



# Appendix F

## Noise Analysis Report



June 2021

# PRELIMINARY ENGINEERING NOISE ANALYSIS REPORT



## US 278 Corridor Improvements Project

Beaufort County, South Carolina

*Prepared for:*



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## Acronyms and Abbreviations Used in This Report

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ANSI .....	American National Standards Association
CFR .....	Code of Federal Regulation
dB .....	decibel
dB(A) .....	A-weighted sound level in decibel
FHWA .....	Federal Highway Administration
L <sub>eq</sub> .....	equivalent sound pressure level
NAC .....	noise abatement criteria
NRDG .....	noise reduction design goal
NSA .....	noise study area
SCDOT .....	South Carolina Department of Transportation
SLM .....	sound level meter
TNM .....	traffic noise model
TNM 2.5 .....	FHWA Traffic Noise Model Version 2.5





**US 278 Corridor Improvement Project**  
**Beaufort County, South Carolina**  
**PRELIMINARY ENGINEERING NOISE REPORT**  
**April 2021**

**1) EXECUTIVE SUMMARY**

The US 278 Corridor Improvements Project is a highway improvement project by SCDOT located on a 5-mile corridor between Bluffton and Hilton Head Island, SC. The project includes improvements to local points-of-interest, reduced congestion, and the replacement of the eastbound Mackay Creek Bridge, which serves as the single passageway to Hilton Head Island.

For analysis purposes, the project study area was divided into eleven (11) noise sensitive areas (NSAs) as shown in the report figures. Noise measurements and concurrent traffic counts were conducted in all NSAs, as reported in Table 2. Based on the evaluation of existing and future noise levels and the noise abatement criteria described in Table 1, project-related noise impacts were identified NSA 3, 9, 10, and 11.

Based on the evaluation of the noise levels associated with the preliminary engineering plans for the 2045 Design Year Reasonable Alternative 4 (RA4) developed to date, noise abatement features were determined to be not feasible and reasonable within all impacted NSAs in accordance with the *SCDOT Traffic Noise abatement Policy*.

**2) INTRODUCTION**

The following noise assessment has been prepared in compliance with Title 23 of the Code of Federal Regulations, Part 772 (23 CFR Part 772), U.S. Department of Transportation, Federal Highway Administration, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, and *SCDOT Traffic Noise Abatement Policy* (September 2019), to identify potential noise impacts and analyze mitigation as necessary. Predicted noise levels were determined using FHWA TNM 2.5. This noise assessment focuses on the noise analysis and mitigation related to the 2045 design year build alternative.

**a) Project Description**

The US 278 Corridor Improvements Project in Beaufort County is a proposed highway improvement project by South Carolina Department of Transportation which includes a five-mile corridor of US 278 between Bluffton and Hilton Head Island. The purpose of this project is to address structural deficiencies, increase capacity, improve local access, and reduce congestion.



b) Land Use

The project begins at the intersection of Fording Island Road (US 278) and Moss Creek Drive. From this intersection, the project encompasses the portions of US 278 eastward across the sound to Hilton Head Island, ending at the intersection of Squire Pope Road. Noise abatement has been evaluated for the noise study areas (NSAs) which meet the FHWA criteria for a Type I project. These criteria are based on activity categories established in 23 CFR Part 772, Table 1. Eleven NSAs make up the project, which includes predominantly exterior residential sites (Activity Category 'B'), some Exterior recreational sites (Activity Category 'C'), exterior commercial sites (Activity Category E), and infrastructure service areas (Activity Category 'F'). Approximately one and a half miles of the US 278 roadway within the project limits is surrounded by water.

### 3) METHODOLOGY

a) Traffic Noise Modeling

FHWA TNM 2.5 was used to calculate existing and future noise levels. Relevant topographical features such as shoulders, berms, and terrain of significance were added to the traffic noise models to provide accurate sound level results.

b) Traffic Data

A traffic study for the proposed project was completed by CDM Smith and provided to Gannett Fleming. The traffic study included the estimated Average Annual Daily Traffic (AADT) for the existing year (2018) and the design year (2045) build, and no-build alternatives. Each alternative included fleet mix percentages, directional splits, peak hour, and peak hour volume. A speed limit of 45 to 55 miles per hour (mph) was used for US 278. See Appendix A for traffic data tables, which are calculated based on *Level of Service C Volumes for Traffic Noise Modeling*, ITRE report dated September 2018.

c) Field Measurements

Short-term (15- to 20-minute duration) measurements were taken at 9 sites, along with concurrent traffic counts using ANSI Type I noise meters at various times of the day between January 30 and 31 of 2020. Meteorological conditions and topographical features were also documented for each site. Measured existing  $LA_{eq}(h)$  noise levels at the short-term measurement sites ranged from 59.8 dB(A) to 81.8 dB(A). These measurements do not necessarily represent the noisiest condition at any particular measurement site. See Appendix B for field data sheets. Calibration certificates related to noise meters and calibrators are in Appendix C.

The noise level descriptor used for this project is the hourly equivalent noise level ( $LA_{eq}(h)$ ).  $LA_{eq}(h)$  is the steady state, A-weighted sound level which contain the same amount of acoustic energy as the actual time-varying A-weighted noise level over a one-hour period.



d) Measurement and Analysis Locations

Measurement sites were positioned to enable validation of the noise prediction model, to assist in defining existing noise levels for second-row residences, and for receivers located approximately 500 feet from the proposed new alignment. As such, in certain locations, noise measurement sites do not correspond precisely with noise analysis sites.

e) Model Validation

Field measurements were used primarily for the purpose of noise model validation, with year 2018 peak hour traffic volumes assumed in the prediction of worst-case existing noise levels.

Using the traffic data obtained concurrently with the short-term measurements, noise levels were modeled and compared to measured noise levels. Existing short-term measured noise levels and hourly traffic data based on concurrent traffic counts are summarized in Table 2. Validation results are shown in Table 3, with FHWA TNM validation data files that accompany this report. Measured versus modeled noise levels were within the acceptable 3dB(A) range for all sites except M-4. This measurement was -4.1 dB(A) below the modeled noise level. The results of the validation process were used to “build” the FHWA TNM used for purposes of modeling existing and future year noise levels, determining future year impacts, and evaluating potential noise abatement options.

#### 4) TRAFFIC NOISE IMPACTS

FHWA has developed noise abatement criteria and procedures in 23 CFR Part 772, as shown in Table 1, that states that traffic noise impacts occur when either:

- 1) The predicted traffic noise levels approach (within 1 dBA) or exceed the FHWA NAC for the applicable activity category shown in Table 1; or,
- 2) The predicted traffic noise levels substantially exceed the existing noise levels by  $\geq 15$  dBA.

