Draft Noise Screening Report

For

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

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1.0 SUMMARY

This report describes the noise screening conducted in support of the Federal Aviation Administration's (FAA) Proposed Action to amend nine 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 nine 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 use of a CATEX is appropriate.

2.0 INTRODUCTION TO NOISE METRICS AND IMPACTS

FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, 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 potential for a change in noise exposure resulting from proposed changes to aircraft routes, considered the proposed action, when compared to current conditions, i.e., current aircraft routes, considered the "baseline" or No Action Alternative. The 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 FAA refers to changes in noise exposure levels meeting the criteria listed below, as "reportable." Although they do not meet the threshold of significance for most land uses, there are factors to consider in whether there are extraordinary circumstances rendering a categorical exclusion as applicable.

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

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

2.2 Noise and Noise-Compatible Land Uses[3]

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.[4]

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*.

3.0 NOISE SCREENING MODEL

FAA's approved screening tool for projects involving air traffic changes uses features available within the Terminal Area Route Generation Evaluation and Traffic Simulation (TARGETS), a flight procedure design tool, combined with the Aviation Environmental Design Tool (AEDT) Environmental Plug-In. This noise screening tool identifies areas that may be exposed to changes in noise impacts

4.0 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.

The Memorandum proposes a two-step process by which FAA would implement the proposed RNAV SIDs. Step 1 has been divided into two planned publication dates, March 29, 2018 and May 24, 2018. In order to meet the April 1, 2018 date to return the west flow procedures to the pre-September 2014 flight paths, FAA would publish three interim SIDs as part of Step 1A. This 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. Step 1B would involve replacing the three interim departure routes in Step 1A and implementing nine new western departure SIDs. These SIDs would not require radar vectoring, in contrast to the three interim SIDs in Step 1A. FAA will conduct public outreach and consider comments and recommendations by the public regarding Step 1. Step Two, which is described in the Draft Environmental Review Document, is not considered in this noise analysis.

Three scenarios were evaluated for this noise analysis: the No Action Scenario, the Proposed Action Scenario, and the Pre-RNAV Western Routes Scenario.

[3] FAA Order 1050.1F. Desk Reference, Chapter 11. Noise and Noise-Compatible Land Use
[4] Refer to FAA Order 1050.1F, Paragraph 11-5. b. (10), for the full definition of noise sensitive areas.

4.1 **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.

4.2 **Proposed Action Scenario**

The Proposed Action Scenario is considered the "end-state" for Step 1 as it includes the changes in Steps 1A and 1B. 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, BNYRD, FTHLS, JUDTH, KATMN, and IZZZO as per the Memorandum.

The changes in Steps 1A and 1B 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.[5] 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.

Step 1A:

Step 1A is designed to provide petitioners short-term relief from aircraft noise, and as an interim step was not modeled.

Step 1B:

The Step 1B nine RNAV SIDs replace the three Step 1A interim RNAV SIDs and the nine current RNAV SIDs. The Step 1B RNAV SIDs incorporate the routes from Step 1A; however they provide additional routing that no longer requires ATC vectoring to join an RNAV route. These nine new procedures ensure a seamless predictable flight path from Phoenix Sky Harbor to the en route air traffic structure. The new RNAV SIDs will be renamed in accordance with FAA criteria

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.

Nine proposed RNAV SID procedures were included in the Proposed Action Scenario (Figures are available in Attachment 1):

- ZEPER (replacing MAYSA): Refer to Figure 4.2.1. ZEPER Procedure and Assigned Tracks
- QUAKY (replacing SNOBL): Refer to Figure 4.2.2. QUAKY Procedure and Assigned Tracks

[5]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.

- MRBIL (replacing YOTES): Refer to Figure 4.2.3. MRBIL Procedure and Assigned Tracks
- FORPE (replacing LALUZ): Refer to Figure 4.2.4. FORPE Procedure and Assigned Tracks
- BROAK (replacing FTHLS): Refer to Figure 4.2.5. BROAK Procedure and Assigned Tracks
- ECLPS (replacing KATMN): Refer to Figure 4.2.6. ECLPS Procedure and Assigned Tracks
- STRRM (replacing BNYRD): Refer to Figure 4.2.7. STRRM Procedure and Assigned Tracks
- FYRBD (replacing JUDTH): Refer to Figure 4.2.8. FYRBD Procedure and Assigned Tracks
- KEENS (replacing IZZZO): Refer to Figure 4.2.9. KEENS Procedure and Assigned Tracks

Using the AEDT Environmental Plug-In, backbones for each departure procedure were created, accounting for the proposed Step 1B procedures as well as the typical dispersion of RNAV SIDs. 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.

4.3 **Pre-RNAV Western Routes Scenario**

This scenario complies with Section 5.b, in the Memorandum that requires FAA to conduct a noise analysis to compare differences in noise between (1) the Pre-RNAV Western Routes[6] and the Proposed Action Scenario. To develop this scenario, track data from a sample set of 90 random days was obtained (prior to the September 2014 RNAV implementation). Using the AEDT Environmental Plug-In, backbones for each departure procedure were created, accounting for the pre-RNAV procedures as well as the increased dispersion of conventional SIDs. 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.

