Noise Screening Analysis Report

For

The Proposed West Flow Area Navigation Standard Instrument Departure Procedures at Phoenix Sky Harbor International Airport described in the Memorandum Regarding Implementation of Court Order per *City of Phoenix, Arizona v. Huerta*, 869 F.3d 963 (D.C. Circuit 2017)

March 2018

Prepared by:
United States Department of Transportation
Federal Aviation Administration

Renton, WA

1.0 SUMMARY

This report describes the noise screening conducted in support of the Federal Aviation Administration's (FAA) Proposed Action to amend two west flow Area Navigation (RNAV) Standard Instrument Departure (SID) procedures at Phoenix Sky Harbor International Airport (Phoenix Sky Harbor), Phoenix, Arizona, as set forth in the agreement stipulated in the Memorandum Regarding Implementation of Court Order per *City of Phoenix, Arizona v. Huerta*, 869 F.3d 963 (D.C. Circuit 2017) ("Memorandum"). Using the FAA-approved noise screening tool, the Terminal Area Route Generation, Evaluation and Traffic Simulation (TARGETS) Aviation Environmental Design Tool (AEDT) Environmental Plug-In, a noise screening analysis was completed to screen for potential increases in noise resulting from implementation of the proposed amendments to the two procedures.

Screening tools use simplified but conservative modeling assumptions to quickly provide estimates of where noise increases may occur. In general modeling accuracy is dependent on a range of factors, including 1) how well the fundamental quantity to be modeled is understood and calculated, and 2) how accurately the inputs needed by the model are provided. All aircraft noise modeling tools must accurately account for the fundamentals of noise. However, while a comprehensive modeling tool also needs detailed inputs, a noise screening tool is optimized to take advantage of simplified inputs to produce results for a more narrowly defined purpose, such as a preliminary assessment of potential noise impacts. As a result, noise screening outputs are not suitable for reporting more detailed or precise noise results at specific locations. This analysis enables the FAA to identify areas that may require additional consideration prior to determining that the Proposed Action falls within the scope of a Categorical Exclusion (CATEX) in accordance with the FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures* (FAA Order 1050.1F).

2.0 INTRODUCTION TO NOISE METRICS AND IMPACTS

FAA Order 1050.1F provides specific guidance and requirements for assessing the potential aircraft noise impacts on the community with respect to changes to aircraft procedures, airspace, etc. For aviation noise analyses, the FAA has determined that the cumulative noise energy exposure of individuals resulting from aviation activities is calculated in terms of Yearly Day-Night Average Sound Level (DNL), the FAA's primary noise metric[1].

The DNL does not measure sound as it occurs in real time, but represents noise as it occurs over an averaged 24-hour period. DNL takes into account the noise level of each individual aircraft event, the number of times those events occur, and the time of day in which they occur. DNL includes a 10-decibel (dB) noise penalty added to noise events occurring from 10:00 p.m. to 7:00 a.m., to reflect the increased sensitivity to noise and lower ambient sound levels at night. The DNL calculation treats noise occurring at night differently from daytime noise.

[1] FAA Order 1050.1F, Appendix B. Section B-1.

2.1 Threshold Values for Noise Impacts

Noise screening evaluates whether there is a potential change in noise exposure due to the proposed action alternative (e.g., proposed changes to aircraft routes) when compared to the current aircraft routes, considered the "baseline" or No Action Alternative. The potential changes in noise exposure, or noise impacts, are compared with threshold levels above which changes in aircraft noise levels may cause a significant or reportable impact. The FAA uses these thresholds that serve as specific indicators of significant impact for some environmental impact categories, including "Noise." Results of the noise screening identify where noise exposure levels change by the following specified amounts:

2.1.1 Significance Threshold[2]

The threshold for a noise impact to be considered significant is whether the proposed action scenario when compared to the baseline scenario would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level.

