FAA
Airspace Policy, Environmental Team (AJV-114)

Evaluation of Changes to the FAA's Proposed Action regarding the Re-designation and Expansion of Restricted Area R-4403

Introduction

The public provided comments in response to both an FAA Notice of Proposed Rulemaking (NPRM) published in July 2014 and a Supplemental Notice of Proposed Rulemaking (SNPRM) published in August 2014 regarding the re-designation and expansion of Restricted Area R-4403 at Stennis Space Center (SSC) in Hancock County and Pearl River County, Mississippi and St. Tammany Parrish, Louisiana. The proposed rule would remove R-4403 and replace it with an expanded restricted airspace consisting of R-4403A, R-4403B, R-4403C, R-4403E, and R-4403F (hereinafter "the Proposed Restricted Areas"). Commenters on the NPRM and SNPRM expressed concerns about the potential impact of the Proposed Restricted Areas on aircraft transiting the area and on published instrument approach procedures serving Picayune Municipal Airport (MJD) and Stennis International Airport (HSA). The FAA has developed a number of mitigation measures to address these concerns, including:

- Revisions to instrument approach procedures serving MJD
- Revisions to instrument approach procedures serving HSA
- Addition of two visual flight rules (VFR) waypoints south of Interstate 10 to assist pilots navigating along Interstate 10 to avoid inadvertently flying into the Proposed Restricted Areas.

These mitigation measures were not evaluated or analyzed in the United States Navy's and National Aeronautics and Space Administration's (NASA) *Final Environmental Assessment for the Redesignation and Expansion of Restricted Airspace R-4403 to Support Military Air-to-Ground Munitions Training and National Aeronautics and Space Administration Rocket Engine Testing at Stennis Space Center, Hancock County and Pearl River County, Mississippi and St. Tammany Parrish, Louisiana*, dated October 2015 (hereinafter "the FEA"). Due to the nature of the mitigation measures and their potential for environmental impact, the FAA has determined that they do not require supplementation of the FEA. The discussion below explains the basis for this determination.

Revisions to Instrument Approach Procedures

MJD:

The current RNAV (GPS) RWY 18 would be split into two separate approaches, a Y variant and a Z variant. The Z variant would be active when the SUA is active. The change that would impact the flight path of aircraft is the missed approach course. The missed approach course in the existing procedure directs aircraft east of the airfield. The revised missed approach course would direct aircraft west of the airfield and away from the Proposed Restricted Airspace.

RNAV (GPS) RWY 36: This procedure would be inactive when the Proposed Restricted Airspace is active. Aircraft would not be able to approach the airfield from the south.

VOR A: The major changes are a 3° change in course, from 132° to 129°, to the runway and the elimination of circling for Category D aircraft (those with approach speeds between 141-165 knots) and Category C aircraft (121-140 knots). These changes would direct aircraft further north of the airfield during their approach and allow them to avoid the Proposed Restricted Airspace during a missed procedure.

HSA:

The current ILS or LOC RWY 18 would be split into two separate approaches, a Y variant and a Z variant. The Z variant would be active when the Proposed Restricted Airspace is active. The change to the procedure that would impact the flight path of aircraft is moving the start of the approach further 8.6 nautical miles further north to avoid the expanded Proposed Restricted Airspace and tie in to an existing Visual Flight Rules Airway. In addition, the holding pattern for missed approaches would move further north.

RNAV (GPS) RWY 18: The change to the procedure that would impact the flight path of aircraft is moving the start of the approach 1.1 nautical miles further north which essentially would lower the altitude of the approach by 9.2%.

Establishment of New VFR Waypoints

The new VFR waypoints south of I-10 would assist VFR pilot navigation by providing navigational reference points, and would not specify a flight path or direct the flow of air traffic. As such they are considered advisory actions, which are not subject to the National Environmental Policy Act (NEPA). Therefore, no further environmental analysis is required for this action.

Environmental Analysis

The changes to the approach procedures at MJD would alter how aircraft fly to the runway and fly missed approaches. They would not change the number, time, or type of aircraft operations, nor would they result in any disturbance of the ground or ground based resources. The changes would not result in any additional flight miles.

The changes to the approach procedures at HSA would shift the start of southbound approaches further north of the airfield resulting in slightly reduced flight altitudes. In addition the holding pattern would be shifted further north to the new start of the revised approach as would the point to where aircraft will fly after a missed approach. Aircraft that missed an approach would fly 8.9 nautical miles further north thereby adding roughly 18 nautical miles to each missed approach. The changes to these approach procedures would not result in any change in the time, type or level of operations at HSA, nor would they result in any disturbance of the ground or ground based resources.

Based on the results of the noise analysis (see below), the changes to the instrument approach procedures at MJD and HSA fall within the scope of the categorical exclusion in paragraph 5-6.5.i of FAA Order 1050.1F, which includes “modifications to currently approved procedures conducted below 3,000 feet [above ground level (AGL)] that do not significantly increase noise over noise sensitive areas.” This categorical exclusion reflects the FAA’s determination, approved by the Council on Environmental Quality, that such actions normally do not cause significant environmental effects, either individually or cumulatively. It would be extraordinary for such an action to have the potential to cause significant environmental effects. Paragraph 5-2 of FAA Order 1050.1F includes a list of circumstances that could involve a potential for significant environmental impact from an otherwise categorically excluded action. These circumstances are addressed under “Extraordinary Circumstances” below.

Air Quality and Climate

The FAA reviewed 30 random days of radar and operations data for MJD and determined that the number of operations and miles flown (and resultant fuel burn) would not change, and as such the changes to the approach procedures at Picayune Municipal would result in no additional fuel burn that in turn would result in an increase in air emissions. As such the changes to the approach procedures at MJD would have no impact on air quality.

The FAA reviewed 28 random days of radar and operations data for HSA and determined that there would be a potential increase in miles flown for aircraft approaching from the north that conduct missed approaches. Each missed approach event would add roughly 18 nautical miles

at an altitude of approximately 2,000 feet AGL that would otherwise not be flown. The review of the data indicates that a missed approach (including training) is flown on average once a day.

The FAA conducted an analysis to estimate changes in emissions from the modified missed approach procedures. Only the tracks captured within the 28 days of radar data identified as causing an increase in miles flown and thus causing the change to the air quality emissions were analyzed. The emissions from these tracks were calculated on an annualized basis within the Aviation Environmental Design Tool (AEDT) flying without the modified missed approach (Baseline) and then flying with the modified missed approach (Alternative). In order to model the missed approaches each missed approach was modelled as three separate flights, an arrival, a departure back to the holding point, and a then as a new arrival. This resulted in an extremely conservative approach as the model assumes that a departing aircraft is emitting more VOCs than a cruising aircraft.[1] Table 1 below shows the change in emissions (Alternative minus Baseline), compared to the highest *de minimis* level for each pollutant under the U.S. Environmental Protection Agency's general conformity rule (40 C.F.R. § 93.153(b)).[2]

	CO (tons)	**VOC (tons)**	**NOx (tons)**	**SOx (tons)**	**PM 2·5 (tons)**	**PM 10 (tons)**
Impact of Procedure (Alternative-Baseline)	-237.03	13.67	5.17	0.001	-0.116	-0.116
Highest EPA *De Minimis* Level	*100*	*100*	*100*	*100*	*100*	*100*
Exceedance of *De Minimis* Level?	No	No	No	No	No	No

Table 1: Air Quality Analysis Results for Approach Procedure Changes at HSA.

Table 1 does not include the *de minimis* level for lead because AEDT does not model lead emissions, but the EPA has released guidance on how to calculate these emissions. Using the document *Lead Emissions from the Use of Leaded Aviation Gasoline in the United States*

[1] Individual pollutant results vary within the AEDT model depending on engine type and activity. The type of engine (jet/piston/turboprop), the fuel flow into the engine, the engine mode, the time in each engine mode, the temperature of the engine, and the atmospheric pressure at that particular place all impact how much of each sort of combustion is occurring and thus impact the differences in emissions. See AEDT 2a Technical Manual (available at https://www.faa.gov/about/office_org/headquarters_offices/apl/research/models/aedt/media/AEDT2a_TechManual_2012August31b.pdf), pages 149-159 for more detail.

[2] The highest *de minimis* levels are used because the relevant Air Quality Control Region is classified as attainment/unclassifiable for all criteria pollutants.

(EPA420-R-08-020, October, 2008), the following formula is given for the calculation where the LTO operations of piston aircraft are known:

$$Pb\ (kg) = (\text{piston-engine LTO})*(7.0*10^{-3})$$

From the aircraft above, two out of the 22 total aircraft in these track sets modeled were piston aircraft, which corresponds to 26 annual piston aircraft operations. Since we're looking at missed approaches which contains actions that simulate parts of an arrival procedure and part of a departure procedure, we'll conservatively assume that 1 operations = 1 LTO cycle in this case. Given this assumption, the annual Pb emissions are 0.182 kilograms or 0.0002 tons, which is well under the EPA's *de minimis* level of 25 tons.

Based on these results, the changes in the approach procedures would not have the potential to cause a significant effect on air quality, as defined in FAA Order 1050.1F.

The same AEDT analysis reported an annual increase in CO_2 emissions of 3.5 metric tons per year, which constitutes an insignificant increase in terms of climate when compared to the 6,708.3 x 10^6 metric tons of CO_2 released in the U.S. in 2011.

Noise Analysis

The FAA conducted a noise screening analysis for the proposed procedure changes at MJD and HSA to determine if there would be any "reportable" or "significant" increase in noise over noise sensitive areas as defined in FAA Order 1050.1F. The analysis for MJD was conducted using the Aviation Environmental Screening Tool. The results of the analysis showed no noise increase at or above DNL 45 dB, and thus no reportable or significant noise increase.

The analysis for HSA was conducted using the Terminal Area Route Generation, Evaluation, and Traffic Simulation (TARGETS) Aviation Environmental Design Tool (AEDT) Environmental Plug-In tool. The results of this analysis also showed no reportable or significant increase in noise.

Extraordinary Circumstances

Based on the above analysis, and consistent with paragraph 5-2.b of FAA Order 1050.1F, the FAA has determined the above-described procedure changes at MJD and HSA would not involve any extraordinary circumstances because they would not:

1) cause an adverse effect on cultural resources protected under the National Historic Preservation Act of 1966, as amended, 54 U.S.C. §300101 et seq.;[3]

[3] Based on the nature of the procedure changes and their potential for environmental impact, the FAA has determined that they are not a type of activity that has the potential to cause effects on historic properties under 36 C.F.R. § 800.3(a).

2) have the potential to cause a significant impact on properties protected under Section 4(f);

3) have the potential to cause a significant impact, ecological, or scenic resources of Federal, state, tribal, or local significance (e.g., federally listed or proposed endangered, threatened, or candidate species, or designated or proposed critical habitat under the Endangered Species Act, 16 U.S.C. §§ 1531-1544);

4) have the potential to cause a significant impact on the following resources: resources protected by the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-667d; wetlands; floodplains; coastal zones; national marine sanctuaries; wilderness areas; National Resource Conservation Service-designated prime and unique farmlands; energy supply and natural resources; resources protected under the Wild and Scenic Rivers Act, 16 U.S.C. §§ 1271-1287, and rivers or river segments listed on the Nationwide Rivers Inventory (NRI); and solid waste management;

5) cause a division or disruption of an established community, or a disruption of orderly, planned development, or an inconsistency with plans or goals that have been adopted by the community in which the project is located;

6) cause an increase in congestion from surface transportation (by causing decrease in level of service below acceptable levels determined by appropriate transportation agency, such as a highway agency);

7) have the potential to cause a significant impact on noise levels of noise sensitive areas;

8) have the potential to cause a significant impact on air quality or a violation of Federal, state, tribal, or local air quality standards under the Clean Air Act, 42 U.S.C. §§ 7401-7671q;

9) have the potential to cause a significant impact on water quality, sole source aquifers, a public water supply system, or state or tribal water quality standards established under the Clean Water Act, 33 U.S.C. §§ 1251-1387, and the Safe Drinking Water Act, 42 U.S.C. §§ 300f-300j-26;

10) cause impacts on the quality of the human environment that are likely to be highly controversial on environmental grounds, as defined in paragraph 5 2.b of FAA Order 1050.1F;

11) be likely to be inconsistent with any Federal, state, tribal, or local law relating to the environmental aspects of the proposed action; or

12) otherwise have the potential to directly, indirectly, or cumulatively create a significant impact on the human environment.