The TNM 2.5 model results for the existing condition, the 2045 design year no-build condition, and 2045 Reasonable Alternative 4 build condition can be found in Table 4.

a) Existing Year Noise Levels

In the existing condition (2018), there are (5) receivers that have noise levels that approach or exceed the NAC criterion for its respective land use.

b) Design Year (2045) No-Build Alternative Noise Levels

There are (5) receivers that have noise levels that approach or exceed the NAC criterion for its respective land use.





c) Design Year (2045) Build Alternative Noise Levels

There are (8) residential receivers that have noise levels that approach or exceed the NAC criterion for its respective land use.

## 5) CONSIDERATION OF ABATEMENT

Since there are impacted receivers due to the 2045 design year build alternative, abatement measures were considered for the proposed project.

When considering noise abatement measures, primary consideration shall be given to exterior areas where frequent human use occurs. Since South Carolina is not part of the FHWA-approved Quiet Pavement Pilot Program, the use of quieter pavements was not considered as an abatement measure for the proposed project. In addition, the planting of vegetation or landscaping was not considered as a potential abatement measure since it is not an acceptable Federal-aid noise abatement measure due to the fact that only dense stands of evergreen vegetation planted 100 feet deep will reduce noise levels. In accordance with 23 CFR §772.13(c), the following measures were considered and evaluated as a means to reduce or eliminate the traffic noise impacts:

- Acquisition of Right-of-Way - The acquisition of additional rights-of-way to mitigate the noise levels at the affected site would result in disruptive relocations.
- Traffic Management - Measures such as exclusive lane designations and signing for prohibition of certain vehicle type would prevent the project from serving its sole purpose of moving people, goods and services in and out of Hilton Head Island.
- Alteration of Horizontal and Vertical Alignments - Alignment modifications as a means of noise abatement would result in disruptive relocations for this project and would not be cost effective.
- Acquisition of real property (predominately unimproved property) to serve as a buffer zone to preempt development – Adequate property is not available to create an effective buffer zone between the proposed roadway and the impacted receivers.
- Noise insulation of public use or nonprofit institutional structures – There are no facilities within the study area that are eligible for consideration for noise insulation.
- Noise Barriers – The optimum situation for the use of free-standing noise barriers is when a dense concentration of impacted receivers lies directly adjacent to and parallel with the highway right-of-way. In these instances, a single barrier can protect many people at a relatively low cost per impacted site.



In consideration of abatement, SCDOT Noise Policy Guidelines state that proposed methods must be both feasible and reasonable. The feasibility and reasonableness of a noise barrier is determined by the following factors.

a) Feasibility

- i) Acoustic Feasibility – In accordance with SCDOT policy, a noise reduction of  $\geq 5$  dBA must be achieved for at least 75% of impacted receivers to consider the noise abatement method to be acoustically feasible. At minimum, at least three (3) impacted receivers must achieve a 5 dB(A) reduction. If this goal is not met, the method is determined not to be feasible and further analysis is not required.
- ii) Engineering Feasibility – Abatement methods must also meet engineering and environmental criteria such as drainage and topographical requirements, in addition to allowing safe access for maintenance, utilities, and property owners. Due to constructability limitations, noise abatement methods cannot exceed 25 feet in height.

b) Reasonableness

The following three reasonableness factors must all be met collectively for a noise abatement method to be considered reasonable. Failure to meet any single reasonableness factor will result in the noise abatement method to be deemed as not reasonable.

- i) Noise Reduction Design Goal (NRDG) – SCDOT policy states that a noise reduction design goal of  $\geq 8$  dBA must be met for 80% of receivers determined to be in the first two building rows, that are also considered benefited.
- ii) Cost Effectiveness – The allowable cost of noise barrier will be based on \$35.00 per square foot; this is based on actual construction costs of recent SCDOT projects. The total barrier construction cost is to be divided by the total number of receivers benefitted, which must remain below \$30,000 per benefitted receptor to be considered cost effective.
- iii) Viewpoint of the Benefited Receptors – If the NRDG and the cost effectiveness criteria are met, SCDOT is to collect a verdict from all benefited receivers, obtaining enough responses to document a decision on either ‘desiring’ or ‘not desiring’ the noise abatement measure. It will be stated that the measure shall be constructed unless a majority (greater than 50% of benefited receivers) of votes for ‘not desiring’ noise abatement is collected.

For this noise analysis it was determined that none of the barriers met the design goal or necessary cost effectiveness. The need for a voting process by the residents of the benefited receivers is void.



c) Noise Barrier Evaluation

- i) NSA 3 – The noise barrier in NSA 3 did not meet feasibility criteria due to the NSA not containing the minimum of (3) impacts necessary as listed in the SCDOT Traffic Noise Abatement Policy.
- ii) NSA 9 – The noise barrier in NSA 9 did not meet feasibility criteria due to the Percentage of Impacted Receivers (less than 75%). In addition, safety and access issues limited the acoustic and engineering feasibility.
- iii) NSA 10 – The noise barrier in NSA 10 did not meet feasibility criteria due to the NSA not containing the minimum of (3) impacts necessary as listed in the SCDOT Traffic Noise Abatement Policy.
- iv) NSA 11 – The noise barrier in NSA 11 did not meet feasibility criteria due to the NSA not containing the minimum of (3) impacts necessary as listed in the SCDOT Traffic Noise Abatement Policy.

## 6) FINDINGS AND RECOMMENDATIONS

The noise analysis determined there to be a total of 8 impacted receptors for the 2045 Build Alternative. All impacted receptors are activity category 'B,' or residential impacts. Accordingly, mitigation analysis was warranted under the SCDOT Traffic Noise Abatement Policy. Barrier analysis was completed for NSA 3, NSA 9, NSA 10, and NSA 11. However, none of the noise mitigation methods met feasibility and reasonableness criteria as listed in the SCDOT Traffic Noise Abatement Policy.

## 7) CONSTRUCTION NOISE

It is recognized that construction, while temporary in nature, will result in increased noise levels during certain periods and at certain locations. If required during the final design noise analysis, a more detailed consideration of construction noise and associated abatement/mitigation will be undertaken, consistent with the availability and detail of anticipated construction scheduling and operations. Construction of temporary noise barriers and the early construction of permanent noise barriers will be considered as will the possibility of developing construction noise specifications and/or special provisions related to construction time periods, duration of construction activities, types of construction equipment, and/or equipment noise levels.