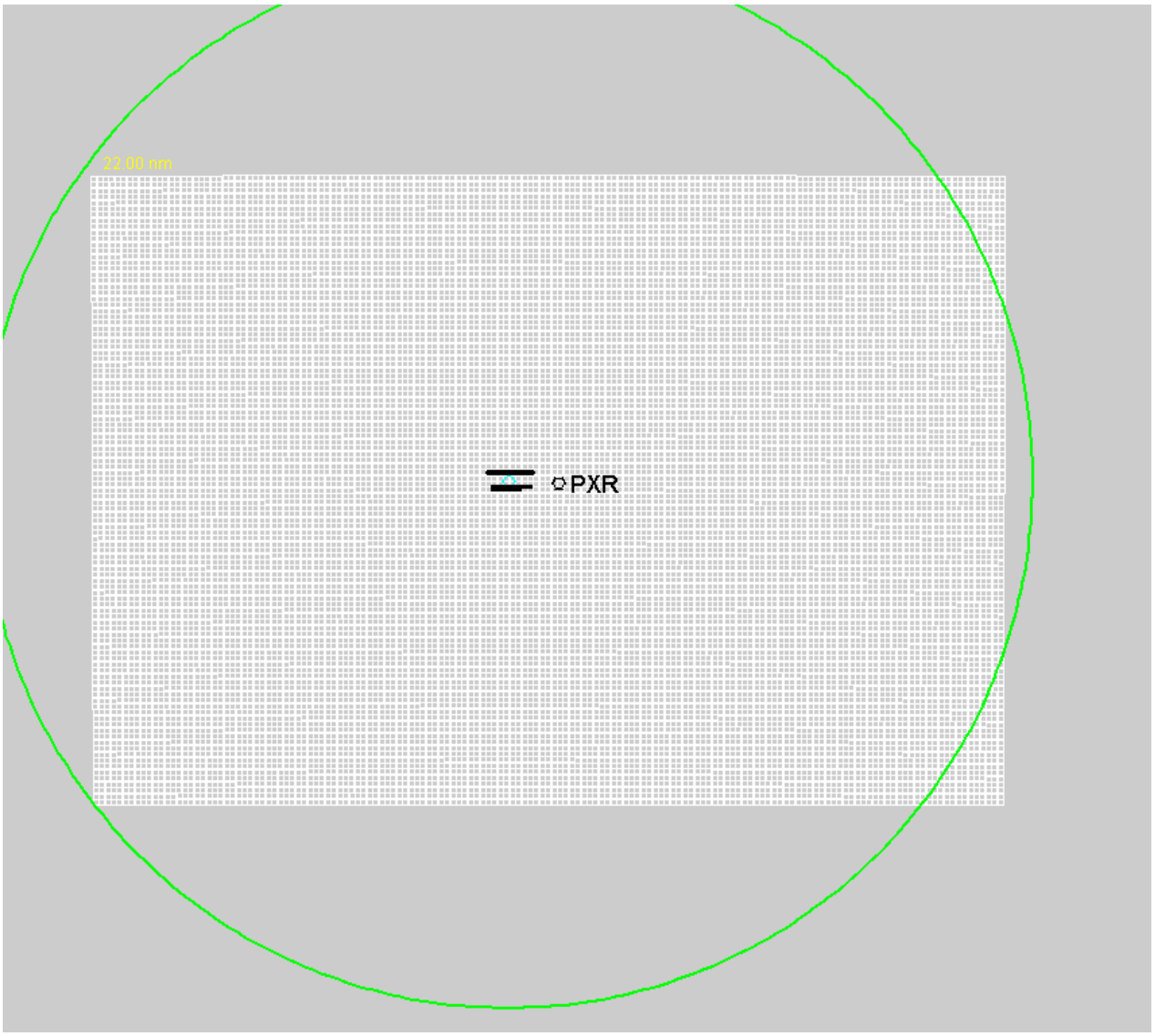
5.0 **DEVELOPMENT OF THE NOISE ANALYSIS STUDY AREA**

The study area for the noise analysis is considered to be the geographic area where the potential to be impacted by noise from the Proposed Action exists. The noise 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

[6] The "Pre-RNAV Western Routes" are defined in the Memorandum as the Standard Instrument Departures (SIDs) for Runways 25L, 25R, and 26 that were in pace prior to September 18, 2014. These SIDs are called CHILY, ST. JOHN'S, SILOW, MAXXO, STANFIELD, and BUCKEYE.

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 intervals.

Figure 5.1 – Noise Screening Grid Points (green ring set at 22 NM is for distance reference only).



6.0 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, 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.

6.1 Collection of Radar Track Data

Historical radar track data was obtained from the FAA's National Offload Program (NOP)[7] . 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 all three 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] All traffic data was obtained using the Phoenix Terminal Radar Approach Control as the radar source facility.

6.2 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 all three scenarios, the 2017 Track Data was used to represent arrivals, as changes to arrivals are not being proposed.

7.0 NOISE SCREENING METHODOLOGY

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

7.1 Scenario Specific Assumptions

7.1.1 Proposed Action Scenario

Aircraft operations were reassigned to the procedures identified in the Proposed Action to model aircraft as flying the proposed Step 1B 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.

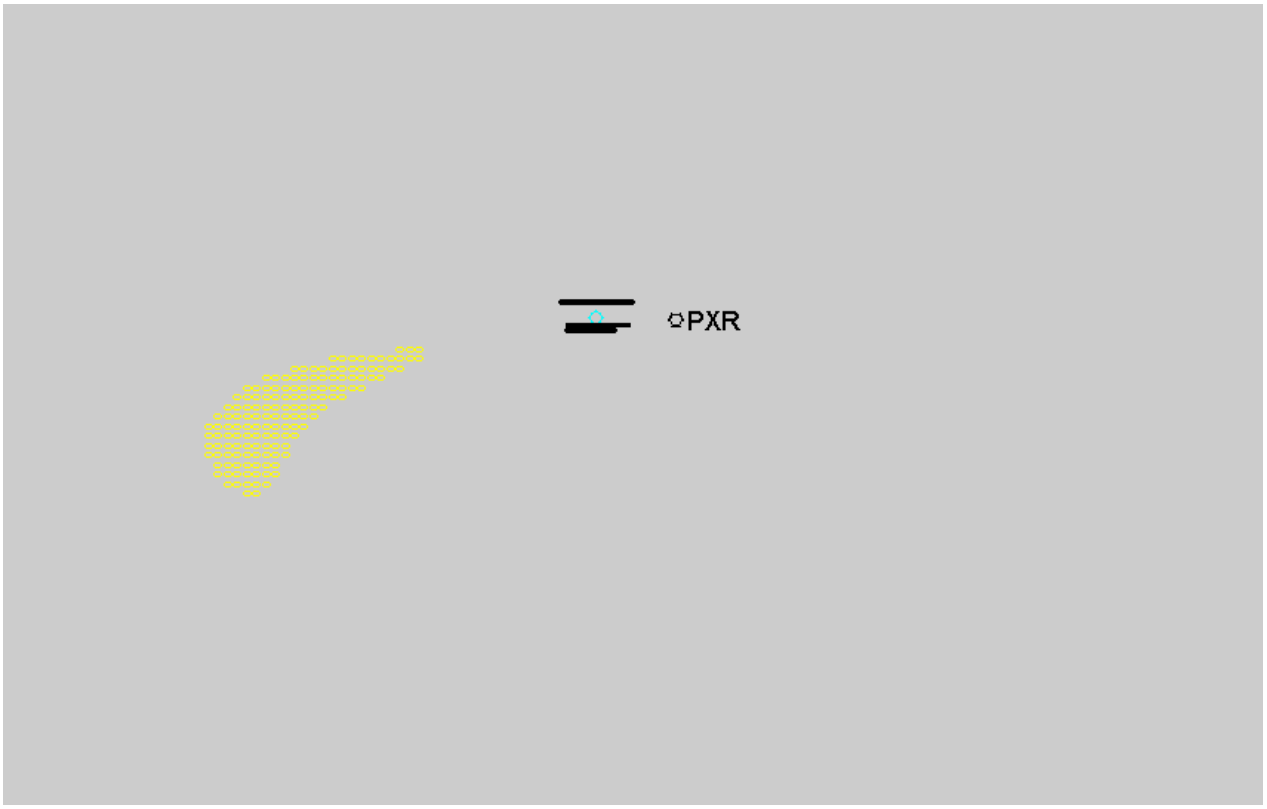
7.1.2 Pre-RNAV Western Routes Scenario

Pre-RNAV departures followed radar vectors issued by air traffic control after take-off to the first or succeeding common waypoint on the departure procedure. To create the Pre-RNAV Western Routes Scenario, flight track data from 90 random days in the year preceding September 2014 were compiled. This track data was used to create backbones to depict the dispersion and tracks of the conventional (ground-based) SIDs in effect prior to implementation of the RNAV SIDs. The 2017 Track Data was superimposed on the backbones that were based on the 2014 radar tracks, and track bundles were assigned to the individual backbone most closely aligned with the track bundles.

8.0 **NOISE SCREENING RESULTS**

FAA conducted a separate noise screening analysis for each scenario, then compared the Proposed Action Scenario to the No Action Scenario (Figure 8.1), and the Proposed Action Scenario to the Pre-RNAV Western Routes Scenario in accordance with Section 5 of the Memorandum (Figure 8.2).