2.1.2 Reportable Noise Thresholds

The noise screening tool also identifies certain areas with potential increases in areas exposed to lower levels of noise. Specifically, the FAA refers to changes in noise exposure levels meeting the criteria listed below as "reportable."

- For DNL 60 dB to less than 65 dB: ± 3 dB
- For DNL 45 dB to less than 60 dB: ± 5 dB

Although they do not meet the threshold of significance for most land uses, there may be factors to consider in whether there are extraordinary circumstances rendering a categorical exclusion as applicable. These factors are:

- An adverse effect on cultural resources protected under the National Historic Preservation Act of 1966, as amended, 54 U.S.C. §300101 et seq.
- An impact on properties protected under Section 4(f) of the Department of Transportation Act.
- An impact on natural, ecological, or scenic resources of Federal, state, tribal, or local significance.
- An impact on noise levels of noise sensitive areas.[3]
- An impact on air quality.

[2] FAA Order 1050.1F, Appendix B, Section B-1.5.

[3] An area is noise sensitive if aircraft noise may interfere with the normal activities associated with the use of the land. Normally, noise sensitive areas include residential, educational, health, and religious structures and sites, and parks, recreational areas, areas with wilderness characteristics, wildlife refuges, and cultural and historical sites.

- Impacts on the quality of the human environment that are likely to be highly controversial on environmental grounds.[4]
- Likelihood to directly, indirectly, or cumulatively create a significant impact on the human environment.

3.0 Noise and Noise-Compatible Land Uses[5]

The compatibility of existing and planned land uses in conjunction with an aviation or aerospace proposal is usually associated with noise impacts. An area is noise sensitive if aircraft noise may interfere with the normal activities associated with the use of the land.[6]

Noise compatibility or non-compatibility of land use is determined by comparing the Proposed Action DNL values to the values in the FAA Order 1050.1f, Desk Reference, Exhibit 11-3, Land-Use Compatibility with Yearly Day-Night Average Sound Levels.

4.0 NOISE SCREENING MODEL

FAA's approved screening tool for projects involving air traffic changes uses features available within the TARGETS, a flight procedure design tool, combined with the AEDT Environmental Plug-In. This noise screening tool identifies areas that may be exposed to changes in noise impacts.

5.0 SCENARIOS EVALUATED

To determine the potential impact(s) from noise, the AEDT Environmental Plug-In for TARGETS compares the baseline scenario to an alternative scenario or scenarios. For the purposes of noise modeling, a scenario is a group of traffic bundles (collections of radar tracks) assigned to one or more procedures or routes. The baseline scenario typically represents the existing procedures as they are flown at the time of the analysis. The alternative scenarios represent the radar tracks assigned to the proposed action(s), and any other alternative actions that may be considered.[7]

---

[4] The term "highly controversial on environmental grounds" means there is a substantial dispute involving reasonable disagreement over the degree, extent, or nature of a proposed action's environmental impacts or over the action's risks of causing environmental harm. FAA Order 1050.1F. Section 5-2.b.(10).

[5] FAA Order 1050.1F. Desk Reference, Chapter 11. Noise and Noise-Compatible Land Use

[6] Refer to FAA Order 1050.1F, Paragraph 11-5. b. (10), for the full definition of noise sensitive areas.

[7] Section 5.b in the Memorandum requires the FAA to conduct a noise analysis comparing differences in noise between the Pre-RNAV Western Routes[7] and the Step One Letter of Agreement instructions. In the Draft Noise Screening Report and the Draft Environmental Review dated January 2018, the FAA initially analyzed the Pre-RNAV Western Routes with the proposed Step 1B RNAV SID procedures where the initial segments of the proposed flight paths would be overlays of the procedures proposed under Step 1A. Because the proposed Step 1B RNAV SIDs would complete Step One, the FAA intends to provide the final Pre-RNAV Western Route noise analysis in the Noise Screening Analysis Report for Step 1B.