# Tables



**Table 1: 23 CFR Part 772, Noise Abatement Criteria (NAC) Hourly A Weighted Sound Level in Decibels (dB(A))**

<b>Activity Category</b>	<b>L<sub>eq</sub> (h)<sup>\1,2\</sup></b>	<b>L10(h)<sup>\1,2\</sup></b>	<b>Evaluation Location</b>	<b>Description of Activity Category</b>
<b>A</b>	57	60	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
<b>B</b>	67	70	Exterior	Residential.
<b>C</b>	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
<b>D</b>	52	55	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
<b>E<sup>\3\</sup></b>	72	75	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
<b>F</b>				Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
<b>G</b>				Undeveloped lands that are not permitted.

SOURCE: 23 CFR Part 772

\1\ Either Leq(h) or L10(h) (but not both) may be used on a project.

\2\ The Leq(h) and L10(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.

\3\ Includes undeveloped lands permitted for this activity category.



**Table 2 - Measurement Results**

Site ID Number	Address of Measurement Site	Date	Time Period	15 Minute M1-M4 /20 Minute M5-M11 Concurrent Traffic Counts Per Lane							
				Roadway	Autos	Medium Trucks	Heavy Trucks	Buses	Motor-cycles	Total	Measured Leq
M1	US 278 Rest area pullover*	1.25.2019	7:20-7:35am	EB US-278	493	2	9	0	0	504	77.4
				WB US-278	239	3	3	2	0	247	
M2	US 278 Beside entrance to Pinckney Wildlife*	1.25.2019	8:35-8:50am	EB US-278	670	7	9	0	0	686	72.6
				WB US-278	322	7	4	3	0	336	
M3	US 278 Beside entrance to Blue Heron Pt Rd*	1.25.2019	7:40-7:55am	EB US-278	735	5	8	0	0	748	74.0
				WB US-278	419	10	8	4	0	441	
M4	US 278 Along drive of Memories Matter*	1.25.2019	8:10-8:25am	EB US-278	626	13	15	0	0	654	81.8
				WB US-278	367	3	3	2	0	375	
M5	13 Fording Island Rd	1.30.2020	10:32-10:52am	EB US-278	561	19	13	0	1	594	64.5
				WB US-278	562	23	14	2	0	601	
M6	23 Fording Island Rd	1.30.2020	10:32-10:52am	EB US-278	561	19	13	0	1	594	65.1
				WB US-278	562	23	14	2	0	601	
M7	1690 Fording Island Rd	1.30.2020	11:20-11:40am	EB US-278	539	10	19	0	0	568	67.8
				WB US-278	580	11	12	0	0	603	
M8	7 Blue Heron Rd	1.30.2020	12:43-1:03pm	EB US-278	540	2	5	0	0	547	59.8
				WB US-278	553	11	11	0	0	575	
M11	77 William Hilton Parkway (US 278)	1.30.2020	12:01-12:21pm	EB US-278	553	13	9	1	0	576	72.1
				WB US-278	599	11	12	0	0	622	

\* 15-minute readings





**Table 3 - Validation Results**

Site ID Number	Address of Measurement Site	Date	Time Period	TNM Model Validation Noise Levels in dBA		
				Modeled Leq(h)	Measured Leq	Difference
M1	US 278 Rest area pullover*	?	7:20-7:35am	75.5	77.4	-1.9
M2	US 278 Beside entrance to Pinckney Wildlife*	?	8:35-8:50am	72.4	72.6	-0.2
M3	US 278 Beside entrance to Blue Heron Pt Rd*	?	7:40-7:55am	73.8	74.0	-0.2
M4	US 278 Along drive of Memories Matter*	?	8:10-8:25am	77.7	81.8	-4.1**
M5	13 Fording Island Rd	1.30.2020	10:32-10:52am	63.5	64.5	-1.0
M6	23 Fording Island Rd	1.30.2020	10:32-10:52am	62.3	65.1	-2.8
M7	1690 Fording Island Rd	1.30.2020	11:20-11:40am	67.6	67.8	-0.2
M8	7 Blue Heron Rd	1.30.2020	12:43-1:03pm	61.3	59.8	1.5
M11	77 William Hilton Parkway (US 278)	1.30.2020	12:01-12:21pm	71.5	72.1	-0.6

\* 15-minute readings

\*\* This measurement was taken within 50' of the highway, which may have resulted in inconsistencies between measured and modeled noise levels due to limitations in the model when calculating close distances.



**Table 4:**  
**US 278 Fording Island Rd, Hilton Head, SC**  
**Summary of Modeled Noise Levels**

NSA	Site ID	NAC	Existing (2018)	Future No-Build (2045)		Future Build No-Barrier (2045)	
				Noise Levels	Increase Over Existing	Noise Levels	Increase Over Existing
NSA 1	R1.1	B	58.9	58.9	0	61.6	3
	R1.2	B	60.9	60.9	0	63.3	2
	R1.3	B	60.4	60.4	0	62.9	3
	R1.4	B	60.0	60.0	0	62.4	2
	R1.5	B	60.2	60.2	0	62.4	2
	R1.6	B	59.8	59.8	0	62.0	2
	R1.7	B	47.2	47.3	0	48.3	1
	R1.8	B	49.2	49.2	0	50.6	1
	R1.9	B	51.7	51.7	0	52.3	1
	R1.10	B	52.4	52.4	0	53.6	1
	R1.11	B	54.6	54.6	0	55.6	1
	R1.12	B	57.4	57.4	0	59.1	2
	R1.13	B	57.0	57.0	0	59.4	2
	R1.14	B	57.2	57.2	0	59.8	3
	R1.15	B	57.1	57.1	0	59.4	2
	R1.16	B	57.0	57.0	0	59.3	2
	R1.17	B	56.7	56.7	0	58.9	2
	R1.18	B	56.7	56.7	0	58.6	2
	R1.19	B	56.4	56.3	0	58.0	2
	R1.20	B	54.2	54.2	0	56.3	2
	R1.21	B	44.1	45.1	1	44.8	1
	R1.22	B	52.1	52.3	0	54.4	2
	R1.23	B	41.5	42.8	1	42.1	1
	R1.24	B	50.1	50.1	0	52.0	2
	R1.25	B	50.7	50.7	0	52.4	2
	R1.26	B	49.6	49.6	0	50.5	1
	R1.27	B	50.2	50.2	0	51.0	1
	R1.28	B	50.1	50.1	0	50.8	1
	R1.29	B	50.8	50.8	0	51.3	1
	R1.30	B	50.6	50.6	0	50.6	0
	R1.31	B	48.7	48.7	0	48.7	0
	R1.32	B	49.2	49.2	0	49.2	0
NSA 2	R2.1 (Hilton pool)	C	60.7	60.7	0	64.7	4
	R3.1 (M5)	B	64.3	64.3	0	65.5	1
	R3.2	B	64.5	64.5	0	65.2	1
	R3.3	B	63.6	63.6	0	64.0	0
	R3.4 (M6)	B	63.6	63.6	0	64.1	0
	R3.5	B	60.1	60.1	0	59.6	0
	R3.6	B	55.4	55.4	0	54.8	0