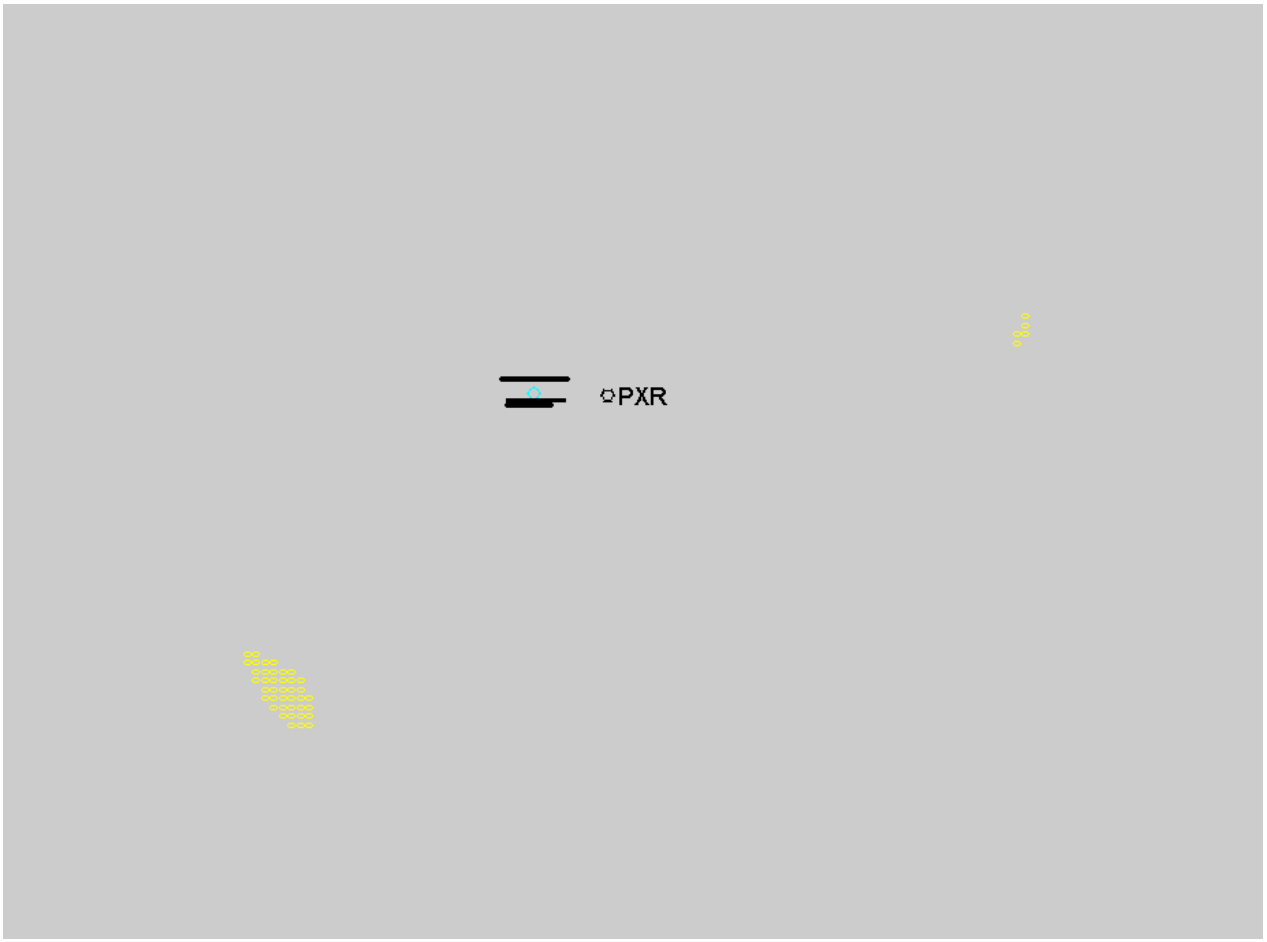
Figure 8.1. Changes in Noise Exposure Levels: Comparison of the No Action Scenario and the Proposed Action Scenario.



Legend

	DNL 45-60 dB Alternative noise exposure that is 5.0 dB or greater than the baseline

Figure 8.2. Changes in Noise Exposure Levels: Comparison of the Pre-RNAV Western Routes Scenario to the Proposed Action Scenario:



Legend

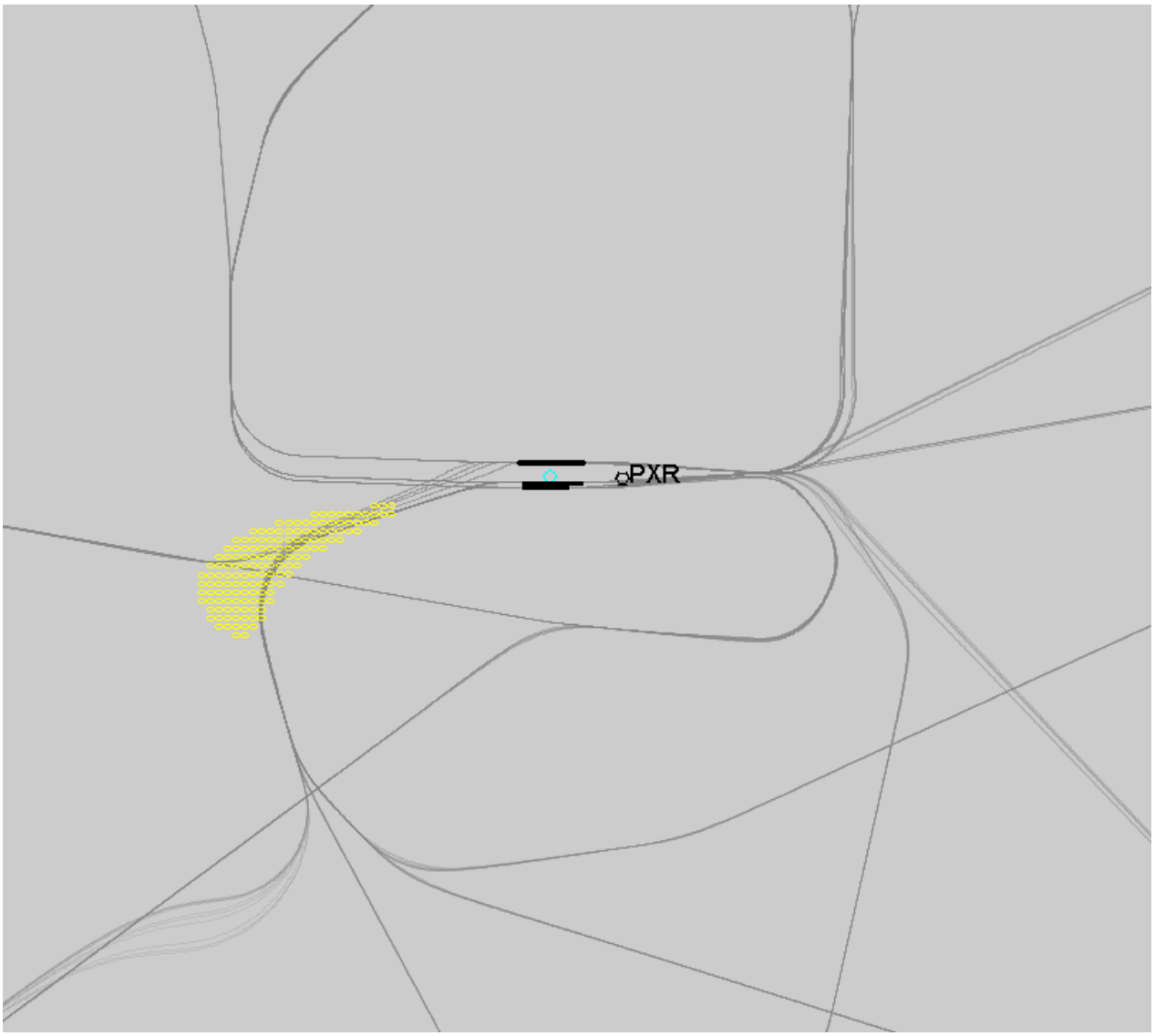
	DNL 45-60 dB Alternative noise exposure that is 5.0 dB or greater than the baseline

The noise screening in Figure 8.1 indicates that the Proposed Action will not result in significant noise impacts relative to the No Action Scenario. . However, the screening did identify an area of reportable change of more than DNL 5 dB between the DNL 45 dB and DNL 60 dB noise exposure level. The area is located approximately three nautical miles southwest of Phoenix Sky Harbor. It encompasses approximately 22 square miles and is roughly defined by the Salt River along its northern edge, 7th Avenue to the east, 75th Avenue to the west, and Elliot Road to the south.

