

NORTH

0 0.5 1 1.5 Miles

Map Area

Date: May 2016
Source: Jcob

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Map Last Updated: 5/24/2016

Figure H-5 Sky Harbor International Airport Threshold Siting Surface (Runway 7R)

Source: FAA, HDR

Map Last Updated: 5/12/2016

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