**Table 4:**  
**US 278 Fording Island Rd, Hilton Head, SC**  
**Summary of Modeled Noise Levels**

NSA	Site ID	NAC	Existing (2018)	Future No-Build (2045)		Future Build No-Barrier (2045)	
				Noise Levels	Increase Over Existing	Noise Levels	Increase Over Existing
NSA 3	R3.7	B	60.8	60.8	0	60.6	0
	R3.8	B	55.4	55.4	0	55.7	0
	R3.9	B	52.1	52.1	0	53.0	1
	R3.10	B	59.1	59.1	0	59.0	0
	R3.11	B	52.9	52.9	0	53.8	1
	R3.12	B	52.1	52.1	0	52.8	1
	R3.13	B	58.9	58.9	0	59.4	1
	R3.14	B	58.0	58.0	0	58.6	1
	R3.15	B	54.5	54.5	0	55.2	1
	R3.16	B	60.4	60.4	0	60.9	1
	R3.17	B	57.8	57.8	0	58.7	1
	R3.18	B	53.5	53.5	0	55.3	2
	R3.19	B	54.6	54.6	0	55.1	1
	R3.20	B	60.4	60.4	0	61.7	1
	R3.21	B	58.3	58.3	0	60.6	2
	R3.22	B	59.7	59.7	0	61.7	2
NSA 4	R4.1 (M7)	C	64.2	64.1	0	60.8	-3
NSA 5	R5.1 (M2)	-	74.3	74.3	0	59.1	-15
NSA 6	R6.1	B	60.2	60.2	0	62.8	3
	R6.2	B	58.6	58.6	0	61.6	3
	R6.3	B	57.8	57.8	0	60.8	3
	R6.4	B	55.8	55.7	0	58.1	2
	R6.5	B	54.5	54.1	0	56.5	2
	R6.6	B	56.8	56.7	0	56.8	0
	R6.7	B	52.8	52.7	0	54.9	2
	R6.8	B	55.2	55.2	0	56.0	1
	R6.9	B	50.8	50.8	0	53.1	2
	R6.10	B	51.5	51.5	0	52.7	1
	R6.11	B	53.3	53.2	0	54.0	1
	R6.12	B	50.0	49.9	0	52.2	2
	R6.13	B	50.6	50.4	0	53.0	2
	R6.14	B	54.2	54.3	0	56.6	2
	R6.15	B	51.5	51.5	0	53.3	2
	R6.16	B	59.0	59.0	0	60.5	2
	R6.17	B	59.1	59.1	0	61.4	2
	R6.18	B	59.0	59.0	0	61.6	3
	R6.19	B	59.0	59.0	0	61.7	3
	R6.20 (Mariners Cove Tennis Court)	C	60.7	60.7	0	63.2	3



**Table 4:**  
**US 278 Fording Island Rd, Hilton Head, SC**  
**Summary of Modeled Noise Levels**

NSA	Site ID	NAC	Existing (2018)	Future No-Build (2045)		Future Build No-Barrier (2045)	
				Noise Levels	Increase Over Existing	Noise Levels	Increase Over Existing
NSA 7	R7.1	B	63.3	63.3	0	63.1	0
	R7.2	B	60.8	60.8	0	59.6	-1
	R7.3	B	59.0	59.0	0	57.6	-1
	R7.4	B	57.3	57.3	0	56.3	-1
	R7.5	B	55.4	55.4	0	54.5	0
	R7.6	B	53.7	53.7	0	54.4	0
	R7.7	B	55.3	55.3	0	55.6	0
	R7.8	B	57.4	57.4	0	57.4	0
	R7.9	B	62.4	62.4	0	61.0	-1
	R7.10 (M8, Vacant Lot)	-	-	-	-	-	-
	R8.1	B	62.3	62.3	0	62.7	0
	R8.2	B	58.3	58.3	0	60.3	2
	R8.3	B	56.1	56.1	0	56.8	1
	R8.4	B	50.3	50.3	0	54.5	4
	R8.5	B	50.3	50.3	0	54.2	4
	R8.6	B	48.3	48.3	0	50.8	3
	R8.7	B	57.7	57.7	0	56.1	-2
	R8.8	B	56.8	56.8	0	55.3	-2
	R8.9	B	48.5	48.6	0	51.1	3
	R8.10	B	51.4	51.4	0	52.2	1
	R8.11	B	54.4	54.4	0	57.0	3
	R8.12	B	57.2	57.2	0	59.7	3
	R8.13	B	56.8	56.8	0	61.0	4
	R8.14	B	57.1	57.1	0	61.3	4
	R8.15	B	57.4	57.4	0	62.1	5
	R8.16	B	57.7	57.7	0	62.8	5
	R8.17	B	57.6	57.6	0	63.0	5
	R8.18	B	57.5	57.5	0	63.4	6
	R8.19	B	56.1	56.1	0	61.8	6
	R8.20	B	56.7	56.7	0	62.0	5
	R8.21	B	56.8	56.8	0	62.0	5
	R8.22	B	56.6	56.6	0	61.9	5
	R8.23	B	56.4	56.4	0	61.5	5
	R8.24	B	55.9	55.9	0	60.5	5
	R8.25	B	56.6	56.6	0	61.0	4
	R8.26	B	56.6	56.6	0	60.8	4
	R8.27	B	56.1	56.1	0	59.6	4
	R8.28	B	56.7	56.7	0	60.0	3
	R8.29	B	57.2	57.2	0	59.9	3
	R8.30	B	57.9	57.9	0	60.3	2