The screening in Figure 8.2 also indicates that the Proposed Action will not result in significant noise impacts relative to the Pre-RNAV Western Routes Scenario. This noise screening is for informational purposes and is not intended to show a potential observed change from the current state should the proposed procedures be implemented. This screening also indicates that the Proposed Action will not result in significant noise impacts relative to the Pre-RNAV Western Routes Scenario. The screening did identify two areas of reportable change of more than DNL 5 dB between the DNL 45 dB and DNL 60 dB noise exposure level. The first area is approximately 10 NM to the southwest of the Phoenix Sky Harbor Airport and spans roughly 3 NM northwest to southeast and 1.25 NM wide. This area is located at the area where four SIDs, the BROAK, FYRBD, STRRM and ECLPS first begin to diverge at the WETAL waypoint. The second area is significantly smaller at approximately 12 NM east of Phoenix Sky Harbor Airport and spans roughly 1 NM north to south and .5 NM wide.

Figures 8.3 and 8.4 show the areas of potential reportable change with an overlay of the Proposed Action procedures. The Proposed Action procedures are represented by simulated tracks based on aircraft flying the centerlines of the proposed procedures.

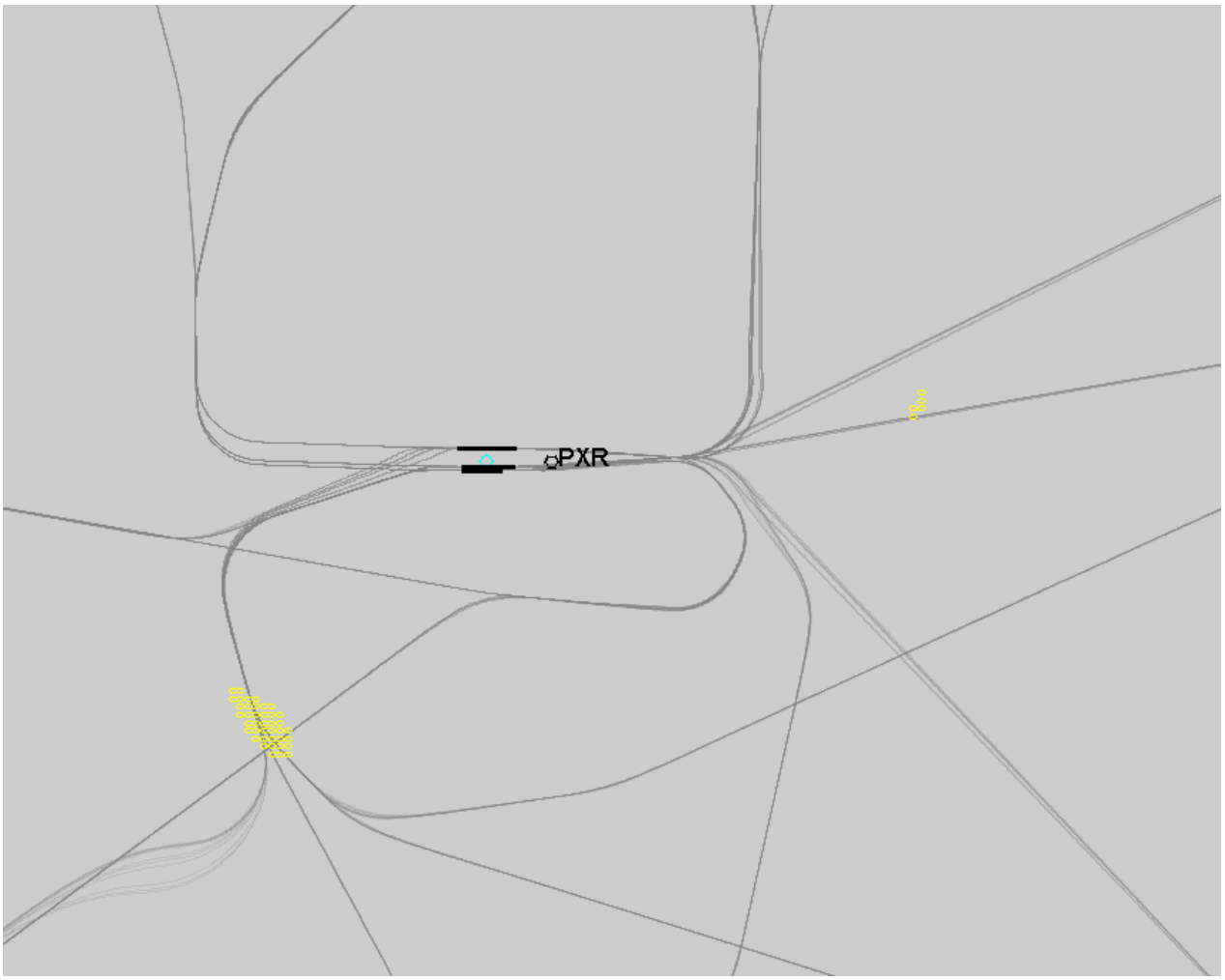
Figure 8.3. Area of Reportable Change in Noise Relative to No Action Scenario with Overlay of Proposed Procedures (tracks lines depicted simulated flight tracks (depicts potential tracks of various aircraft performance) on the centerline of the departure procedures).



Legend

	DNL 45-60 dB Alternative noise exposure that is 5.0 dB or greater than the baseline

Figure 8.4. Area of Reportable Change in Noise Relative to Pre-RNAV Western Routes Scenario with Overlay of Proposed Procedures (tracks lines depicted simulated flight tracks (depicts potential tracks of various aircraft performance) on the centerline of the departure procedures).



Legend

	DNL 45-60 dB Alternative noise exposure that is 5.0 dB or greater than the baseline

9.0 EVALUATION OF NOISE SCREENING RESULTS

For the comparison of the Proposed Action and the No Action Scenarios, the FAA further reviewed the existing land use within the polygon to determine whether the Proposed Action is compatible with the existing land uses.

The FAA reviewed the City of Phoenix, Planning and Development Department, *City of Phoenix General Plan* which identifies existing land use within the greater Phoenix area.[8] Based on this review, land use within the area of the reportable change in noise consists of approximately 57% residential, 12% industrial, 4% commercial, 3% business parks, 8% public/quasi-public, and 16% parks and open space.

The existing land uses identified in the City of Phoenix General Plan are consistent with the land use categories per Exhibit 11-3, *Land-Use Compatibility with Yearly Day-Night Average Sound Levels*. FAA Order 1050.1F states "The compatibility of existing and planned land uses in the vicinity of an airport is usually associated with the extent of the airport's noise impact. If the noise analysis concludes that there is no significant impact, a similar conclusion usually may be drawn with respect to compatible land use." The predicted change in noise exposure levels of the Proposed Action at noise-sensitive areas would remain below the significant impact threshold. Therefore, the Proposed Action is compatible with existing land use when compared with the No Action Alternative.