Conclusion

Based on the foregoing analysis, and consistent with Paragraph 9-3 of FAA Order 1050.1F and 40 C.F.R. § 1502.9(c)(1), the FAA has determined that the above-described procedure changes

at MJD and HSA are not “substantial changes” to the FAA’s proposed action that are “relevant to environmental concerns,” and therefore do not require supplementation of the FEA.

TARGETS

AEDT Environmental Plug-in Report

For

Stennis International Airport

KHSA

Bay St Louis, Mississippi

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March 21, 2016

Stennis International Airport **(**HSA**)**

TARGETS Environmental Analysis Process

1. Purpose

The purpose of this report is to document the process used to analyze the noise impact of a proposed changes to instrument flight procedures at Stennis International Airport (HSA). Figure 1-1 shows the airport diagram for HSA. This report shows the analysis of instrument flight procedures at HSA using the Terminal Area Route Generation, Evaluation, and Traffic Simulation (TARGETS) Aviation Environmental Design Tool (AEDT) Environmental Plug-In tool. Table 1-1 shows the procedure names and types to be modeled.

Figure 1-2 shows the existing ILS or LOC procedure to be replaced by two of the proposed procedures. The proposed ILS or LOC procedures will establish a “Y” variant and a “Z” variant. The proposed ILS or LOC procedures are shown in Figures 1-3 and 1-4. Figure 1-5 shows the existing RNAV procedure to be replaced by a new RNAV procedure, which is shown in Figure 1-6.

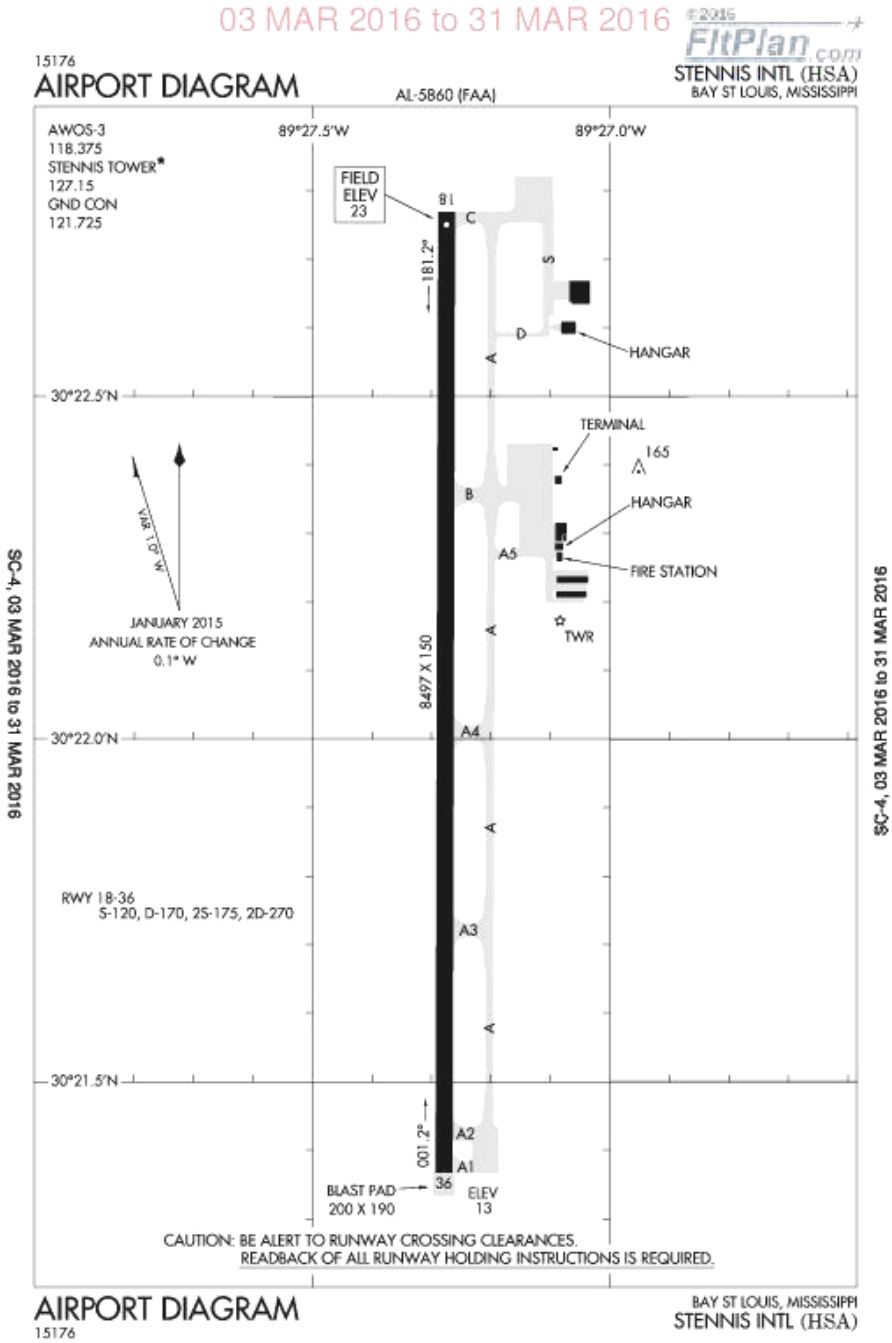

Figure 1-1: Airport Diagram of HSA

Procedure Name	Procedure Type
ILS or LOC Y RWY 18	ILS or LOC
ILS or LOC Z RWY 18	ILS or LOC
RNAV (GPS) RWY 18	RNAV