**Table 4:**  
**US 278 Fording Island Rd, Hilton Head, SC**  
**Summary of Modeled Noise Levels**

NSA	Site ID	NAC	Existing (2018)	Future No-Build (2045)		Future Build No-Barrier (2045)	
				Noise Levels	Increase Over Existing	Noise Levels	Increase Over Existing
NSA 8	R8.31	B	58.9	58.9	0	61.0	2
	R8.32	B	59.6	59.6	0	61.3	2
	R8.33	B	60.3	60.3	0	61.7	1
	R8.34	B	49.4	49.4	0	52.1	3
	R8.35	B	50.1	50.1	0	53.0	3
	R8.36	B	50.5	50.5	0	53.2	3
	R8.37	B	50.5	50.5	0	53.4	3
	R8.38	B	50.5	50.5	0	53.7	3
	R8.39	B	49.5	49.5	0	53.2	4
	R8.40	B	49.7	49.7	0	52.7	3
	R8.41	B	49.7	49.7	0	52.9	3
	R8.42	B	49.9	49.9	0	53.3	3
	R8.43	B	50.0	50.0	0	53.3	3
	R8.44	B	49.7	49.7	0	52.7	3
	R8.45	B	49.7	49.6	0	52.1	2
	R8.46	B	50.6	50.6	0	52.9	2
	R8.47	B	50.1	50.1	0	52.6	3
	R8.48	B	50.1	50.1	0	52.7	3
	R8.49	B	50.7	50.7	0	53.0	2
	R8.50	B	50.6	50.6	0	53.4	3
	R8.51	B	51.1	51.1	0	54.4	3
	R8.52	B	51.7	51.7	0	54.4	3
	R8.53	B	50.8	50.7	0	53.7	3
	R8.54	B	50.4	50.4	0	52.3	2
	R8.55	B	50.4	50.4	0	52.5	2
	R8.56	B	56.1	56.1	0	57.6	2
	R8.57	B	54.0	54.0	0	55.5	2
	R8.58	B	45.5	45.5	0	48.7	3
	R8.59	B	48.0	48.0	0	49.7	2
	R8.60	B	50.3	50.8	1	53.3	3
	R8.61	B	46.4	48.1	2	49.3	3
	R8.62	B	46.9	46.9	0	49.1	2
	R8.63	B	50.1	50.1	0	52.7	3
	R8.64	B	60.8	60.8	0	63.5	3
	R8.65	B	56.0	56.0	0	57.5	2
	R8.66	B	51.7	51.7	0	52.5	1
	R8.67	B	55.2	55.2	0	57.6	2
	R8.68	B	59.0	58.9	0	61.3	2
	R8.69	B	60.5	60.4	0	62.8	2

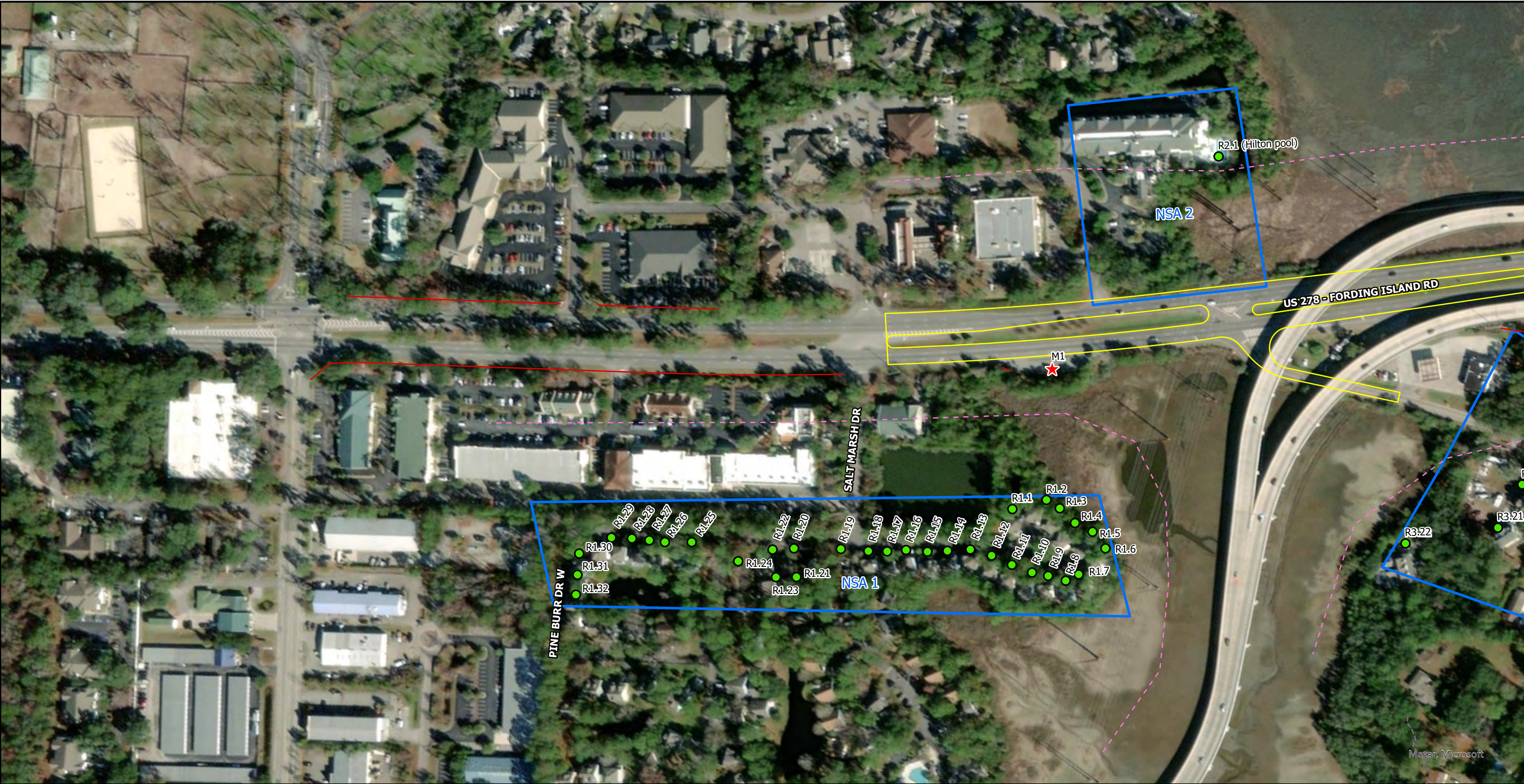
**Table 4:**  
**US 278 Fording Island Rd, Hilton Head, SC**  
**Summary of Modeled Noise Levels**