The Memorandum between the City of Phoenix, and the historic neighborhood petitioners, proposes a two-step process by which FAA would implement the proposed RNAV SIDs.[8] The changes under Step One of the Memorandum were divided into two actions with independent utility: Step 1A and Step 1B. The Proposed Action addressed in this Noise Screening Analysis Report, Step 1A, is the first step in implementing the Memorandum. The FAA is proposing to implement Step 1A on March 29, 2018, which would amend certain westerly routes for aircraft departing from Phoenix Sky Harbor. The two RNAV SIDs as part of Step 1A would alter only the initial departure procedures at Phoenix Sky Harbor, requiring aircraft to return to the RNAV procedures after the first legs of their initial departure, turning after 43rd Avenue.

The changes under Step 1B would complete implementation of Step One in the Memorandum and replace the Step 1A RNAV SIDs as well as the current RNAV SIDs. Step 1B, which would involve replacing the two departure routes in Step 1A and implementing nine new western RNAV SIDs, is not considered in this noise analysis.

Two scenarios were evaluated for this noise analysis: the No Action Scenario, and the Proposed Action Scenario.

5.1 No Action Scenario

The No Action Scenario represents radar tracks as they are currently flown and is considered the baseline. Noise screening of the No Action Scenario modeled the noise impact(s) of Phoenix Sky Harbor arrivals and departures based on a 90-day sample of radar track data.

5.2 Proposed Action Scenario

The Proposed Action would revise the western flow of aircraft flying the RNAV SID procedures from Runways 25L, 25R and 26 at Phoenix Sky Harbor. The RNAV SIDs being revised are the MAYSA, LALUZ, SNOBL, YOTES, and IZZZO consistent with Step One as described in the Memorandum.

The Step 1A procedure designs allow aircraft to climb to an altitude of 500 feet Above Ground Level (AGL), or 1,635 feet Mean Sea Level (MSL), to an "engagement point" when the aircraft navigation flight management computer begins providing the pilot with route, altitude and speed guidance.[9] This "engagement point" does not occur at a specific location, but is determined by when the aircraft leaves the runway surface and the aircraft climbs through 1,635 feet MSL.

As originally proposed in the draft Environmental Review document dated January 2018, aircraft on the southwest RNAV SIDs (BNYRD, FTHLS, JUDTH, and KATMN), would follow a southwest course to the WETAL fix in order to connect to the en route airway structure for flights to the south, southwest and southeast. Based on initial consultation under Section 106 of the National Historic Preservation Act, the FAA revised the Proposed Action in order to make the

[8] Step Two which is described in the final Environmental Review Document, is not considered in this noise analysis

[9]The "engagement point" refers to Lateral Navigation (LNAV) engagement where aircraft navigate over a ground track with guidance from an electronic device that gives the pilot (or autopilot) error indications in the lateral direction only and not in the vertical direction.