Table 1: HSA Procedures to Be Modeled

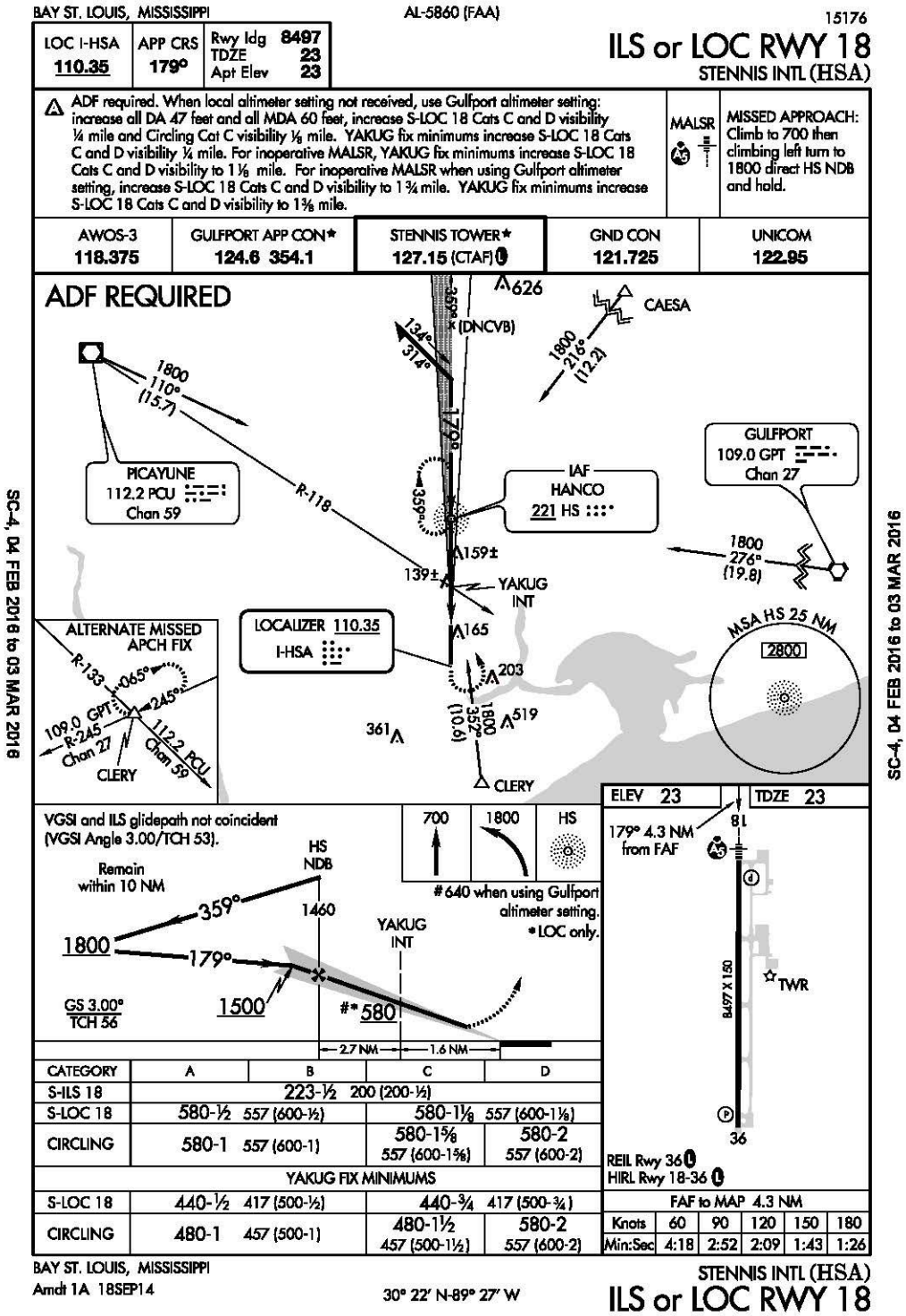

Figure 2-2: Current Published ILS or LOC Approach Procedure

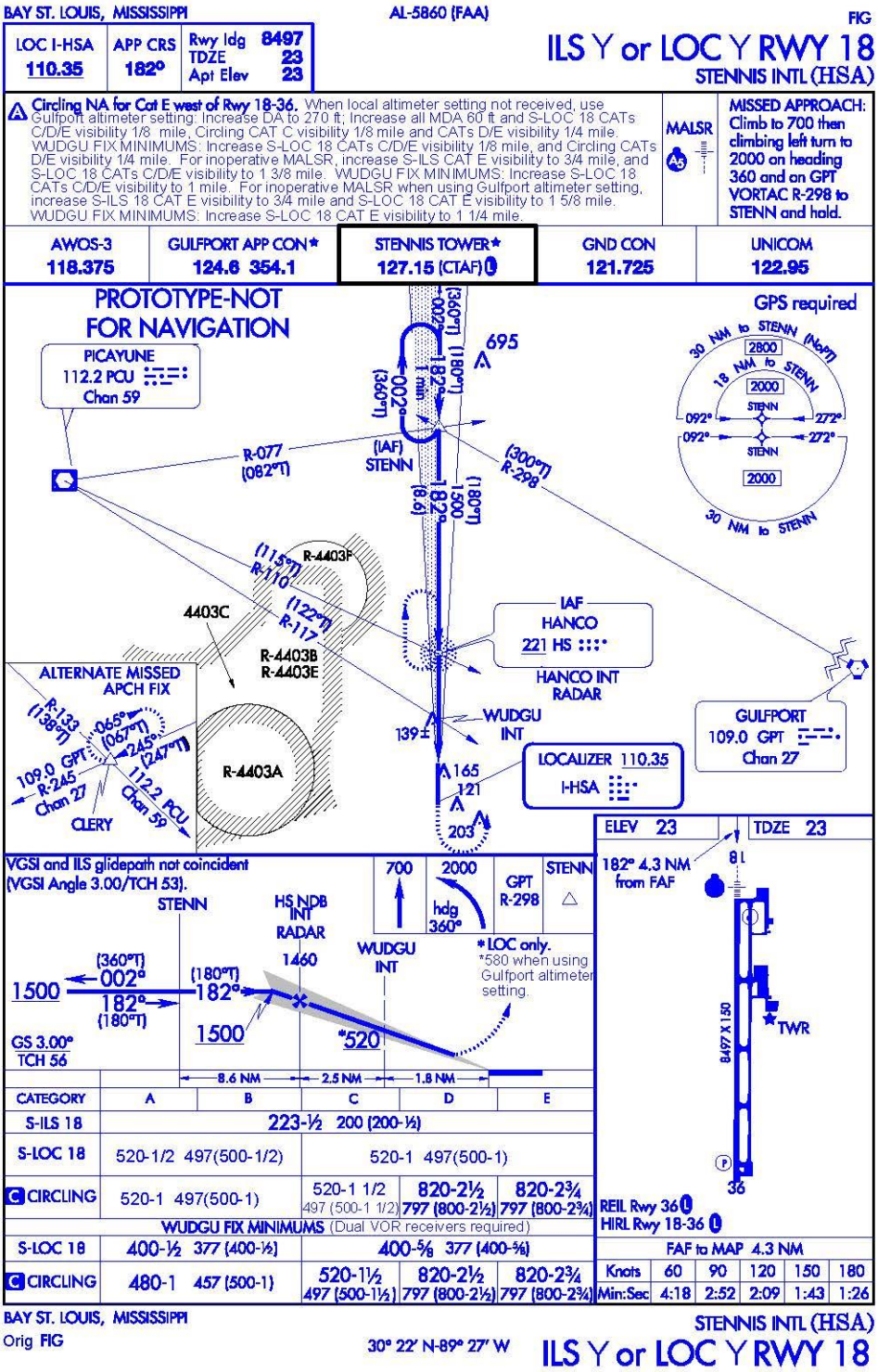

Figure 3-3: Proposed Procedure ILSY or LOCY RWY 18

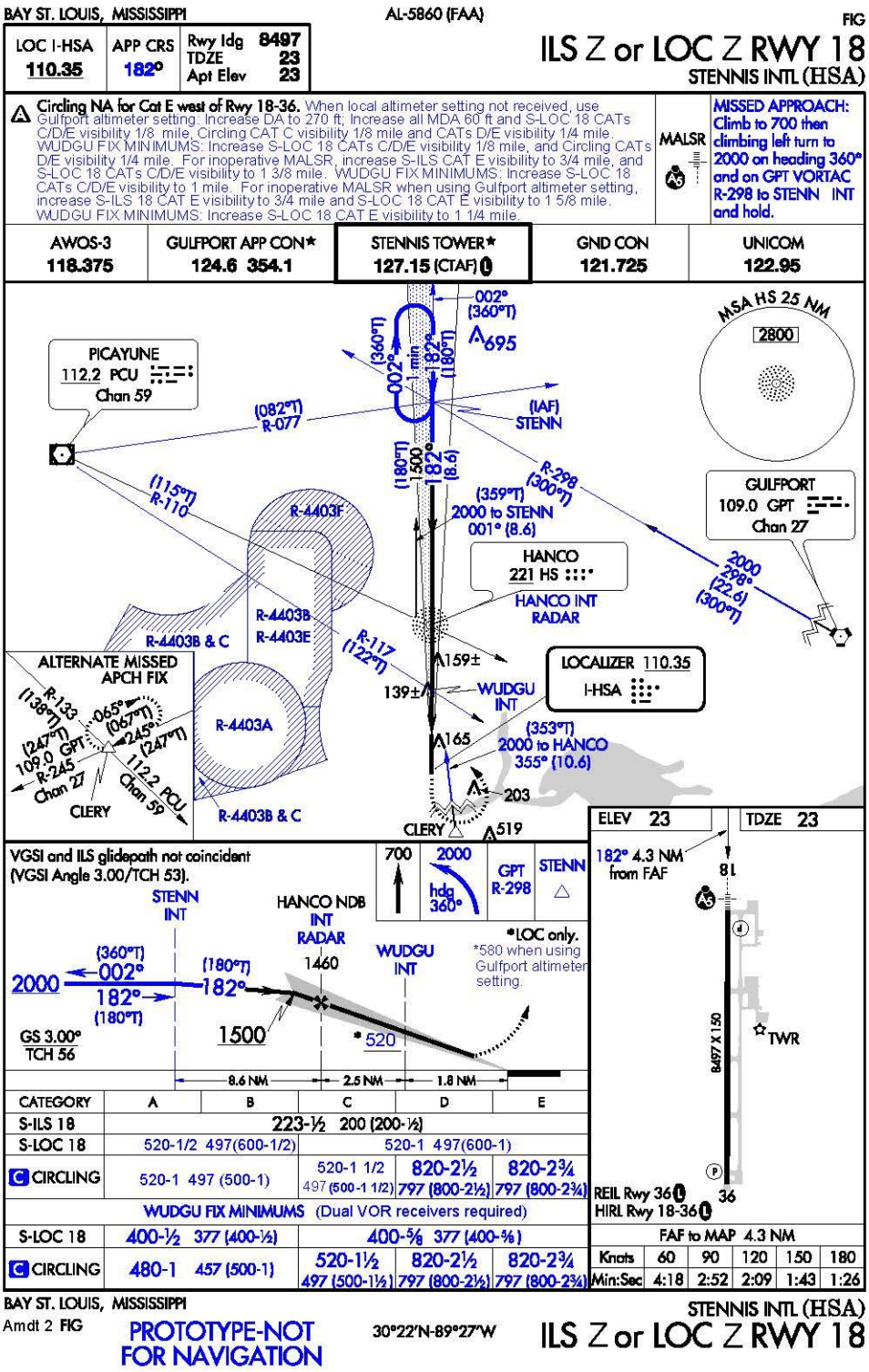

Figure 4-4: Proposed Procedure ILSZ or LOCZ RWY 18

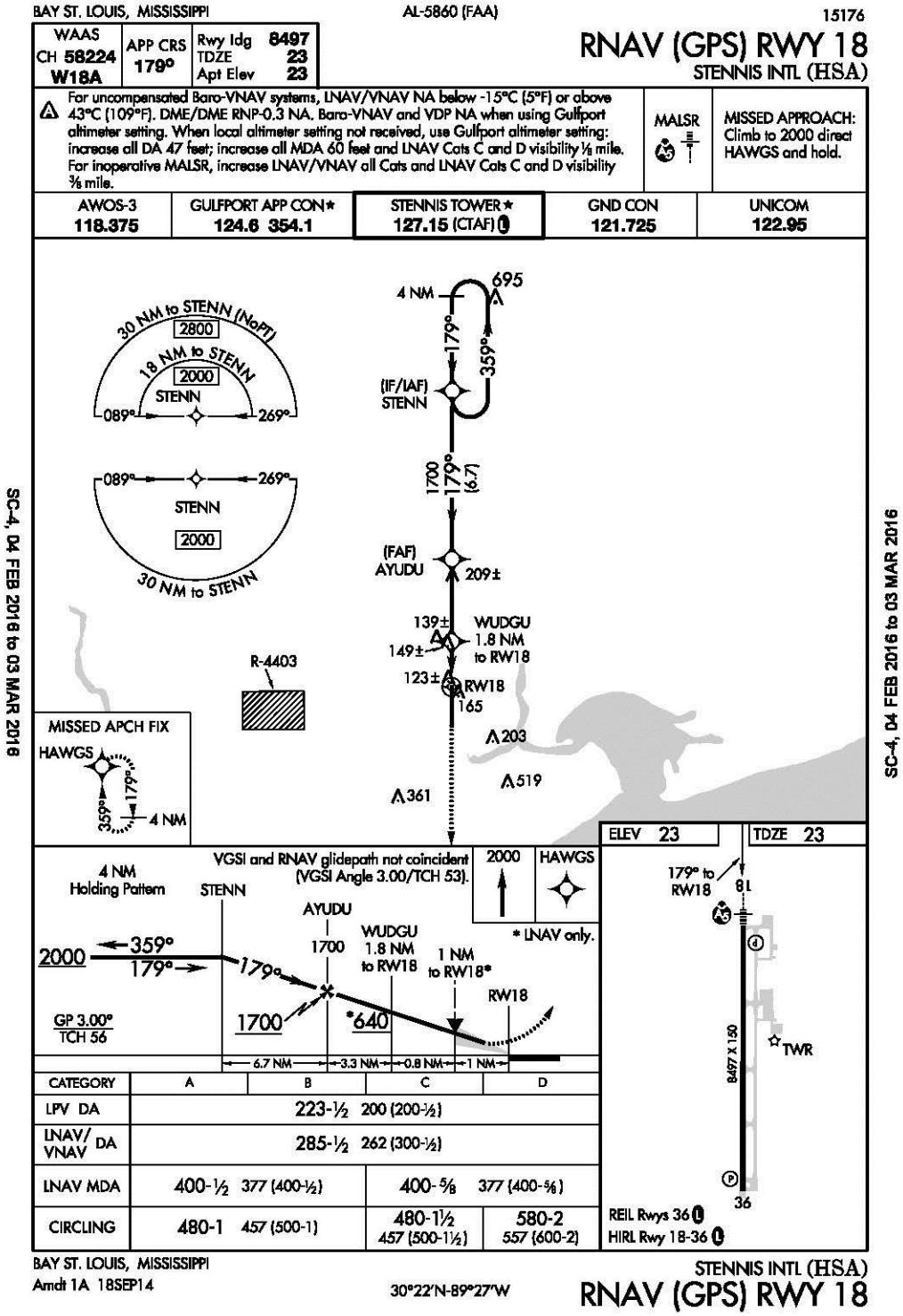

Figure 5-5: Current Published RNAV Approach Procedure

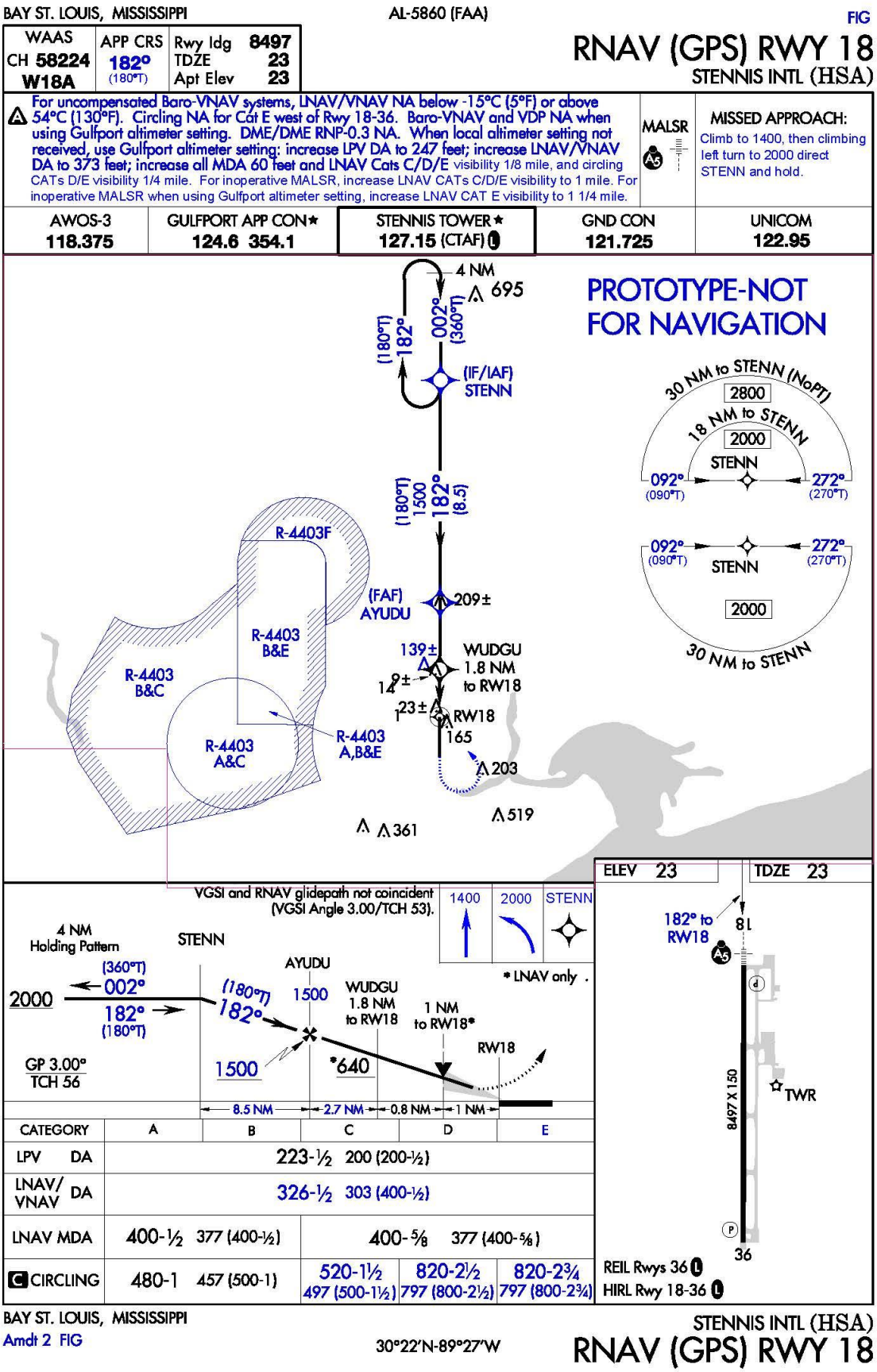

Figure 6-6: Proposed Procedure RNAV (GPS) RWY 18

2. Methodology

Historic radar track data for HSA was obtained from the FAA's National Offload Program (NOP). Twenty Eight days of radar track data totaling 347 tracks were selected for the HSA analysis representing a range of temperature and wind conditions as well as being representative of the average runway usage. The dates selected for this project were the following:

01/01/2015	04/28/2015	07/24/2015	10/19/2015
01/12/2015	05/05/2015	08/15/2015	11/10/2015
01/25/2015	05/29/2015	08/23/2015	11/16/2015
02/18/2015	06/06/2015	09/19/2015	11/28/2015
03/15/2015	06/18/2015	09/26/2015	11/30/2015
03/28/2015	06/25/2015	09/28/2015	12/17/2015
04/11/2015	07/10/2015	10/05/2015	12/20/2015

These dates represent average traffic counts and traffic flows through various seasons and peak travel times for HSA. Historical radar track data (Figures 2-1 and 2-2) was used to create a baseline noise exposure, which provides lateral path definition, aircraft fleet mix, departure/arrival stream proportions for each runway, and day/night traffic ratios. A legend (table 2-1) shows, by color, the altitudes of the track data.

After the baseline scenario was built, those aircraft operations which were assigned to the proposed procedures were modeled as flying the proposed procedure instead of their historical tracks, which creates the alternative scenario. Changes to the procedures involved moving waypoint STENN 1.1 nautical mile north to tie into a victor airway V-552. For the purpose of this report, historical track data referenced in relation to STENN refer to the 'old' STENN. New procedures being modeled referenced in relation to STENN refer to the 'new' STENN.

For the procedures modeled for HSA, part of the proposed ILS or LOC procedure involved a change to the missed approach. All tracks that had missed their approach in the historic data gathered from NOP were modeled on the missed approach course in TARGETS. Missed approaches are difficult to model because of the tool's difficulty in analyzing the altitude profiles of an aircraft that descends and ascends on one path within the study boundary, therefore the route for the missed approach course was created as a departure. This was done by assigning a copy of all arrivals to a departure route following the missed approach course, then doubling the number of arrivals in the alternative scenario compared to the baseline scenario. This created the effect of landing using the proposed arrival procedure, departing using the proposed missed approach course, and landing again using the proposed arrival procedure.

The changes in the proposed RNAV procedure consist of moving the holding pattern from the east side of STENN to the west side and lowering the altitude of the approaching aircraft. These changes to the RNAV procedure created a holding pattern and approach that is identical to that of the proposed ILS or LOC Z RWY 18 procedure. In order to model this procedure, one route was created to model both procedures together, and all approaching aircraft were assigned to this single route.