NSA	Site ID	NAC	Existing (2018)	Future No-Build (2045)		Future Build No-Barrier (2045)	
				Noise Levels	Increase Over Existing	Noise Levels	Increase Over Existing
	R8.70	B	55.0	55.0	0	56.1	1
	R8.71	B	58.5	58.4	0	59.8	1
	R8.72	B	58.6	58.6	0	60.2	2
	R8.73	B	61.3	61.3	0	64.0	3
	R8.74	B	55.6	55.6	0	57.8	2
	R8.75	B	55.3	55.3	0	57.4	2
	R8.76	B	57.9	57.8	0	60.4	3
	R8.77	B	53.7	53.7	0	56.1	2
	R8.78	B	49.0	48.9	0	51.6	3
	R8.79	B	61.9	61.8	0	65.2	3
	R8.80	B	54.6	54.6	0	57.0	2
	R8.81	B	49.9	49.9	0	52.5	3
	R8.82	B	52.9	52.9	0	55.2	2
	R8.83	B	51.8	51.8	0	53.8	2
	R8.84	B	51.3	51.3	0	53.4	2
	R8.85	B	51.2	51.3	0	53.4	2
	R8.86	B	52.7	52.7	0	54.7	2
	R8.87	B	54.5	54.5	0	56.5	2
	R8.88	B	49.9	49.9	0	51.9	2
	R8.89	B	52.9	52.8	0	55.0	2
	R8.90	B	50.4	50.4	0	52.5	2
	R8.91	B	48.0	48.0	0	50.3	2
	R8.92	B	47.2	47.2	0	49.4	2
	R8.93	B	48.0	47.9	0	50.0	2
	R8.94	B	48.3	48.0	0	50.3	2
	R8.95	B	49.0	49.0	0	51.5	3
	R8.96	B	52.2	52.1	0	54.5	2
	R8.97	B	57.8	57.7	0	60.7	3
NSA 9	R9.1	B	65.7	65.6	0	69.9	4
	R9.2	B	64.7	64.6	0	68.4	4
	R9.3	B	66.6	66.5	0	70.5	4
NSA 10	R10.1	B	72.1	72.0	0	73.4	1
	R10.2	B	69.0	68.8	0	70.8	2
NSA 11	R11.1 (take)	E					
	R11.2	B	67.0	66.9	0	71.2	4
	R11.3	B	69.9	69.7	0	73.5	4

# Figures







0

75

150

300 Feet

Modeling Sites

Impacted, Not Benefited

Not Impacted, Not Benefited

Acquired

Vacant

Measurement Sites

66 dB(A) Contour

Design Edge of Travel

Right-of-Way

NSAs

Gannett Fleming

Excellence Delivered As Promised

US 278 Realignment Noise Analysis

Hilton Head, SC

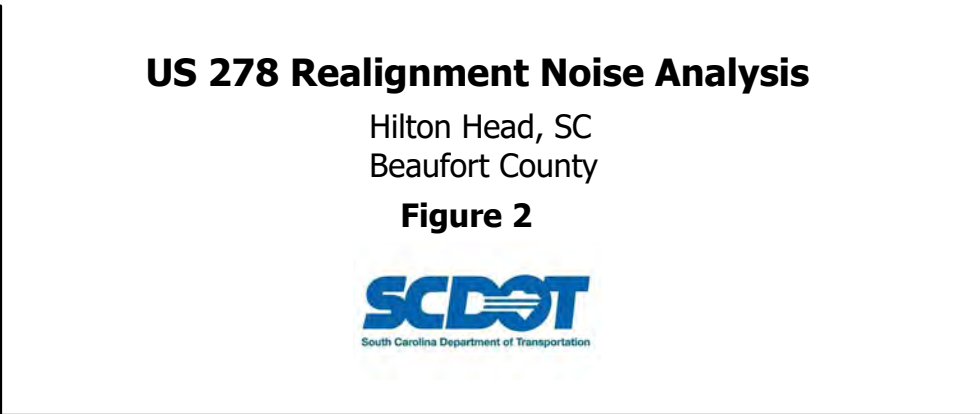
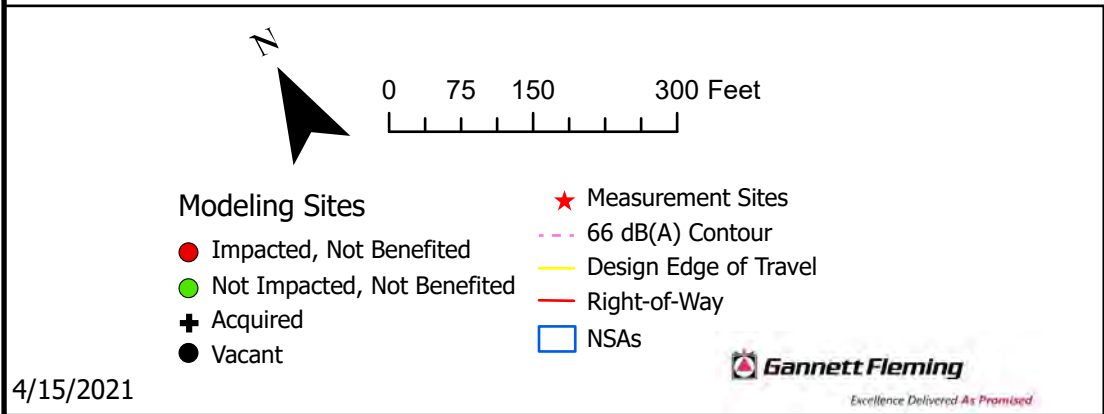
Beaufort County

Figure 1

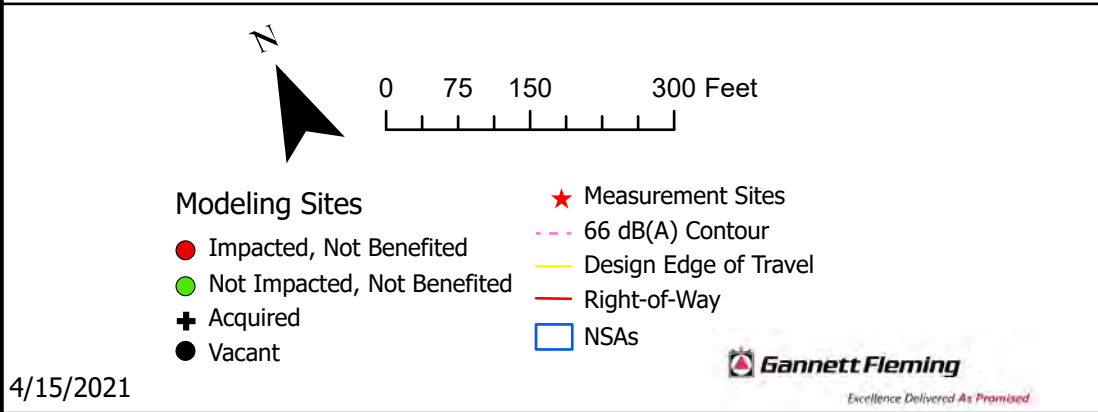
SCDOT

South Carolina Department of Transportation













Maxar, Microsoft



0 75 150 300 Feet

Modeling Sites

- Impacted, Not Benefited
- Not Impacted, Not Benefited
- ⊕ Acquired
- Vacant

- ★ Measurement Sites
- - - 66 dB(A) Contour
- - - Design Edge of Travel
- - - Right-of-Way
- NSAs