[8] www.phoenix.gov/pdd/pz/general-plan-2002. Accessed December 29, 2017.

10.0 **CONCLUSION**

FAA has conducted a noise screening analysis of three alternatives: the No Action Scenario representing current conditions, the Proposed Action Scenario representing the proposed procedures at the conclusion of Step 1B, and the Pre-RNAV Western Routes Scenario representing conditions prior to September 2014. No significant noise impacts were identified when the Proposed Action was compared to the No Action Scenario or to the Pre-RNAV Western Routes Scenario.

ATTACHMENT 1

Figure 4.2.1. ZEPER Procedure and Assigned Tracks

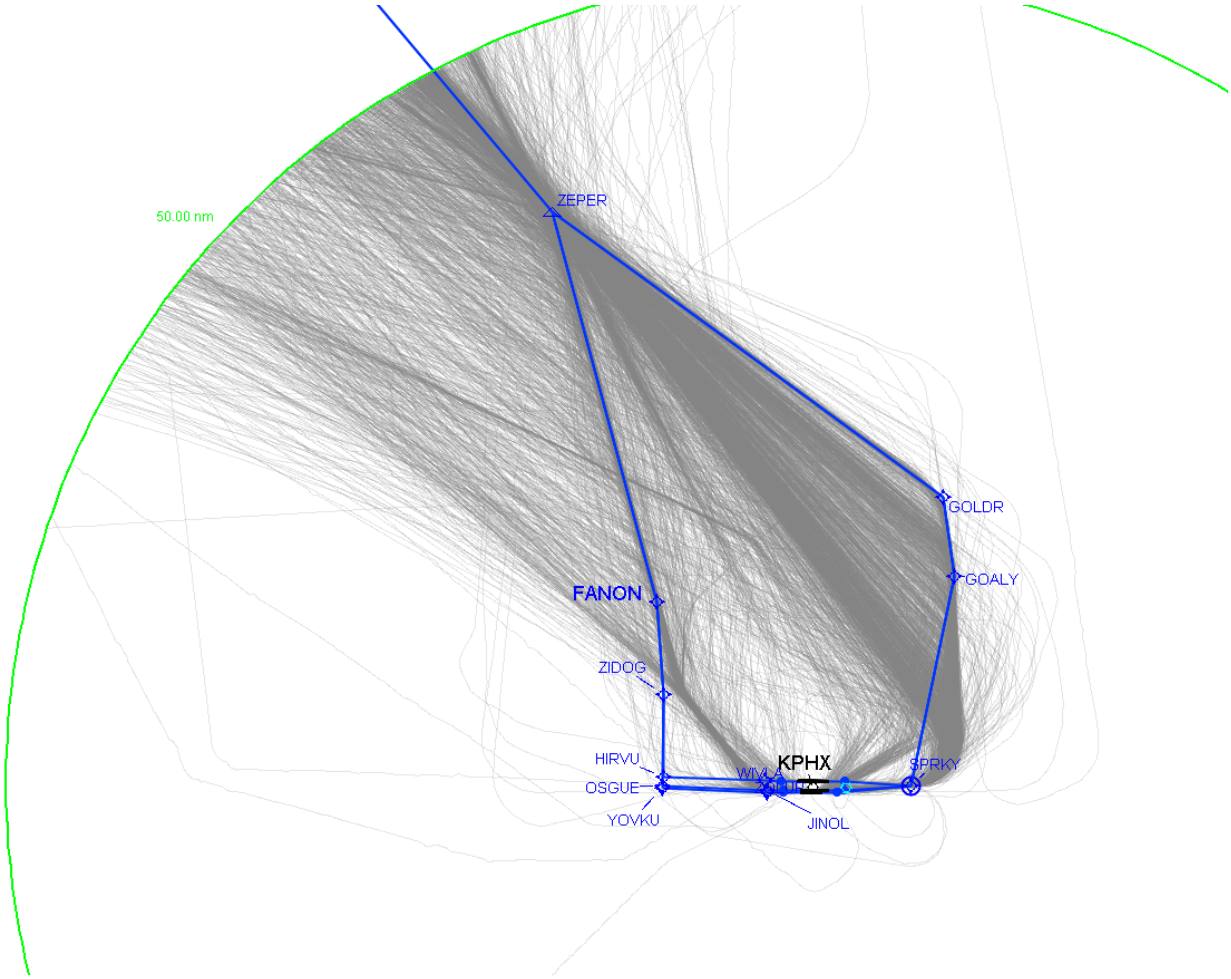