The analysis does not take into account terrain. The altitude controls of the RNAV procedures were used to adjust the vertical profile for each modeled aircraft flying the proposed procedure. When a range of altitudes was given for a particular waypoint, the lowest point of the range was used in order to model the most conservative environmental case.

The TARGETS Environmental Plug-in uses 0.3 nautical mile dispersion on either side of the centerline of a procedure as its default dispersion value. In cases where the model generated by the TARGETS Flyability function tracks do not line up on the centerline of a procedure, the dispersion value is assigned using 0.3 nautical miles on either side of the outside flyability tracks as the guideline. For the missed approach, the dispersion was set to emulate historic flight tracks of aircraft that followed the same course described in the proposed missed approach instructions.

For this analysis no procedures were modelled for the baseline scenario. The 28 days of flight track data were used as is to generate the baseline noise. The assumptions listed in Appendix A were used to construct the alternative scenario.

Once the baseline and alternative scenarios were built, the TARGETS Environmental Plug-in Tool was used to generate noise outputs for both scenarios. The Environmental Plug-in Tool uses the Aviation Environmental Design Tool version 2b (AEDT 2b) to calculate noise. The noise output files from AEDT 2b for both the baseline and alternative noise exposures consist of a series of equally spaced grid points, each assigned a yearly day-night average noise level (DNL) value. This data is then loaded back into TARGETS by the Environmental Plug-in Tool, which generates three outputs: baseline noise exposure, alternative noise exposure, and noise impact.

The noise impact is a comparison between the baseline and the alternative noise exposure that depicts reportable and significant noise changes at all affected locations per the criteria indicated in FAA Order 1050.1F ("Environmental Impacts: Policies and Procedures") and Chapter 32 of FAA Order 7400.2K ("Procedures for Handling Airspace Matters"). The reportable and significant noise increases and decreases (if any) are then depicted on an aerial photograph using Google Earth.

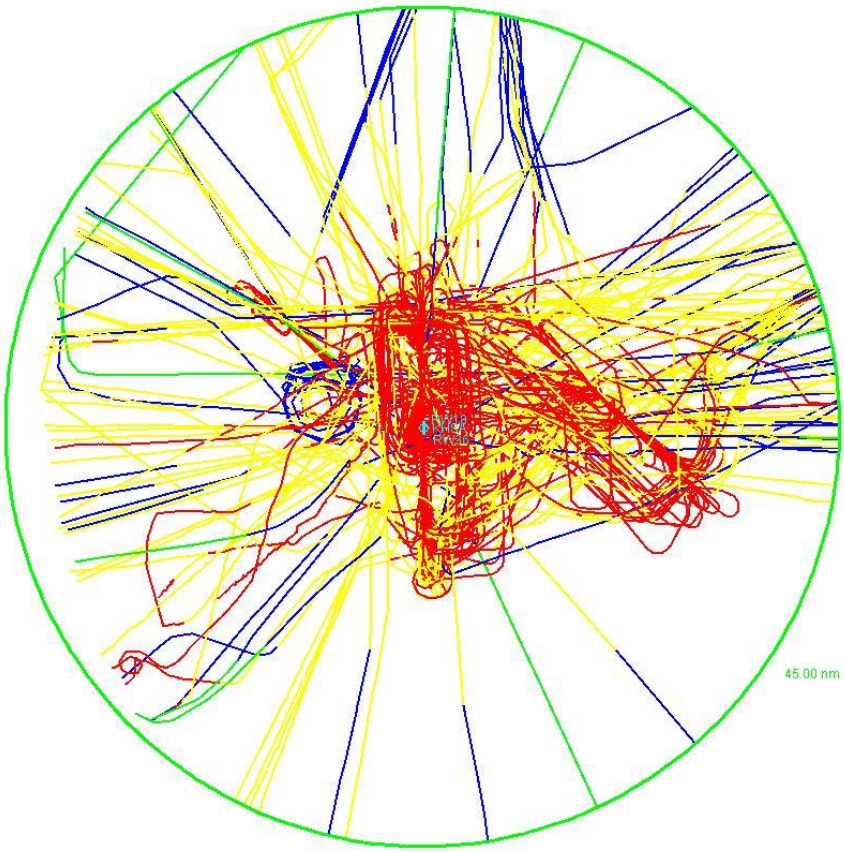

Figure 2-1, HSA Arrival Traffic Used in Analysis

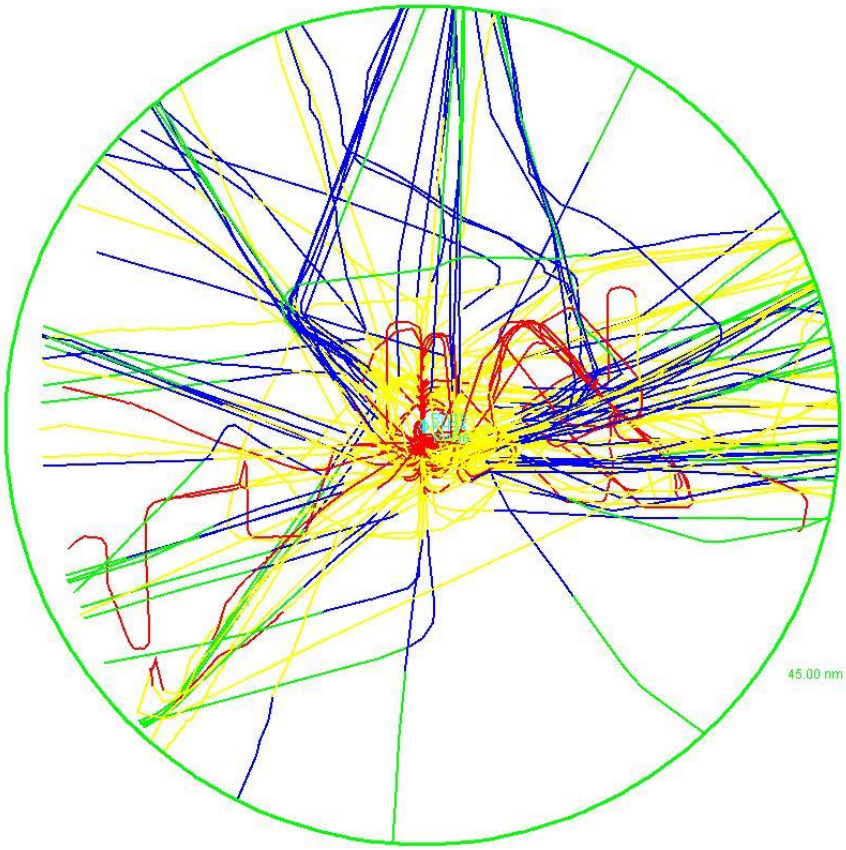

Figure 2-2, HSA Departure Traffic Used in Analysis

Track Data Legend with Above Ground Level (AGL) and Mean Sea Level (MSL) Altitudes			
Airport: XXX		***Field Elevation***	***13***
AGL Altitudes		**MSL Altitudes**	**Legend Colors**
1000		1013	
2000		2013	
3000		3013	
4000		4013	
5000		5013	
6000		6013	
7000		7013	
8000		8013	
9000		9013	
10000		10013	
11000		11013	
12000		12013	
13000		13013	
14000		14013	
15000		15013	
16000		16013	
17000		17013	
18000		18013	
Above		Above	

Table 2-1: Legend for Baseline Arrival and Departure Traffic

3. Baseline Noise Exposure

TARGEST AEDT Environmental Plug-in generates a noise exposure map using track data that graphically illustrates noise exposure around the airport using various colors to represent different DNL levels. The baseline noise exposure is shown in Figure 3-1, which depicts the levels and locations of noise exposure above DNL 45 dB produced by the historical radar track data for arrivals and departures. Table 3-1 is the legend for the baseline noise exposure Figures. The results indicate exposure levels of DNL 45-50 dB at the outer edge of the affected area, increasing gradually toward the runway. Noise exposures above DNL 65 dB occur only at the runway.