US 278 Realignment Noise Analysis

Hilton Head, SC  
Beaufort County

Figure 4







0

75

150

300 Feet

Modeling Sites

Impacted, Not Benefited

Not Impacted, Not Benefited

Acquired

Vacant

Measurement Sites

66 dB(A) Contour

Design Edge of Travel

Right-of-Way

NSAs

Gannett Fleming

Excellence Delivered As Promised

US 278 Realignment Noise Analysis

Hilton Head, SC  
Beaufort County

Figure 5

SCDOT

South Carolina Department of Transportation





Maxar, Microsoft



0 75 150 300 Feet

#### Modeling Sites

- Impacted, Not Benefited
- Not Impacted, Not Benefited
- ⊕ Acquired
- Vacant

★ Measurement Sites

--- 66 dB(A) Contour

--- Design Edge of Travel

--- Right-of-Way

□ NSAs

**Gannett Fleming**

Excellence Delivered As Promised

## US 278 Realignment Noise Analysis

Hilton Head, SC  
Beaufort County

**Figure 6**



Jenkins Island

US 278

Map data © OpenStreetMap contributors, Mapbox, Esri





N

075150300 Feet

Modeling Sites

● Impacted, Not Benefited

● Not Impacted, Not Benefited

⊕ Acquired

● Vacant

★ Measurement Sites

--- 66 dB(A) Contour

--- Design Edge of Travel

--- Right-of-Way

□ NSAs

Excellence Delivered As Promised

4/15/2021

US 278 Realignment Noise Analysis

Hilton Head, SC  
Beaufort County

Figure 7

South Carolina Department of Transportation







# Appendix A

## Traffic Data



## Appendix A - Traffic Data

2018 Existing Condition - Peak Hour Traffic Volume Breakdown												
Segment			Fleet Mix					TNM By -Lane Traffic Inputs (Hourly)				
#	Description	Vehicles Per Hour (LOS C)	Directional %	Auto %	MT %	HT%	Total Tck %	Auto Volume	MT Volume	HT Volume	Posted Speed EB*	Posted Speed WB*
1	Moss Creek Dr to Salt Marsh Dr	1310	50%	97%	2%	1%	3%	1271	26	13	50	45
2	Salth Marsh Dr to Fording Island Rd Ext	1310	50%	97%	2%	1%	3%	1271	26	13	50	45
3	Fording Island Rd Extension to PWR	1310	50%	97%	2%	1%	3%	1271	26	13	55	55
4	PWR to Gateway Dr	1340	50%	98%	1%	1%	2%	1313	13	13	55	55
5	Gateway Dr to Jenkins Rd	1340	50%	98%	1%	1%	2%	1313	13	13	45	45
6	Jenkins Rd to Signal	1340	50%	98%	1%	1%	2%	1313	13	13	45	45
7	Sigal to Squire Pope Rd	1340	50%	98%	1%	1%	2%	1313	13	13	45	45
8	Squire Pope Rd to Spanish Wells Rd	1340	50%	98%	1%	1%	2%	1313	13	13	45	45

2045 No-Build Alternative - Peak Hour Traffic Volume Breakdown												
Segment			Fleet Mix					TNM By -Lane Traffic Inputs (Hourly)				
#	Description	Vehicles Per Hour (LOS C)	Directional %	Auto %	MT %	HT%	Total Tck %	Auto Volume	MT Volume	HT Volume	Posted Speed EB*	Posted Speed WB*
1	Moss Creek Dr to Salt Marsh Dr	1310	50%	97.0%	2%	1%	3%	1271	26	13	50	45
2	Salth Marsh Dr to Fording Island Rd Ext	1310	50%	97.0%	2%	1%	3%	1271	26	13	50	45
3	Fording Island Rd Extension to PWR	1310	50%	97.0%	2%	1%	3%	1271	26	13	55	55
4	PWR to Gateway Dr	1340	50%	98.0%	1%	1%	2%	1313	13	13	55	55
5	Gateway Dr to Jenkins Rd	1340	50%	98.0%	1%	1%	2%	1313	13	13	45	45
6	Jenkins Rd to Signal	1340	50%	98.0%	1%	1%	2%	1313	13	13	45	45
7	Sigal to Squire Pope Rd	1340	50%	98.0%	1%	1%	2%	1313	13	13	45	45
7	Squire Pope Rd to Spanish Wells Rd	1340	50%	98.0%	1%	1%	2%	1313	13	13	45	45

2045 Build Alternative - Peak Hour Traffic Volume Breakdown												
Segment			Fleet Mix					TNM By -Lane Traffic Inputs (Hourly)				
#	Description	Vehicles Per Hour (LOS C)	Directional %	Auto %	MT %	HT%	Total Tck %	Auto Volume	MT Volume	HT Volume	Posted Speed EB*	Posted Speed WB*
1	Moss Creek Dr to Salt Marsh Dr	1310	50%	97%	2%	1%	3%	1271	26	13	50	45
2	Salth Marsh Dr to Fording Island Rd Ext	1310	50%	97%	2%	1%	3%	1271	26	13	50	45
3	Fording Island Rd Extension to PWR	1310	50%	97%	2%	1%	3%	1271	26	13	55	55
4	PWR to Gateway Dr	1340	50%	98%	1%	1%	2%	1313	13	13	55	55
5	Gateway Dr to Jenkins Rd	1340	50%	98%	1%	1%	2%	1313	13	13	45	45
6	Jenkins Rd to Signal	1340	50%	98%	1%	1%	2%	1313	13	13	45	45
7	Sigal to Squire Pope Rd	1340	50%	98%	1%	1%	2%	1313	13	13	45	45
8	Squire Pope Rd to Spanish Wells Rd	1340	50%	98%	1%	1%	2%	1313	13	13	45	45