Figure 4.2.2. QUAKY Procedure and Assigned Tracks

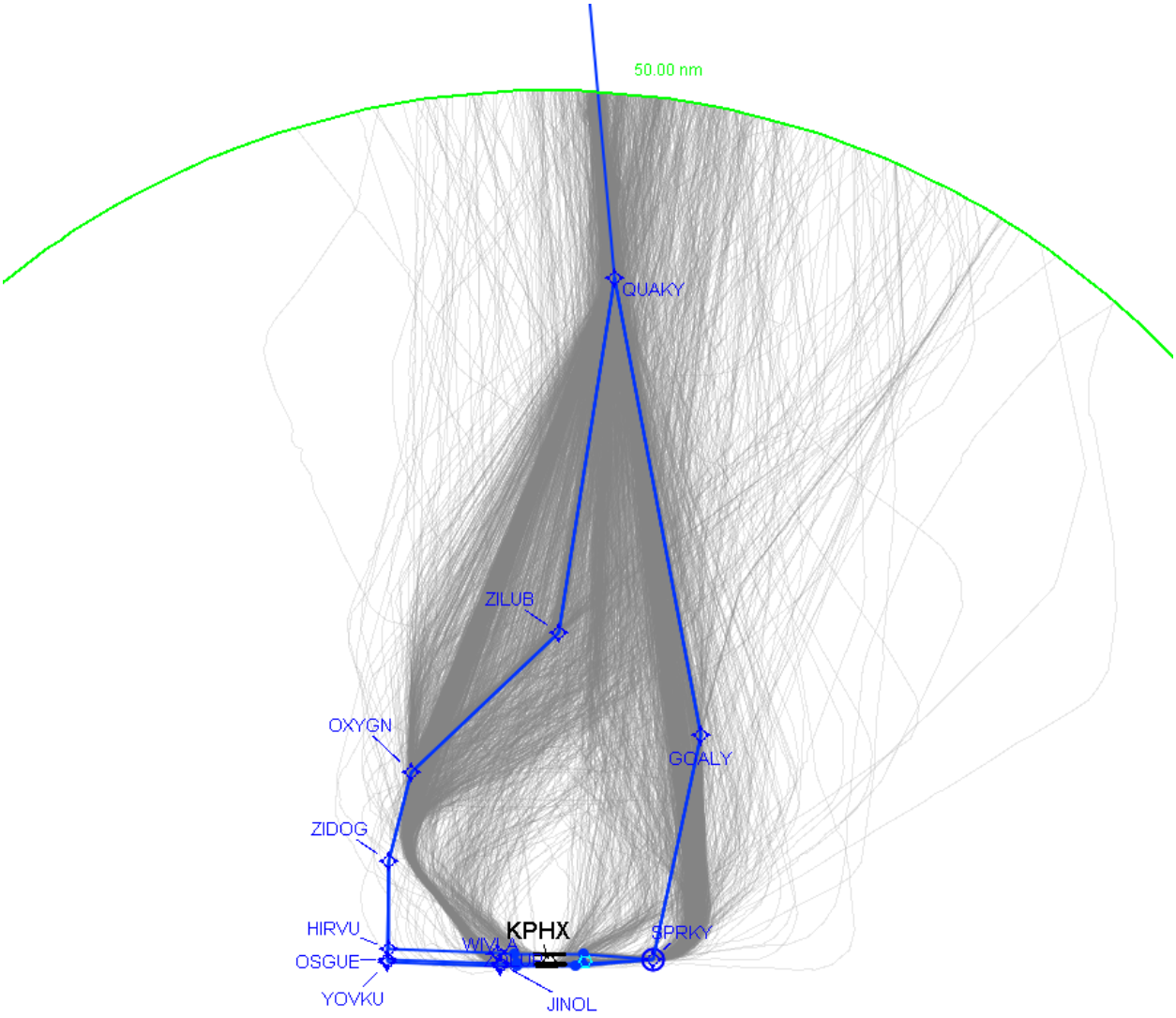


Figure 4.2.3. MRBIL Procedure and Assigned Tracks

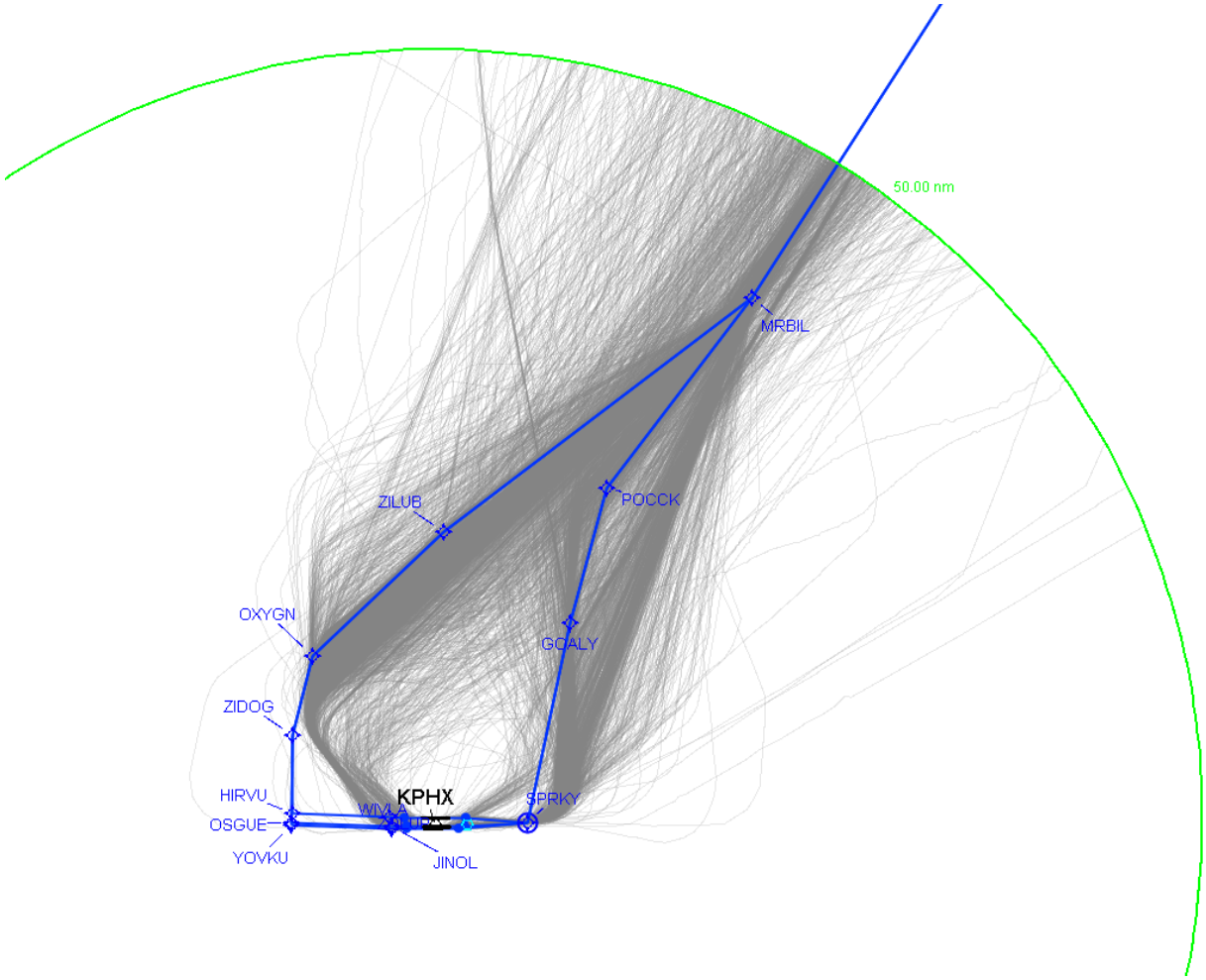


Figure 4.2.4. FORPE Procedure and Assigned Tracks

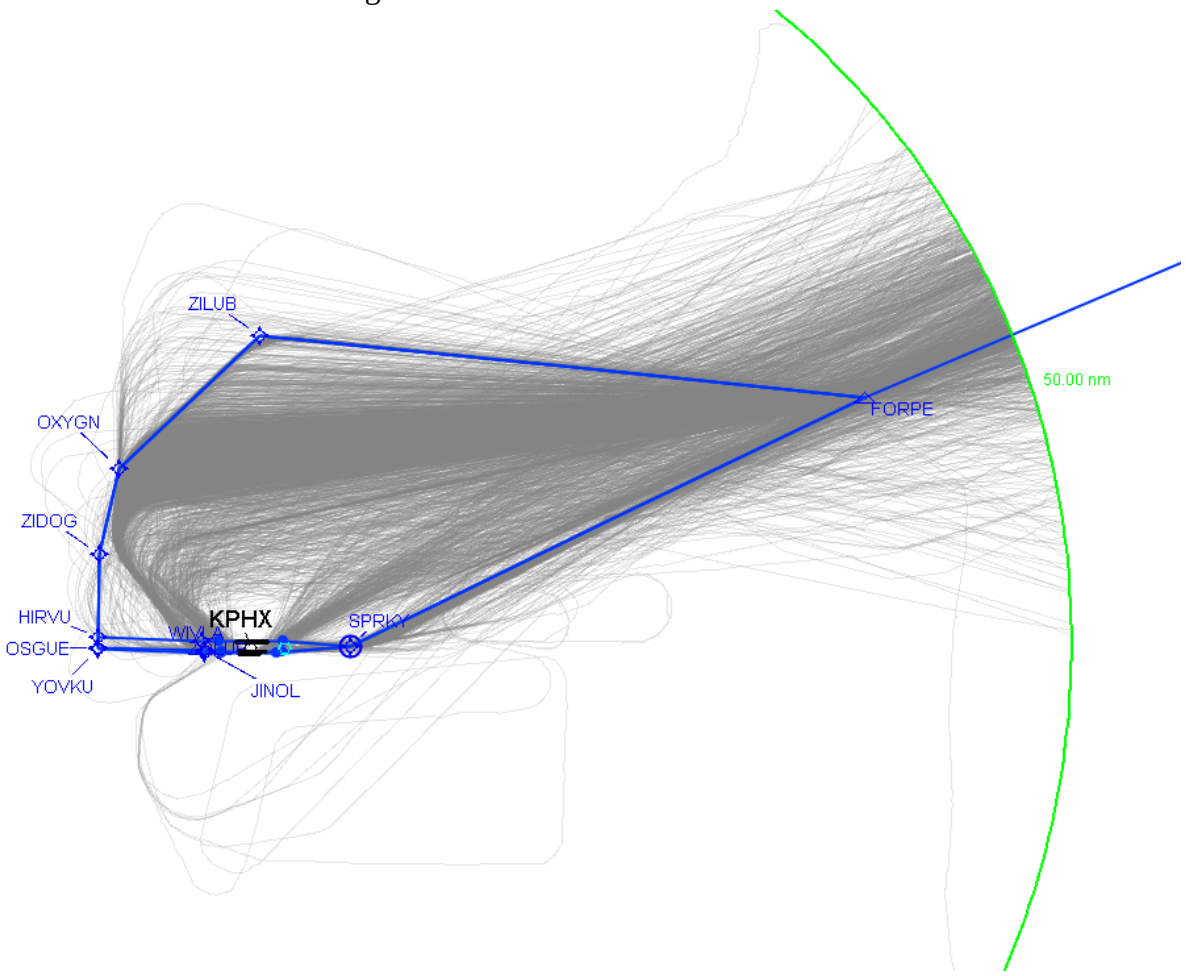


Figure 4.2.5. BROAK Procedure and Assigned Tracks

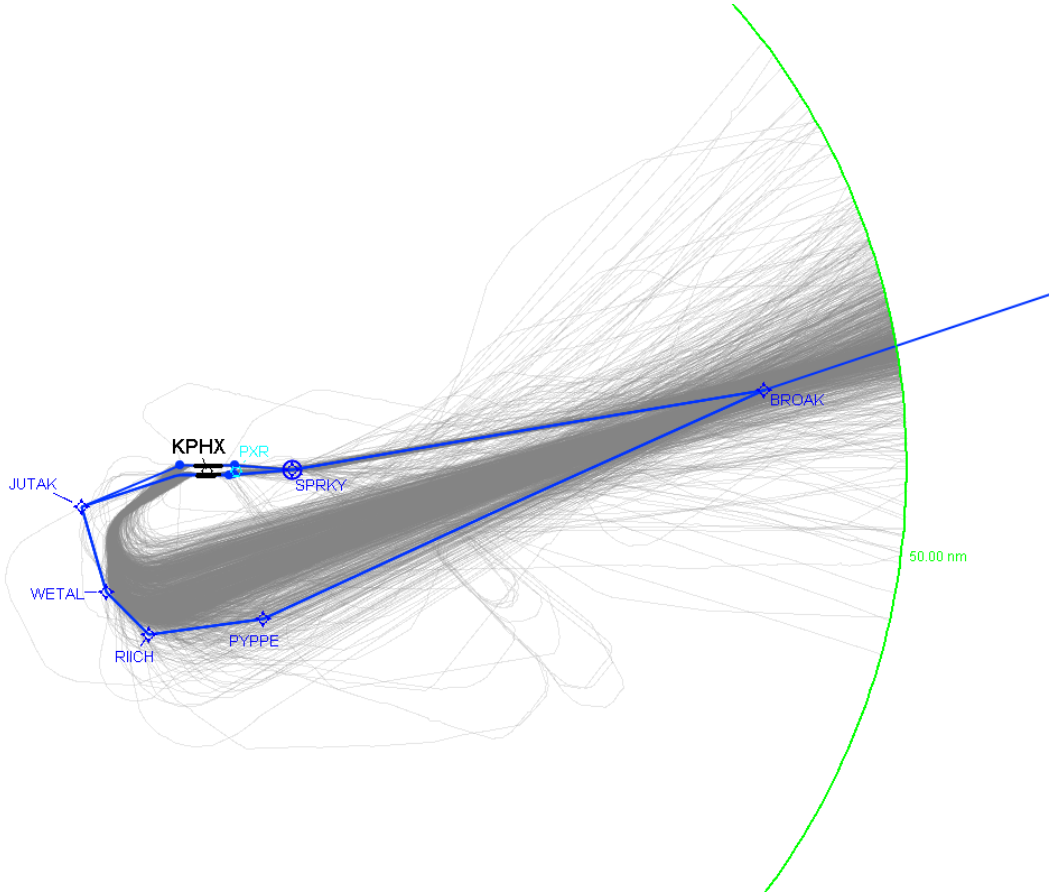