Figure 3-1, Baseline Noise Exposure in TARGETS

GEOMETRIC SHAPE	COLOR	DNL VALUE
No Shape	None	Less
SQUARE	BLUE	45–50 dB
SQUARE	LIGHT BLUE	50–55 dB
SQUARE	GREEN	55–60 dB
SQUARE	YELLOW	60–65 dB
SQUARE	ORANGE	65–70 dB
SQUARE	PINK	70–75 dB
SQUARE	RED	75 dB OR MORE

Table 2-1: Legend for Noise Exposure

4. Alternative Noise Exposure

TARGEST AEDT Environmental Plug-in generates an alternative noise exposure map by reassigning tracks in the baseline to fit the procedures in the alternative scenario. The alternative noise exposure is shown in Figure 4-1, which depicts the levels and locations of the noise exposure above DNL 45 dB using the proposed procedures. Table 4-1 is the legend for the alternative noise exposure Figures. The results indicate exposure levels of DNL 45-50 dB at the outer edge of the affected area, increasing gradually toward the runway. Noise exposures above DNL 65 dB occur only at the runway.

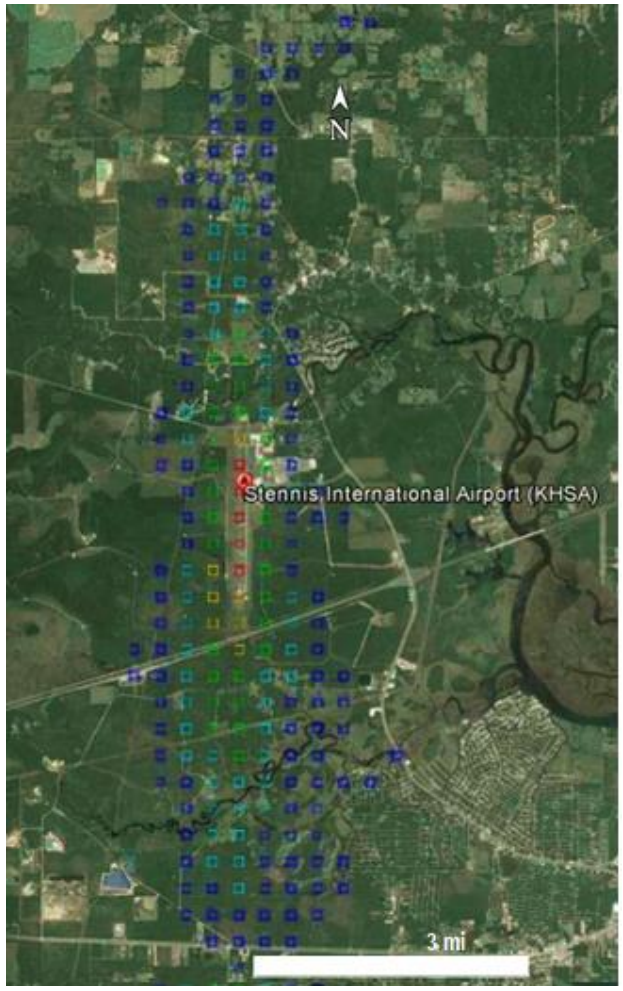

Figure 4-1, Alternative Noise Exposure for the Proposed Procedures in TARGETS

GEOMETRIC SHAPE	COLOR	DNL VALUE
No Shape	None	Less than 45dB
SQUARE	BLUE	45–50 dB
SQUARE	LIGHT BLUE	50–55 dB
SQUARE	GREEN	55–60 dB
SQUARE	YELLOW	60–65 dB
SQUARE	ORANGE	65–70 dB
SQUARE	PINK	70–75 dB
SQUARE	RED	75 dB OR MORE

Table 3-1: Legend for Noise Exposure

5. Comparison of Baseline and Alternative Noise Exposure

Figure 5-1 shows a side-by-side view of the baseline and alternative scenarios.

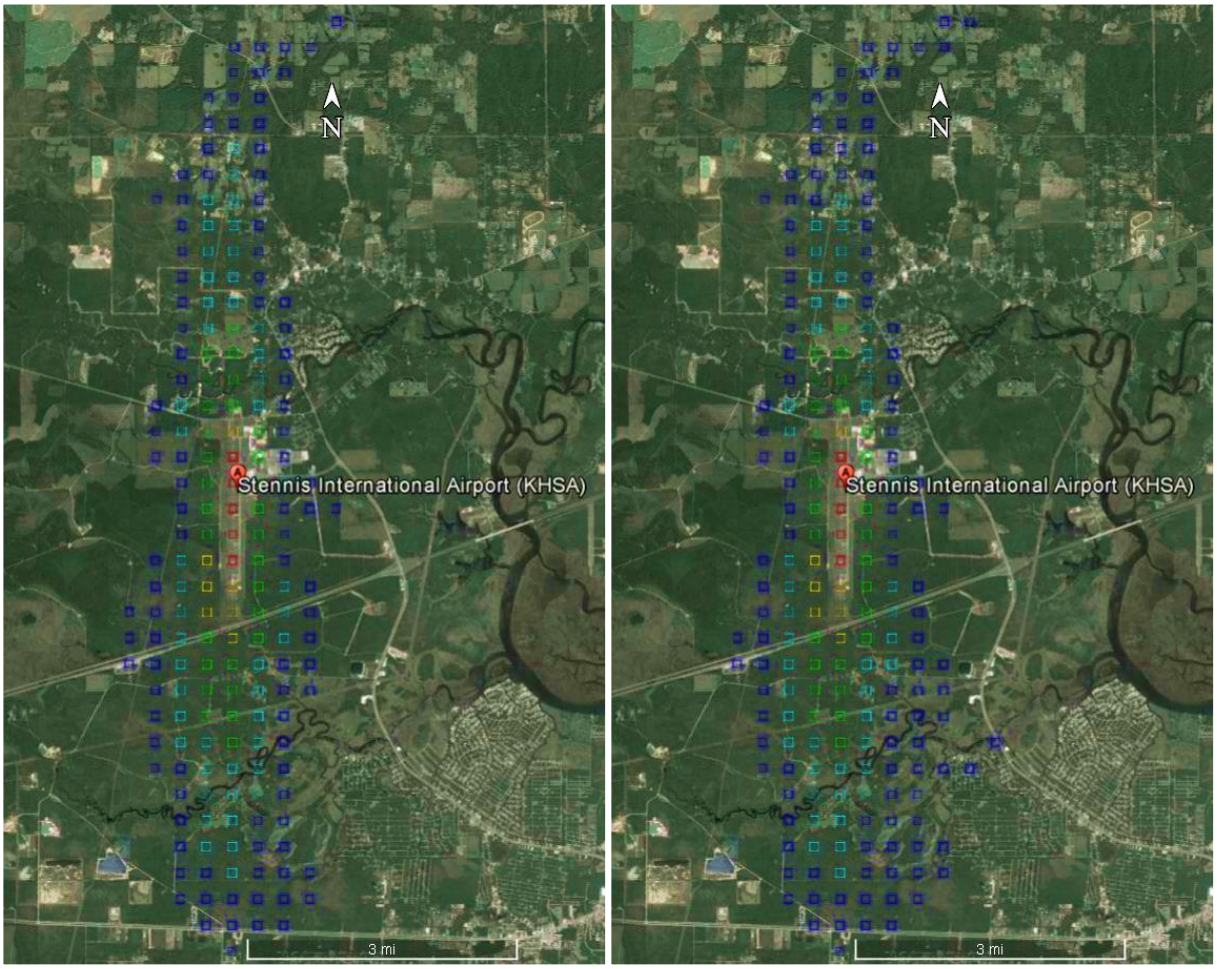

Figure 5-1, Noise Exposure changes by comparison of scenarios for the Proposed Procedures in TARGETS

The following tables show the results of the TARGETS AEDT Environmental Plug-in analysis of the noise grid created to analyze noise exposure and impacts. The grid used for the study consists of an area extending 30 nautical miles (nm) in each direction of the airport. The grid is divided into points measuring .25nm.

Baseline Exposure:

%65+dB	%65-60dB	%60-55dB	%55-50db	%50-45dB	%<45dB
0	0	0	0.1	0.2	99.7

The report indicates that 99.7% of the study area is exposed to less than 45dB DNL. Of the remaining study area, 0.2% is exposed to between 54-50dB DNL, and 0.1% is exposed to 50-55dB DNL.

Alternative Exposure:

% 65+dB	% 65-60dB	% 60-55dB	% 55-50db	% 50-45dB	% <45dB
0	0	0	0.1	0.2	99.7

The report indicates results identical to the baseline. 99.7% of the study area is exposed to less than 45dB DNL. Of the remaining study area, 0.2% is exposed to between 54-50dB DNL, and 0.1% is exposed to 50-55dB DNL.

IMPACT

% Red	% Orange	% Yellow	% No Change	% Green	% Blue	% Purple
0	0	0	100	0	0	0

The impacts measure differences between the baseline and alternative scenarios. In this case, 100% of the study area depicted no change in noise exposure. If changes had occurred, the results would be indicated graphically in the noise results. The colors listed in the above table reference the following legend for noise impacts.

GEOMETRIC SHAPE	COLOR	DNL DIFFERENCE
SQUARE	PURPLE	45-60 DB WITH A DECREASE OF 5.0 DB OR GREATER
SQUARE	BLUE	60-65 DB WITH A DECREASE OF 3.0 DB OR GREATER
SQUARE	GREEN	65 DB OR GREATER WITH A DECREASE OF 1.5 DB OR GREATER
OVAL	RED	65 DB OR GREATER WITH AN INCREASE OF 1.5 DB OR GREATER
OVAL	ORANGE	60-65 DB WITH AN INCREASE OF 3.0 DB OR GRTEATER
OVAL	YELLOW	45-60 DB WITH AN INCREASE OF 5.0 DB OR GREATER

Appendix A

This document provides reference for the methodology and reasoning for track assignments used in the noise model. It lists the track data as categorized in the project, a description of each track set, and the backbone they were assigned to.