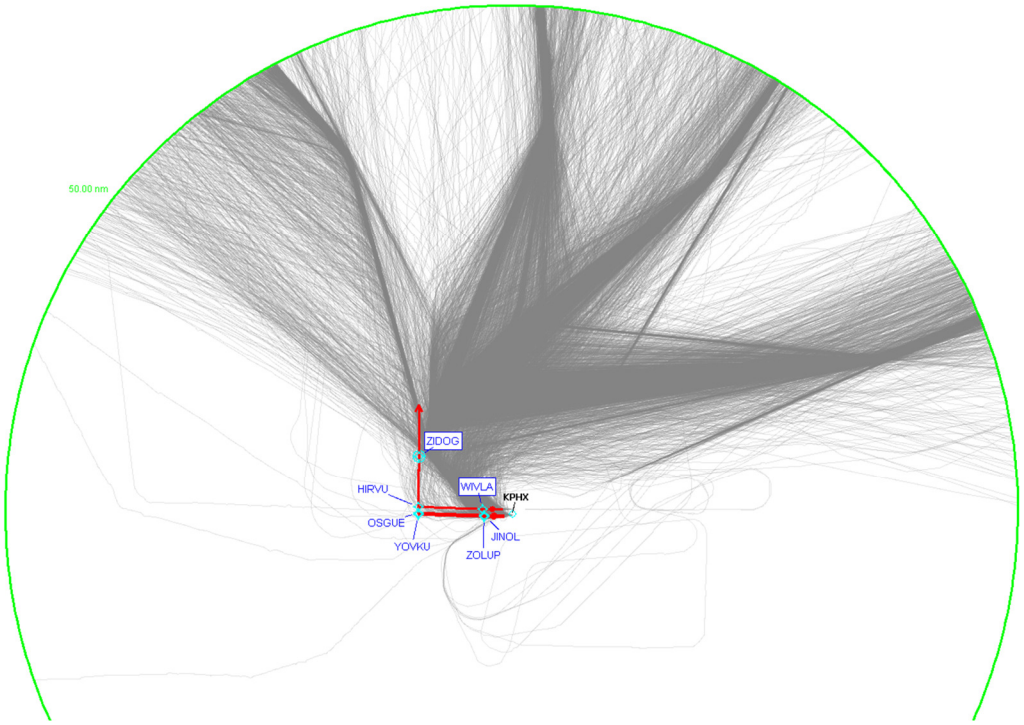
WETAL RNAV SID unavailable to aircraft pending further evaluation and consultation.[10] As a result, aircraft departing to the west then turning south would follow the procedures that are currently in place. Because the WETAL RNAV SID will be unavailable for use, it is not part of the Proposed Action. For purposes of the noise screening of Step 1A, it is assumed that the WETAL RNAV SID would not be used for operations.

The Proposed Action scenario models the noise impact if 100% of Phoenix Sky Harbor departure aircraft were assigned one of the proposed RNAV SIDs as appropriate by the route of flight.

Two proposed RNAV SID procedures were included in the Proposed Action Scenario:

- ZIDOG (replacing MAYSA, LALUZ, SNOBL, and YOTES RNAV SIDs): Refer to Figure 4.2.1. ZIDOG Procedure and Assigned Tracks
- KEENS (replacing IZZZO RVAN SID): Refer to Figure 4.2.2. KEENS Procedure and Assigned Tracks