Figure 4.2.6. ECLPS Procedure and Assigned Tracks

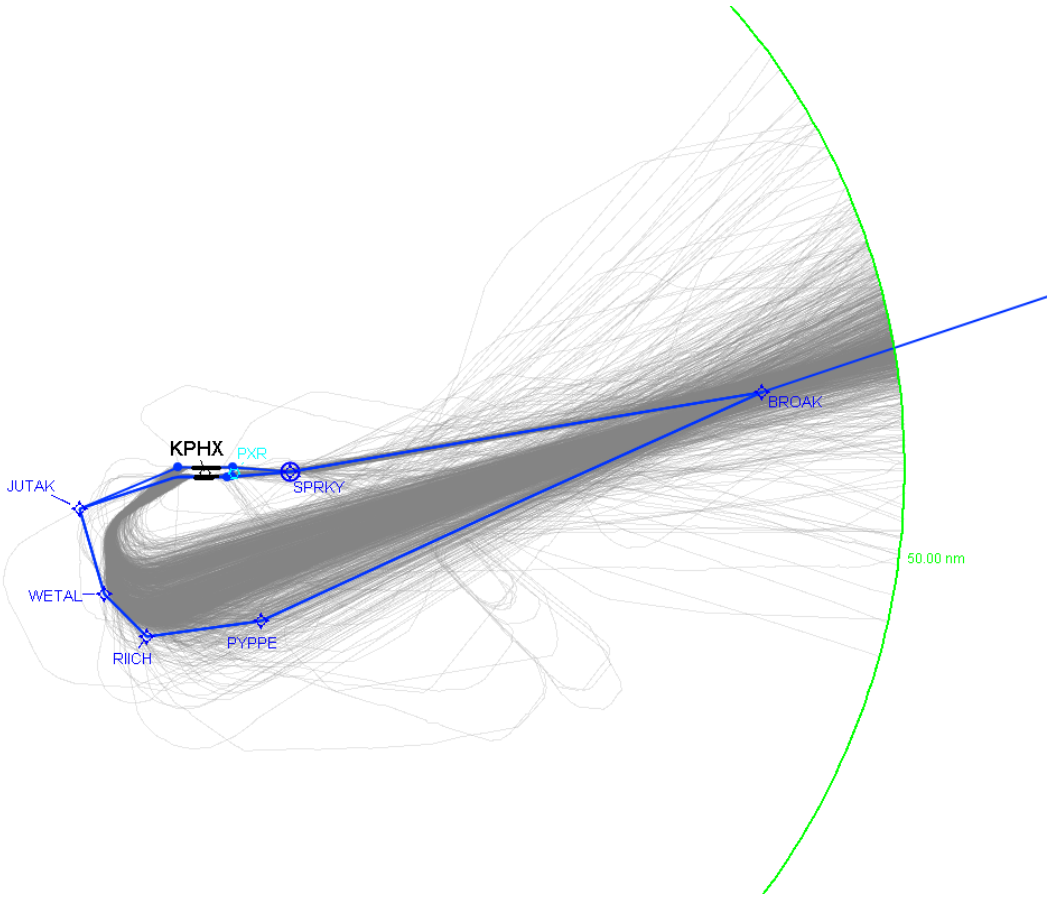


Figure 4.2.7. STRRM Procedure and Assigned Tracks

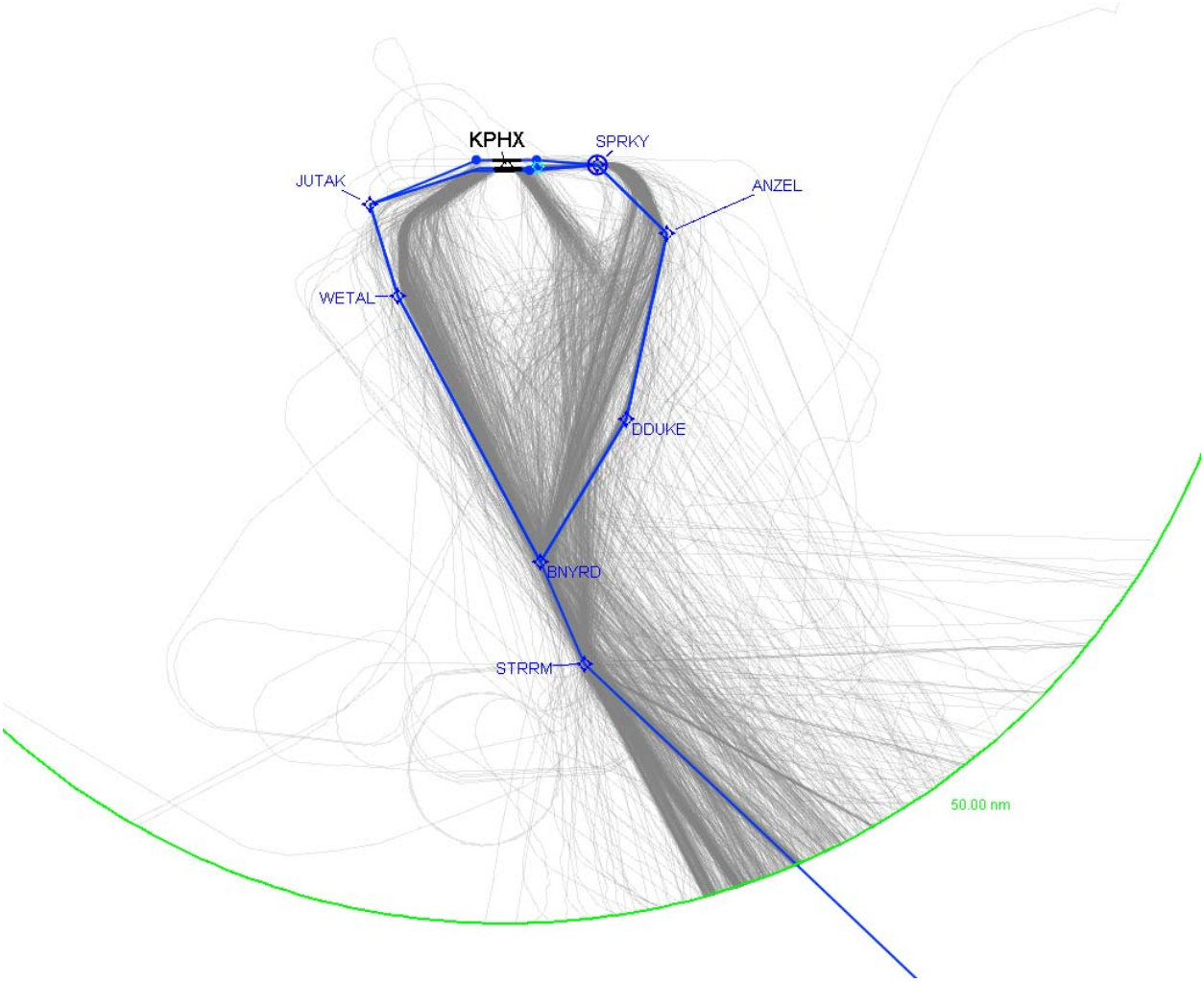


Figure 4.2.8. FYRBD Procedure and Assigned Tracks

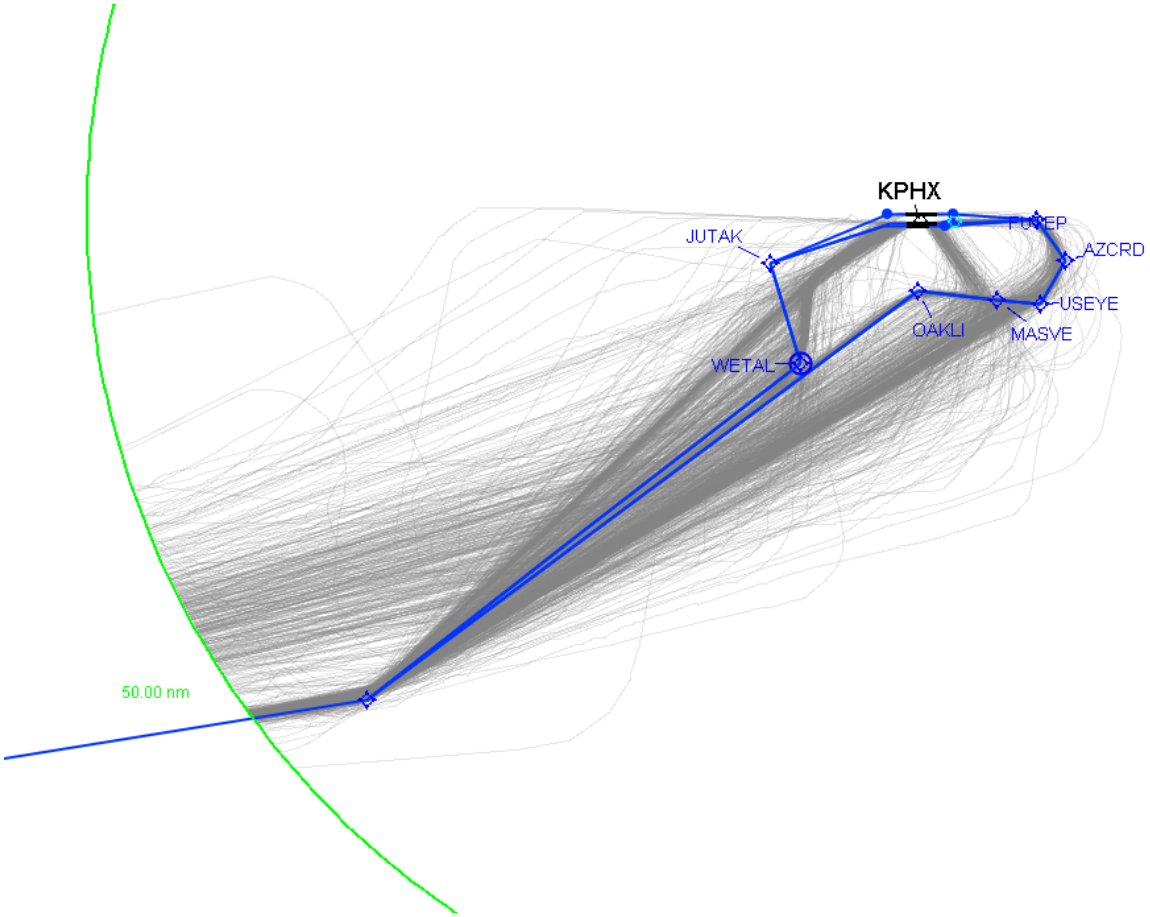


Figure 4.2.9. KEENS Procedure and Assigned Tracks