- Three procedures were modeled:
    - ILS or LOC **Y** RWY18
    - ILS or LOC **Z** RWY18
    - RNAV RWY 18: Proposed Revisions to RNAV RWY 18 procedure, when modelled, is essentially identical to ILS or LOC Y RWY18 in flight profile, missed approach, and holding pattern. So the modelled revision of ILS or LOC RWY18 was used for both itself and RNAV RWY 18.
- Tracks were separated by runway (18 and 36) and by operation (Arrival or Departure)

- Because there were no proposed changes to existing departure procedures, there were no changes from the baseline to the alternative scenarios for departures from RWY 18 and departures or arrivals to RWY 36

- All the remaining tracks (i.e. RWY 18 Arrivals) were split into three categories. The ILS or LOC Y and Z assigned tracks were then copied and/or split into subcategories according to the following criteria:

    - Runway 18 arrivals: ILS or LOC Y: These tracks represent the "Y" variant, which approaches STENN at 1500. This group contains tracks that were at the lowest altitudes as they reached STENN, very close to or below 2000ft.

        - ARR:KHSA:ILSY:RW18: tracks that did not use a holding pattern and did not miss approach. These tracks were assigned to a backbone that crossed over STENN and proceeded straight to the runway.

        - ARR:KHSA:ILSY:HLD:RW18: tracks that entered a holding pattern before their approach. These tracks were assigned to a backbone that crossed STENN, circled twice in a holding pattern, and then proceeded to the runway.

        - ARR:KHSA:ILSY:MA01arr:RW18: tracks that missed their approach. These tracks were assigned to a backbone that crossed over STENN and proceeded straight to the runway. They were then copied and assigned to additional backbones to replicate a missed approach

        - DEP:KHSA:ILSY:MAdeparture:RW18: the first copy of the tracks that had missed their approach. This track set is identical to the track set above (DEP:KHSA:ILSY:MAdeparture:RW18) except that it is modeled as a departure that follows the course described in the proposed procedure for missed approaches. The backbone connects to the third copy of the track set, modeled as a second arrival.

        - ARR:KHSA:ILSY:MA02arr:RW18: the third copy of the missed approach track set. These tracks are assigned to a backbone that connects to the tracks modeled as a departure, continuing to STENN and then entering a holding pattern that circles three times and then proceeds to land.

    - Runway 18 arrivals: ILS or LOC Z: These tracks represent the "Z" variant, which approaches STENN at 2000. This group contains tracks that were at the highest altitudes as they reached STENN, above 2000.

        - ARR:KHSA:ILSZ:RW18: tracks that did not use a holding pattern and did not miss approach. These tracks were assigned to a backbone that crossed over STENN and proceeded straight to the runway.

        - ARR:KHSA:ILSZ:HLD:RW18: tracks that entered a holding pattern before their approach. These tracks were assigned to a backbone that crossed STENN, circled twice in a holding pattern, and then proceeded to the runway.

        - ARR:KHSA:ILSZ:MA01arr:RW18: tracks that missed their approach. These tracks were assigned to a backbone that crossed over STENN and proceeded straight to the runway. They were then copied and assigned to additional backbones to replicate a missed approach
        - DEP:KHSA:ILSZ:MAdeparture:RW18: the first copy of the tracks that had missed their approach. This track set is identical to the track set above
        - (DEP:KHSA:ILSZ:MAdeparture:RW18) except that it is modeled as a departure that follows the course described in the proposed procedure for missed approaches. The backbone connects to the third copy of the track set, modeled as a second arrival
        - ARR:KHSA:ILSZ:MA02arr:RW18: the third copy of the missed approach track set. These tracks are assigned to a backbone that connects to the tracks modeled as a departure, continuing to STENN and then entering a holding pattern that circles three times and then proceeds to land.
    - ARR:KHSA:OTHER:RW18: tracks that appeared to follow no procedure and were therefore assumed to be VFR flights. These tracks were not assigned to a backbone and are the same in the baseline and alternative models.

Aviation Environmental Screening Tool

Report For

Picayune Municipal Airport

MJD

Picayune, MS

Prepared by:

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Date: March 10, 2016

Picayune Municipal Airport (MJD)

AEST Environmental Analysis Process

1. Purpose

The purpose of this report is to document the process used to identify and quantify the noise impact of the proposed changes to three instrument approach procedures at Picayune Municipal Airport (MJD). The following study was designed to test for a change in noise over noise sensitive areas as a result in adjustments to airport procedures. This report shows the analysis at MJD using the Aviation Environmental Screening Tool (AEST). This report refers to the existing historic flight paths as the "baseline scenario." and the proposed changes to the procedure are referred to as the "alternative scenario." Figure 1-1 shows an aerial view of the airport and runway at MJD. Table 1-1 shows the procedure names a brief summary of the major changes. Figure 1-2 shows the existing procedures at MJD.

The proposed changes to existing Area Navigation (RNAV) approach procedures "RNAV (GPS) RWY 18" primarily consists of inflight altitude changes, but for this procedure the required altitudes in flight will not actually be modified causing no change in the procedure from a noise modeling perspective. For the "RNAV (GPS) RWY 36" procedure, the changes to inflight altitudes deal with decision altitudes, minimum approach altitudes, and weather minimums. The altitude at the IAF (WISCO) will increase from at or above 1,800ft to 2,000ft. The changes to the procedure that could affect the noise impact are the changes to the missed approach course for each procedure. The changes will result in aircraft no longer being directed to the East, but instead being directed North from RWY36 or North via the West side of the airport from RWY18 to fix CIQYI (see figures 2-3 and 2-4 in the next section), depending on the runway used.

The relevant proposed change to VOR-A is a 3° change in course from 132° to 129° related to a MAGVAR change at the airport and the elimination of circling for Category D aircraft (aircraft with approach speeds between 141-165 knots)

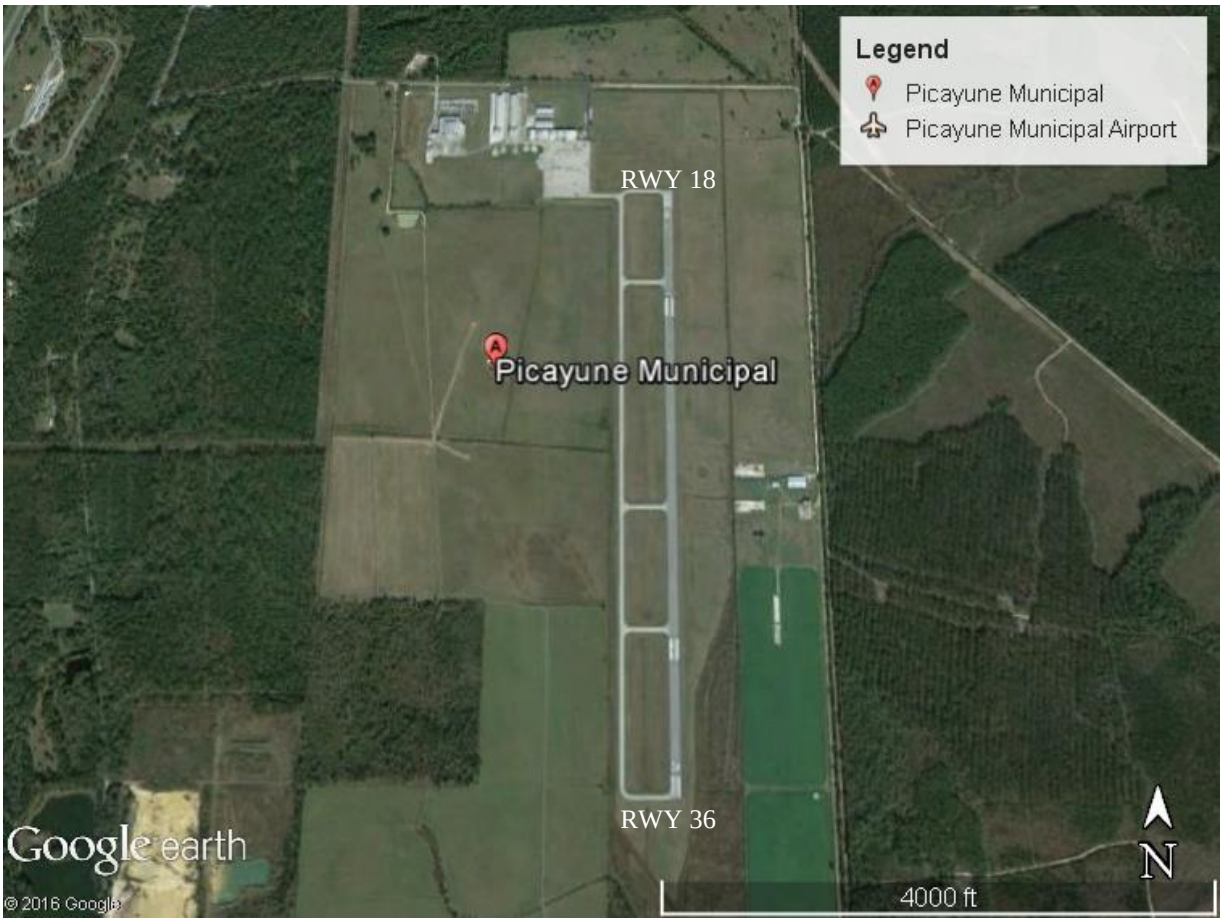
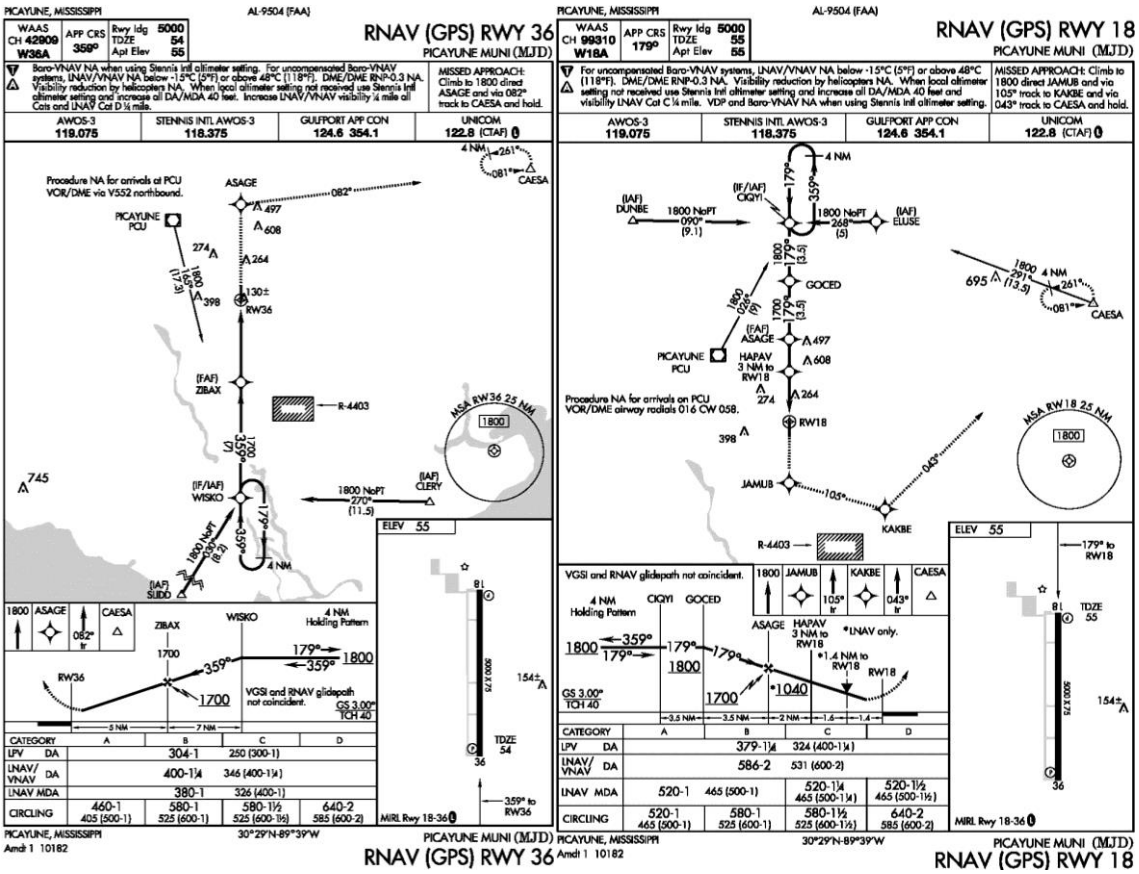