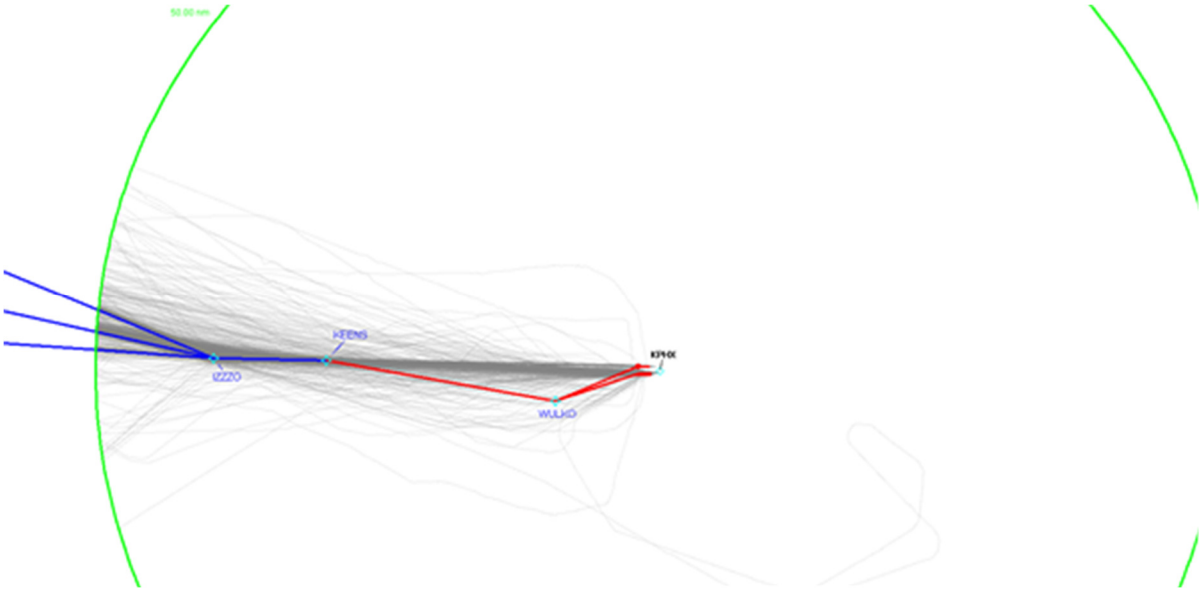
Figure 4.2.1: ZIDOG RNAV Procedure



	ZIDOG RNAV SID Procedure
	2017 Flight Tracks
	Noise Screening Study Area

Figure 4.2.2: KEENS RNAV Procedure

[10] FAA anticipates that Step 1B would finalize RNAV SIDS for aircraft departing to the west then turning south.



	KEENS RNAV SID Procedure
	2017 Flight Tracks
	Noise Screening Study Area

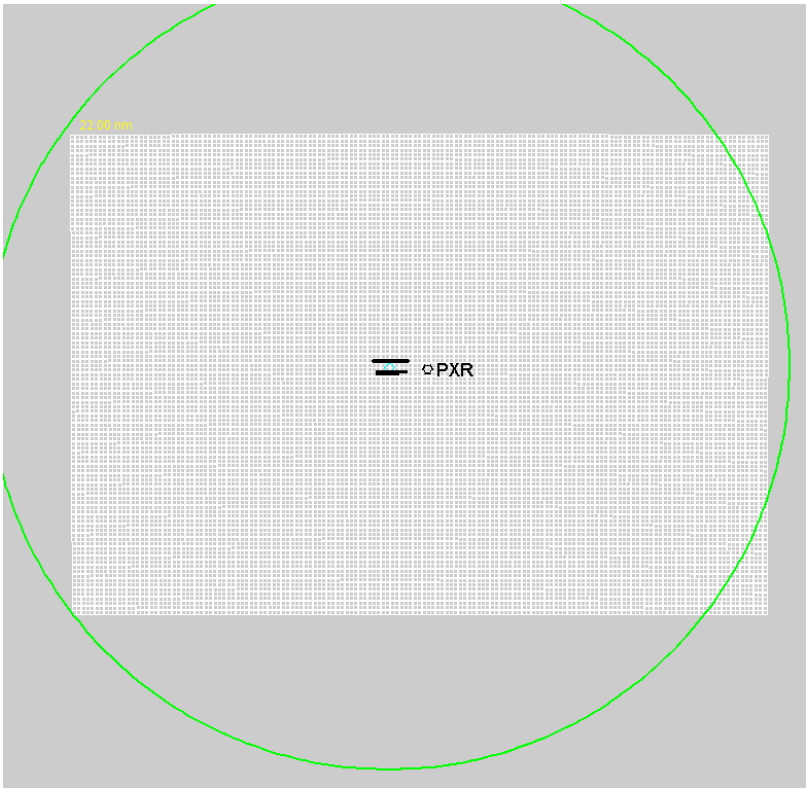
Using the AEDT Environmental Plug-In, backbones for each departure procedure were created, accounting for the proposed Step 1A procedures as well as the typical dispersion of RNAV SID procedures. To ensure a consistent number of operations and a consistent fleet mix across alternatives, the same flights that were used for the No Action scenario were applied to these backbones. This ensured that differences across scenarios were attributable to flight path changes only.

6.0 DEVELOPMENT OF THE NOISE SCREENING ANALYSIS STUDY AREA

The study area for the noise screening analysis is considered to be the geographic area where the potential to be impacted by noise from the Proposed Action exists. The noise screening analysis focused on a change-in-exposure analysis, which examined the change in noise levels at a set of grid points. The noise study area, the area covered by the grid, was established to include all areas in which the No Action screening produced a DNL result of greater than 45 dB (see Figure 5.1). Noise exposure calculations were based on a rectangular grid (receptor set) at airport field elevation with evenly spaced grid points (receptors). Grid points were spaced evenly at 0.25 nautical mile (NM) intervals.