Figure 1-1: View of Picayune Municipal Airport (MJD)

Name of Procedure	Major Change Modeled
RNAV (GPS) RWY 18	Change to missed approach course
RNAV (GPS) RWY 36	Change to missed approach course
VOR A	3° change in course from 132° to 129°

Table 1: MJD Arrival Approaches to Be Modeled



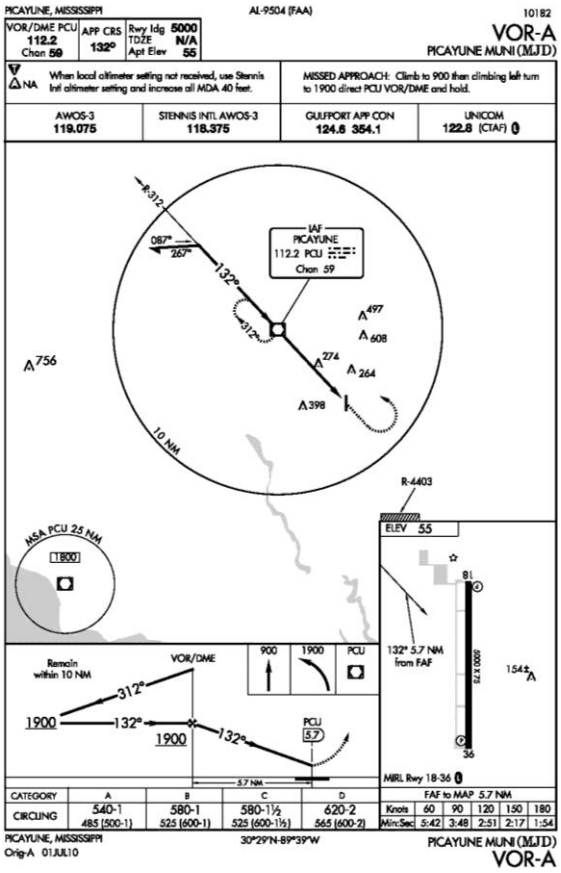


Figure 1-2: MJD Existing Procedures RNAV (GPS) RW18, RNAV (GPS) RWY36, and VOR-A

2. Methodology

Historic Radar Track Data for MJD was obtained from the FAA's National Offload Program (NOP). Thirty days of radar track data totaling 24 tracks (after removing obvious overflights from the track set) were used in the analysis. Days were chosen to capture seasonal weather variation and avoid days where significant thunderstorms or high winds may have affected normal operations.

The following dates were used for this analysis:

01/01/2015	05/29/2015	09/28/2015
01/12/2015	05/30/2015	10/05/2015
01/25/2015	06/07/2015	10/16/2015
02/18/2015	06/18/2015	10/19/2015
03/15/2015	06/25/2015	10/28/2015
03/28/2015	07/12/2015	11/10/2015
04/11/2015	08/15/2015	11/16/2015
04/18/2015	08/23/2015	11/30/2015
04/28/2015	09/19/2015	12/17/2015
05/05/2015	09/26/2015	12/20/2015

The arrival procedures in the alternative scenario were created to replicate the proposed procedures. No flights in the sampled track data missed their approach, as the missed approach is rarely used. However, in order to ensure that even a very rarely used missed approach does not have a noise impact, the alternative scenario was built to replicate all flights following the new missed approach procedure. The arrival procedures in the baseline scenario were generated in AEST automatically according to the sampled track data based on the following 'bundles':

Runway 18 Arrivals	Runway 36 Departures
Runway 18 VOR Arrivals	Runway 36 RNAV East Arrivals
Runway 18 Departures	Runway 36 West Arrivals

Missed approaches are difficult to model because of the tool's difficulty in analyzing the altitude profiles of an aircraft that descends and ascends on one path within the study border, therefore the route for the missed approach course was created as a departure. This was done by assigning a copy of all arrivals to a departure route following the missed approach course, and doubling the number of arrivals in the alternative scenario compared to the baseline scenario. This created the effect of landing using the standard arrival procedure, departing using the missed approach course, and landing again using the standard arrival procedure.

This method is considered valid for the purpose of this project because the noise created in the model would greatly exceed the noise created by aircraft following the normal missed approach course. This is because the altitude is lower in an arrival/departure that connects to the runway (ending/starting at 0ft above ground level, respectively) as it would be in a missed approach. Additionally, the number of flights following the course is a conservative estimate when compared to the historical data.

The baseline arrival routes were generated by AEST using historical track data (Figure 2-1). Arrivals to RWY 36 were split into two bundles: East arrivals and West arrivals. This was done in order to allow backbones to more accurately represent the historic flight track data. Normal departures in the alternative scenario followed the same routes as in the baseline scenario. As with the arrivals in the baseline scenario, these routes were generated automatically in AEST based on the historical track data. For simplicity and clarity, these routes are omitted from the images below.

The approach routes used in the alternative scenario were based on the official procedures. RNAV (GPS) RWY18 and RNAV (GPS) RWY36 procedures are shown together in Figure 2-2. The alternative missed approach course for RNAV (GPS) RWY18 directs aircraft to turn right and proceed directly to fix CIQYI (Figure 2-3). The alternative missed approach for (GPS) RWY36 directs aircraft to proceed directly north to fix CIQYI and hold to the east (Figure 2-4).

The baseline and alternative VOR-A approaches to RWY 18 reflect a 3° change in course from 132° in the baseline scenario to 129° in the alternative scenario. These courses are shown together in Figure 2-5. The baseline is shown in red and the alternative is shown in blue.

AEST assumes that track data is representative of a single day. However, for this study, Thirty days of track data were used. AEST allows for adjusting the model to account for more than one day of data. In this case, annualization should be set to 3.33%. in order to properly represent an average annual day. For this study, annualization was rounded up to 4%. baseline scenarios were run using only historical operations, while the alternative scenario was run using double the number of operations to replicate missed approaches using the method described above.

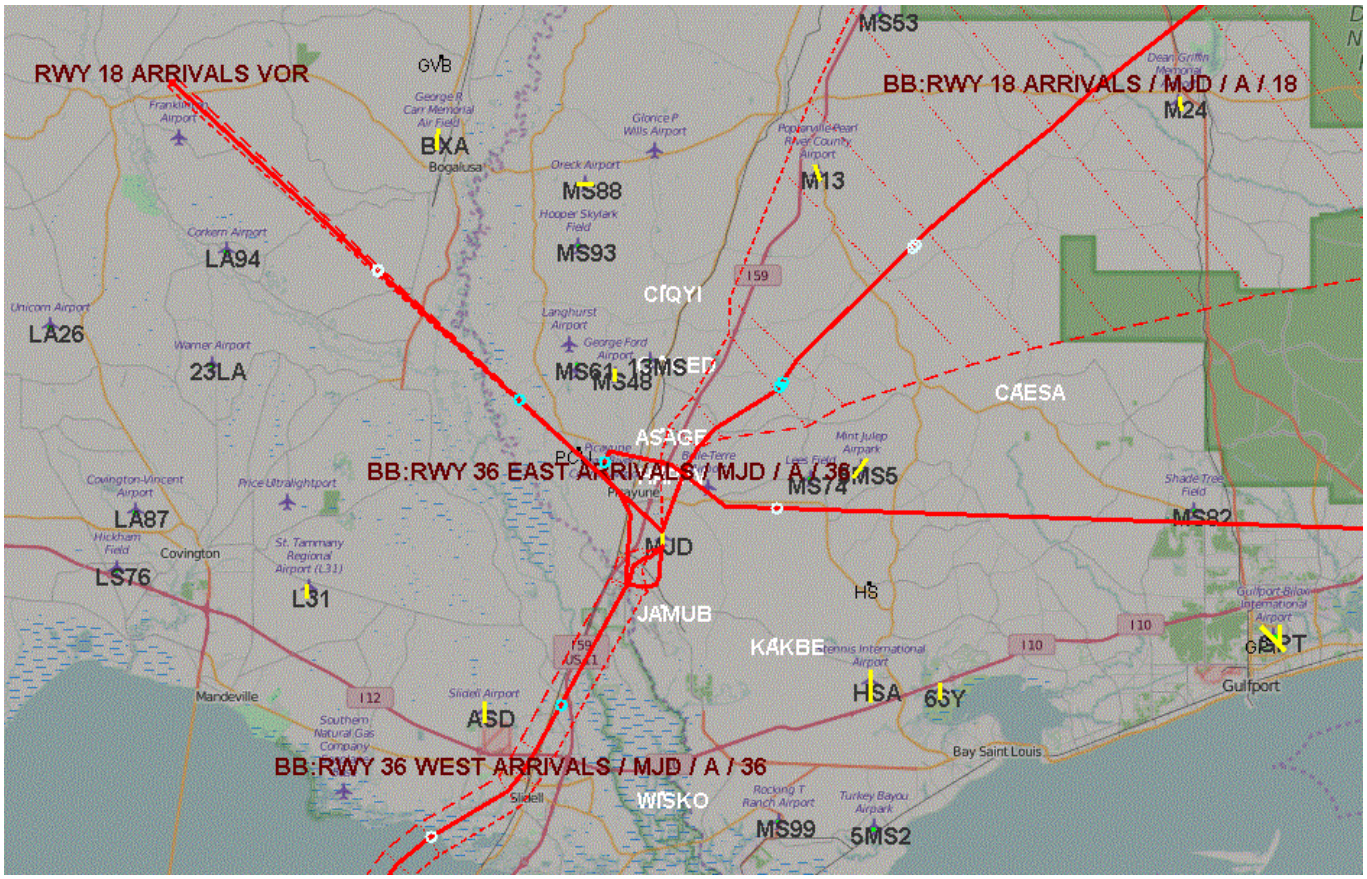


Figure 2-1: Baseline scenario arrival routes generated by AEST using historic track data