Figure 5.1: Noise Screening Grid Points

(The green ring is set at 22 NM is for distance reference only).



7.0 NOISE SCREENING INPUTS AND ASSUMPTIONS

To determine projected noise levels, it is necessary to determine the frequency of aircraft operations and the position of the aircraft in space (laterally and vertically). Arrival and departure direction to and from an airport are generally a function of the geometry of the airport's runways, procedures used to manage air traffic, and weather conditions.

Noise modeling accounts for several types of input data including:

- Airport/runway geometry
- Number of aircraft operations
- Aircraft fleet mix
- Day/night time distributions
- Flight tracks
- Track dispersion information
- Flight track utilization
- Flight profiles
- Runway usage
- Typical operational procedures

Other than airport/runway geometry, the above information can be determined by analysis of historical radar track data. Track data provides information regarding demand levels, fleet mix, lateral/vertical path definitions, path utilization, and runway usage, all broken down by departure/arrival streams and day/night traffic distributions.

7.1 Collection of Radar Track Data

Historical radar track data was obtained from the FAA's National Offload Program (NOP)[11] . Track data was collected for 90 randomly selected days (using a random day generator) during calendar year 2017 ("2017 Track Data"). The selection of 90 random days is considered to best represent average traffic counts and traffic flows accounting for seasonal variations and peak travel times for Phoenix Sky Harbor.

The individual flight tracks were taken directly from the radar system, ensuring accurate representation of runway use and time of day. While the flight trajectories were not modified in any way, they were filtered to remove overflights, incomplete track segments, and other anomalous data, which could have reduced the accuracy of the noise screening analysis. After filtering tracks, 96,110 tracks (47,933 departures and 48,277 arrivals) remained in the 2017 Track Data set providing the aircraft operations and fleet mix that were used to consistently model aircraft operations for the two scenarios. The 2017 Track Data provides the trajectories for the No Action Scenario, i.e., operational information based on current flight procedures and flight tracks. Annual operations and runway use were obtained from the Performance Data Analysis Reporting System (PDARS) using the Phoenix Terminal Radar Approach Control as the radar source facility.

7.2 Other Considerations in Screening Input and Assumptions

- Altitude calculations were based on "above field elevation" (AFE) using the Phoenix Sky Harbor Airport's reference elevation.
- As the proposed procedures are not expected to change the vertical profiles of the Phoenix Sky Harbor arrivals and departures, default AEDT climb and descent profiles were assumed.
- Track dispersion around the Proposed Action backbones was based on an examination of the RNAV dispersion in the 2017 Track Data, while dispersion around the Pre-RNAV Western Routes backbones was based on an examination of radar data prior to September 2014.
- In the two scenarios, the 2017 Track Data was used to represent arrivals, as changes to arrivals are not being proposed.

[11] All traffic data was obtained using the Phoenix Terminal Radar Approach Control as the radar source facility.

- Because the WETAL RNAV SID will be unavailable for use, no flight track data was assigned to the WETAL RNAV SID backbone. To account for departures to the south, southwest, and southeast, the 2017 Track Data utilized for the No Action Scenario was applied as the track data set for the current RNAV SIDs (BNYRD, FTHLS, JUDTH, and KATMN) that will continue to be flown through the completion of Step One of the Memorandum.

8.0 NOISE SCREENING METHODOLOGY

The 2017 Track Data provided the demand levels, fleet mix, runway use, day/night splits used to model the two scenarios, and the same arrival track data was used to represent arrivals the two scenarios as well. For the Proposed Action, the flight tracks were redistributed and reassigned to backbones as necessary to best represent the alternative flight paths of the individual scenarios.

8.1 Scenario Specific Assumptions

8.1.1 Proposed Action Scenario

Aircraft operations were reassigned to the procedures identified in the Proposed Action to model aircraft as flying the proposed Step 1A procedures. Track assignments were based on historic flight paths, assigning the existing tracks to the path of the nearest proposed procedure. The proposed procedures were represented by noise modeling backbones, with dispersion based on an examination of the RNAV dispersion in the 2017 Track Data.

9.0 NOISE SCREENING RESULTS

FAA conducted a separate noise screening analysis for each scenario, and then compared the Proposed Action Scenario to the No Action Scenario. The TARGETS AEDT Environmental Plug-In graphically displays the noise exposure levels for each scenario in a grid point map. The No Action Scenario grid point noise exposure map shown in Figure 8.1 depicts the levels and locations of the noise produced by the historical radar track data for arrivals and departures. Figure 8.2 depicts the Proposed Action scenario grid point noise exposure map levels and locations of the noise produced if the Proposed Action was implemented. Table 8-1 and 8-2 represent the legends for the No Action scenario and Proposed Action scenario grid point color codes for the DNL values.

Figure 8.1: No Action Scenario Grid Point Noise Exposure Results

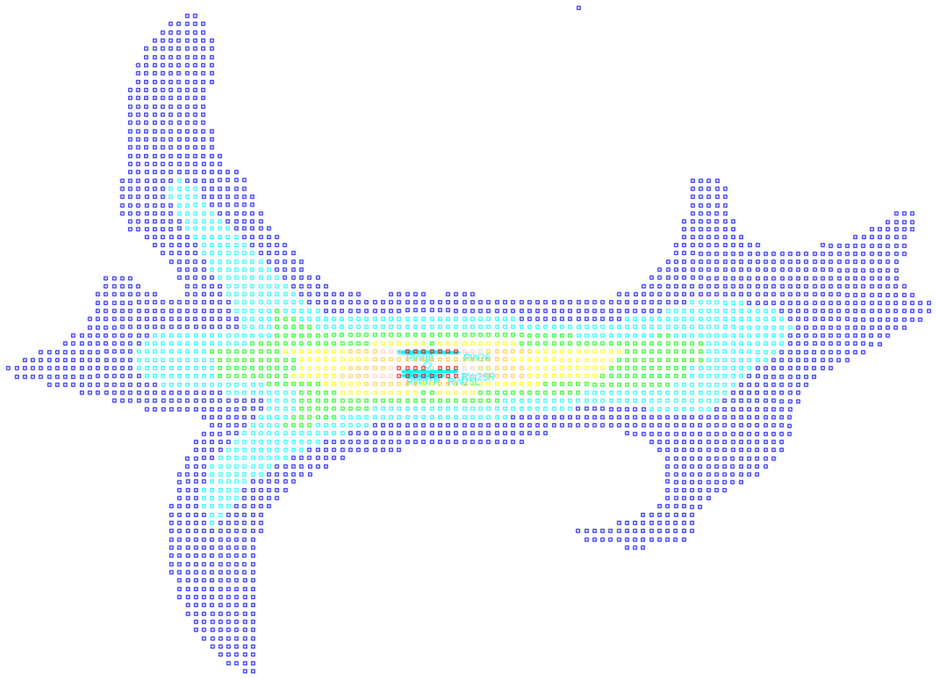


Table 8-1. Legend: No Action Scenario Grid Point Noise Exposure DNL Values

Color	DNL Value
MAGENTA	45 dB OR LESS
BLUE	45–50 dB
LIGHT BLUE	50–55 dB
GREEN	55–60 dB
YELLOW	60–65 dB
ORANGE	65–70 dB
PINK	70–75 dB
RED	75 dB OR MORE