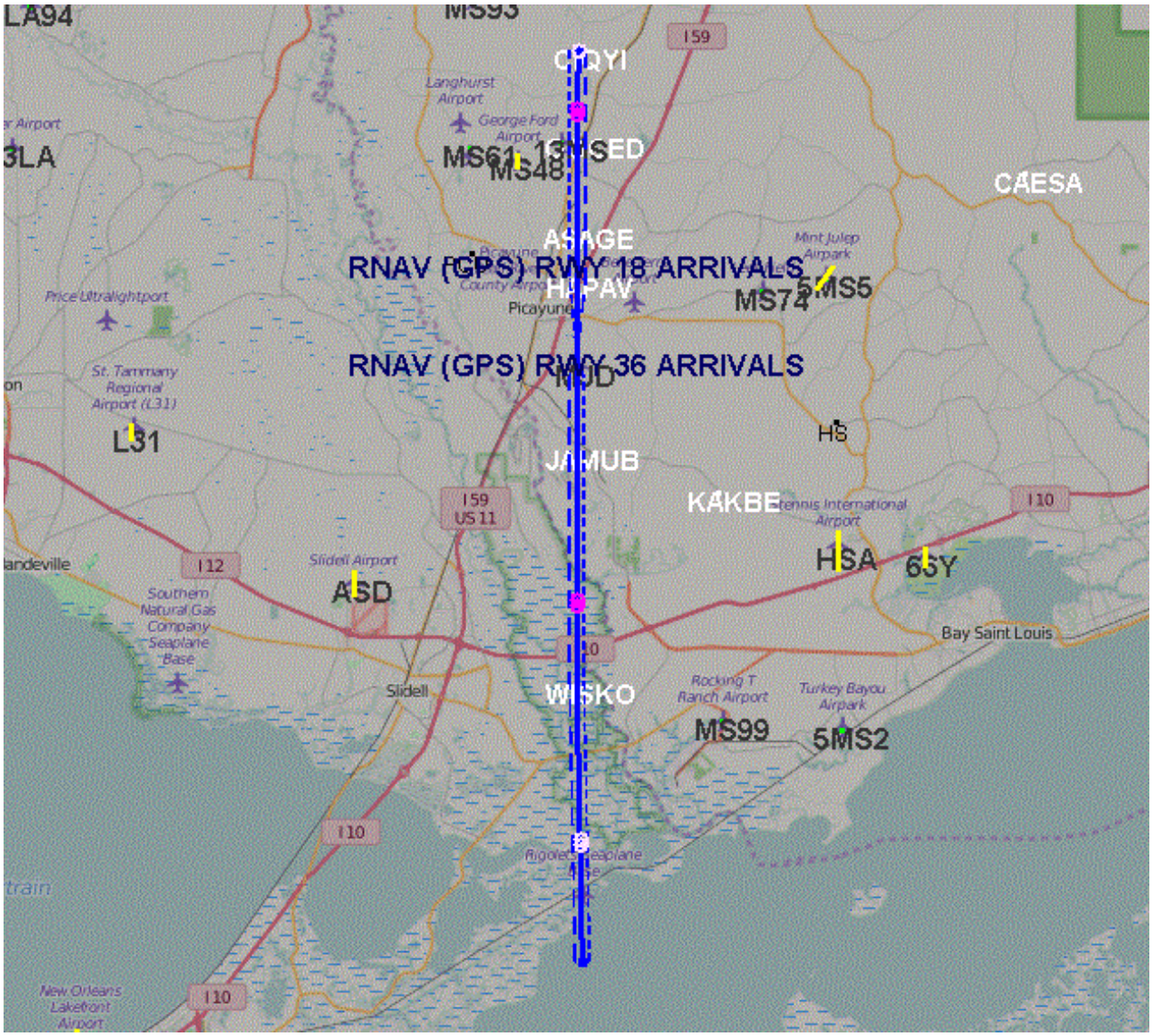


Figure 2-2: RNAV (GPS) RW18 and RNAV (GPS) RWY36 arrival procedures used in the alternative scenario

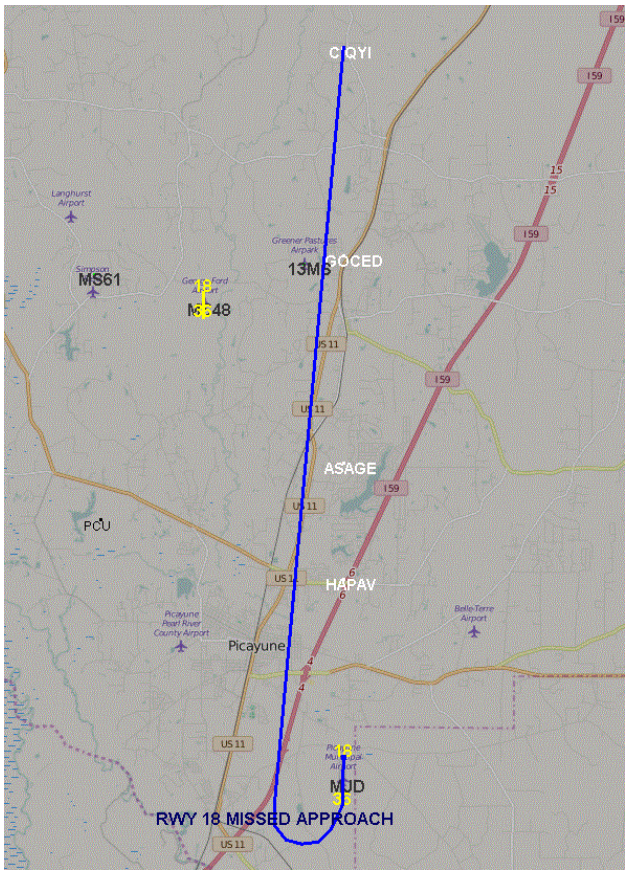


Figure 2-3: Proposed RNAV (GPS) RW18 Missed Approach Course.

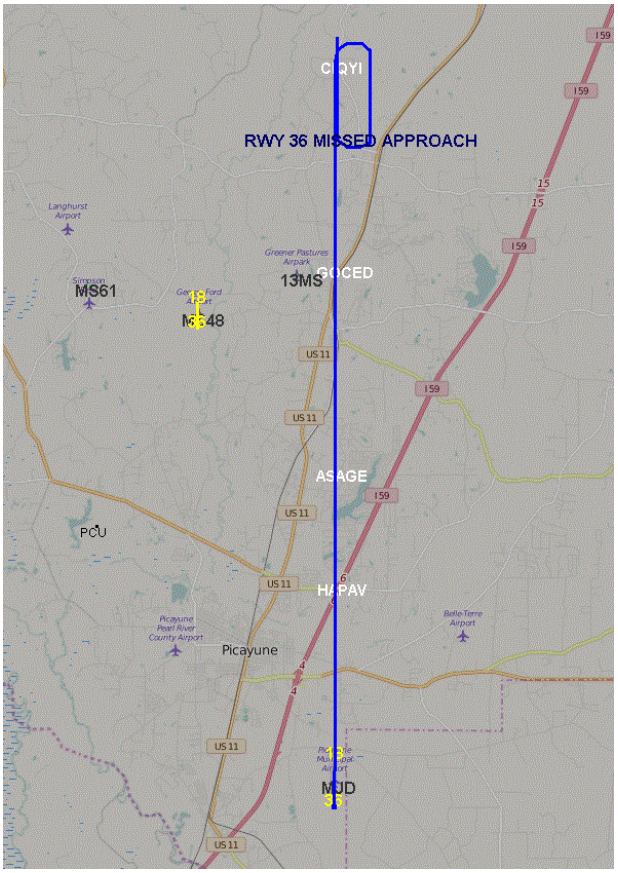


Figure 2-4: Proposed RNAV (GPS) RW36 Missed Approach Course.

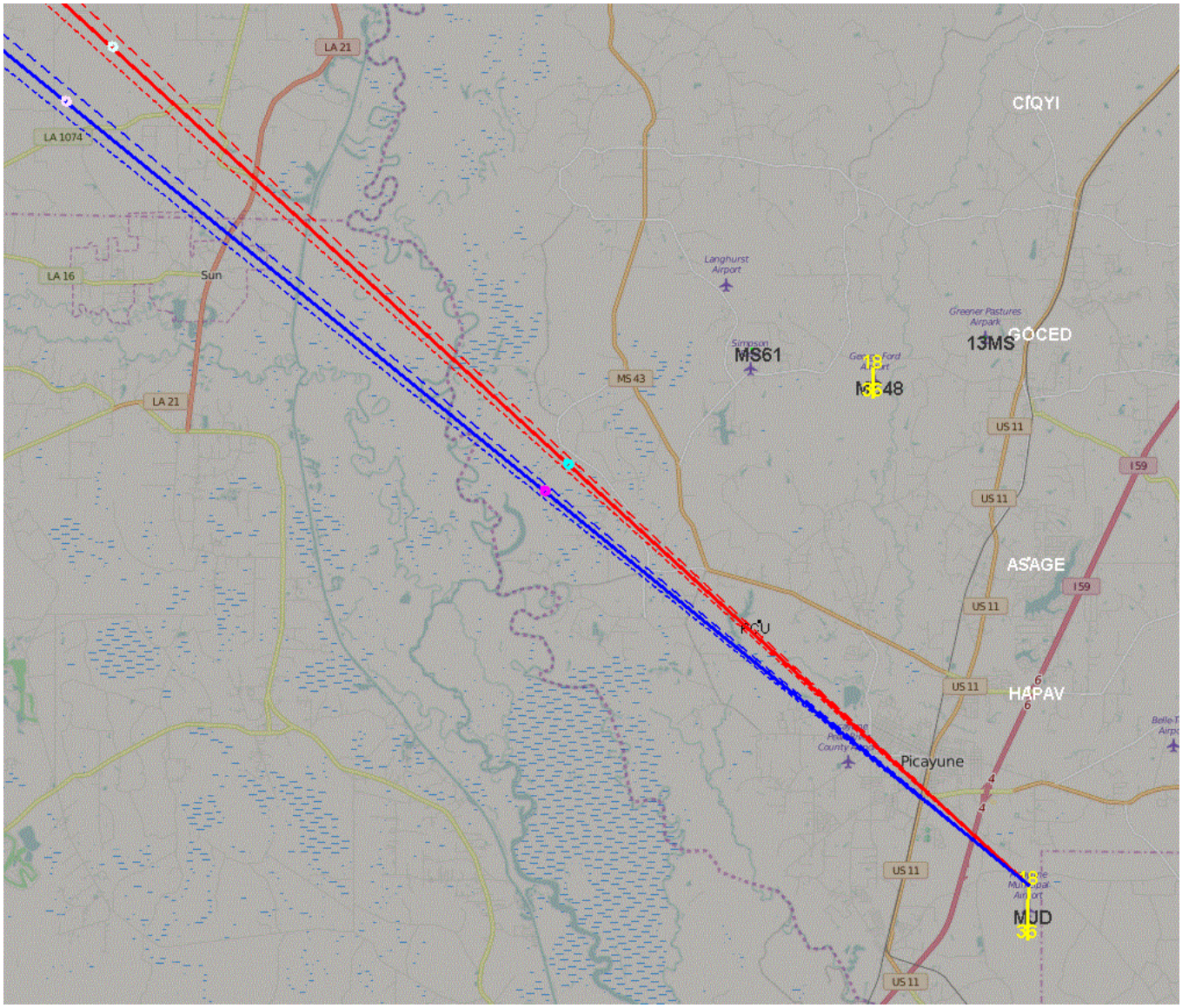


Figure 2-4: The Baseline VOR-A Procedure (red) will shift 3°, from 132° to 129°

3. Results: Comparison of Noise Exposure in Baseline and Alternative Scenarios

Analysis of noise exposure in the baseline scenario shows that 100% of the study area is exposed to noise below Yearly Day Night Average Sound Level (DNL) 45 dB. These results are shown in Table 3-1 below. By comparison, analysis of noise exposure in the alternative scenario shows that 100% of the study area is still only exposed to noise below DNL 45 dB. These results are shown in Table 3-2 below. Figure 3-1 shows the grid used in the study, and graphically illustrates the results of 100% of the study area being exposed to noise below DNL 45 dB. The grid compares the baseline and alternative scenarios and indicates the location of increases in noise, if any.

Based on this analysis using a highly conservative model, the proposed procedure changes will not result in any noise increase at or above DNL 45 dB.

#Name	Type	DNL 65+ dB	DNL 65-60 dB	DNL 60-55 dB	DNL 55-50 dB	DNL 50-45 dB	DNL <45 dB
Grid 1	Quiet Suburb	0	0	0	0	0	100
Overall		0	0	0	0	0	100

Table 3-1: Count of Points in Baseline Exposure Map. 100% of the study area is below DNL 45 dB noise exposure.

#Name	Type	DNL 65+ dB	DNL 65-60 dB	DNL 60-55 dB	DNL 55-50 dB	DNL 50-45 dB	DNL <45 dB
Grid 1	Quiet Suburb	0	0	0	0	0	100
Overall		0	0	0	0	0	100

Table 3-2: Count of Points in Alternative Exposure Map. 100% of the study area is below DNL 45 dB noise exposure.