Figure 8.2: Proposed Action Scenario Grid Point Noise Exposure Results

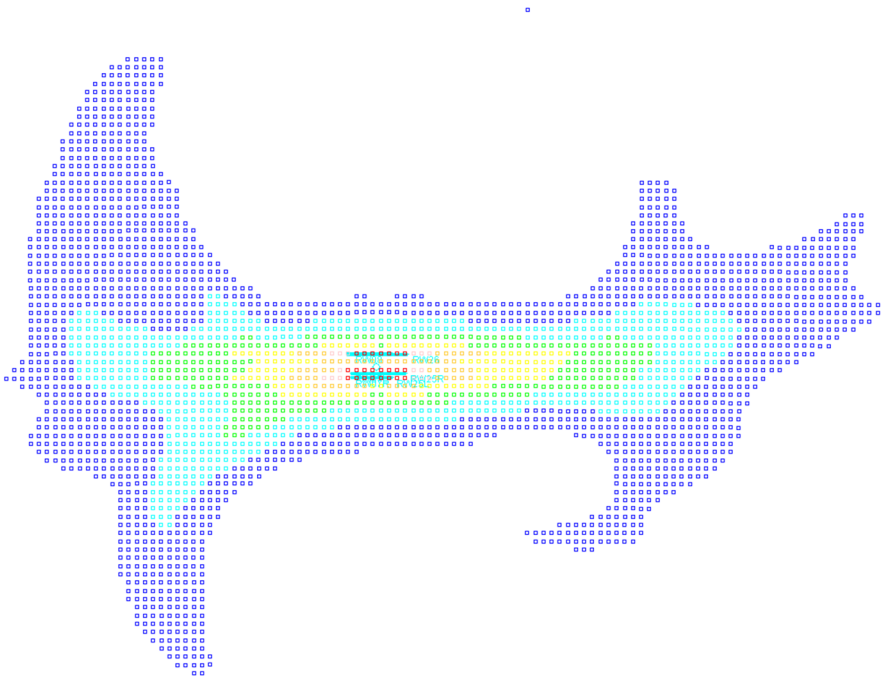


Table 8-2. Legend: Proposed Action Scenario Grid Point Noise Exposure DNL Values

Color	DNL Value
MAGENTA	45 dB OR LESS
BLUE	45–50 dB
LIGHT BLUE	50–55 dB
GREEN	55–60 dB
YELLOW	60–65 dB
ORANGE	65–70 dB
PINK	70–75 dB
RED	75 dB OR MORE

10.0 EVALUATION OF NOISE SCREENING RESULTS

As depicted in Figures 8.1 and 8.2, the light blue colored grid points represent the DNL 50-55 dB noise exposure level (Light Blue). The results of the noise screening analysis for the Proposed Action scenario depicted in Figure 8.2 indicate that the Light Blue grid point area is reduced to the northwest and southwest of Phoenix Sky Harbor. Additionally, the Light Blue grid point area to the west of the airport shifts northwest with the initial turn of the ZIDOG procedure after 43rd Avenue in order to approximate the pre-September 2014 western departure routes.

11.0 **CONCLUSION**

FAA has conducted a noise screening analysis of two alternatives: the No Action Scenario representing current conditions, the Proposed Action Scenario representing the proposed procedures under Step 1A of the Memorandum. As shown in Figure 8.3, the track lines depicted represent the simulated flight tracks on the centerline of the ZIDOG and KEENS RNAV SID procedures. The results of the noise screening analysis comparing the No Action scenario to the Proposed Action scenario indicate that the proposed ZIDOG and KEENS RNAV SID procedures will not result in significant noise impacts relative to the No Action Scenario. Figure 8.3 depicts no location of a grid point for a change in noise exposure of DNL 1.5 dB or more for a noise sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level.

Figure 8.3: Resulting Change in Noise Exposure Levels:
Comparison of the No Action Scenario and the Proposed Action Scenario

Table 8-3. Legend: Change in Noise Exposure Levels Results

	DNL 65 dB No Action noise exposure with no increase or decrease of 1.5 dB or greater in the Proposed Action alternative
	Simulated Flight Track Centerline of Procedure