# Appendix B

## Field Data Sheets



# Highway Noise Monitoring Sheet

DATE: 1/30/2020  
 PROJECT: US-278  
 JOB #: \_\_\_\_\_  
 SITE ID: M-5



ADDRESS: 13 Fording Island Rd E/D  
Bluffton, SC 29910

Meter Storage # \_\_\_\_\_

TYPE ☒ Residential ☐ Commercial ☐ Religion ☐ Educational ☐ Other \_\_\_\_\_

## Measurement Data

Photograph #'s \_\_\_\_\_

SLM NO. 4229 SLM Calibration before 93.6 after 93.6 GPS PT \_\_\_\_\_

Weather: temperature 53°F wind speed 5.5 mph cloud cover cloudy

Time: 1st start 10:32 stop 10:52 total 20 min

2nd start \_\_\_\_\_ stop \_\_\_\_\_ total \_\_\_\_\_

Data: 1st Leq 64.5 Lmax \_\_\_\_\_ Lmin \_\_\_\_\_ SEL \_\_\_\_\_

2nd Leq \_\_\_\_\_ Lmax \_\_\_\_\_ Lmin \_\_\_\_\_ SEL \_\_\_\_\_

## Traffic Data

Roadway#1 US-278 Roadway#2 US-278 Roadway#3 \_\_\_\_\_ Roadway#4 \_\_\_\_\_

Direction EB Direction WB Direction \_\_\_\_\_ Direction \_\_\_\_\_

	1st	2nd		1st	2nd		1st	2nd		1st	2nd
auto	<u>561</u>		auto	<u>562</u>		auto			auto		
med. trk.	<u>19</u>		med. trk.	<u>23</u>		med. trk.			med. trk.		
hvy trk.	<u>13</u>		hvy trk.	<u>14</u>		hvy trk.			hvy trk.		
bus	<u>0</u>		bus	<u>2</u>		bus			bus		
motorcycle	<u>1</u>		motorcycle	<u>0</u>		motorcycle			motorcycle		

auto \_\_\_\_\_ auto \_\_\_\_\_ auto \_\_\_\_\_ auto \_\_\_\_\_

med. trk. \_\_\_\_\_ med. trk. \_\_\_\_\_ med. trk. \_\_\_\_\_ med. trk. \_\_\_\_\_

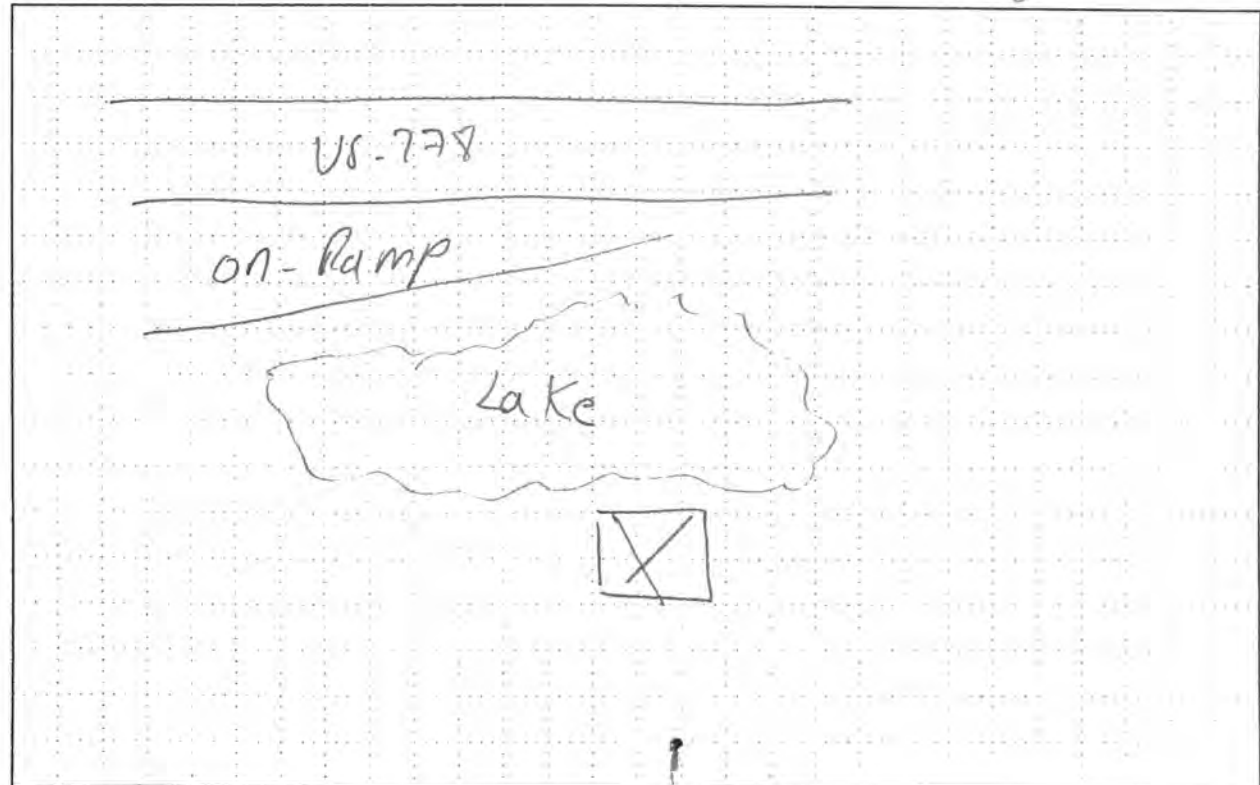
hvy trk. \_\_\_\_\_ hvy trk. \_\_\_\_\_ hvy trk. \_\_\_\_\_ hvy trk. \_\_\_\_\_

bus \_\_\_\_\_ bus \_\_\_\_\_ bus \_\_\_\_\_ bus \_\_\_\_\_

motorcycle \_\_\_\_\_ motorcycle \_\_\_\_\_ motorcycle \_\_\_\_\_ motorcycle \_\_\_\_\_

NOTES: ON-Ramp joint noise audible (also on opposite side)  
near Power Line  
Deleted last 25 seconds at end of recorded reading

## SITE SKETCH



# Highway Noise Monitoring Sheet

DATE: 1/30/20  
 PROJECT: US 278  
 JOB #: \_\_\_\_\_  
 SITE ID: M6



ADDRESS: Near  
330 Fording Island Rd  
Bluffton, SC  
 Meter Storage # \_\_\_\_\_

TYPE ☒ Residential ☐ Commercial ☐ Religion ☐ Educational ☐ Other \_\_\_\_\_

## Measurement Data

Photograph #'s \_\_\_\_\_

SLM NO. 4228 SLM Calibration before 94.1 after 94.1 GPS PT 32.123199°N 80.80054°W

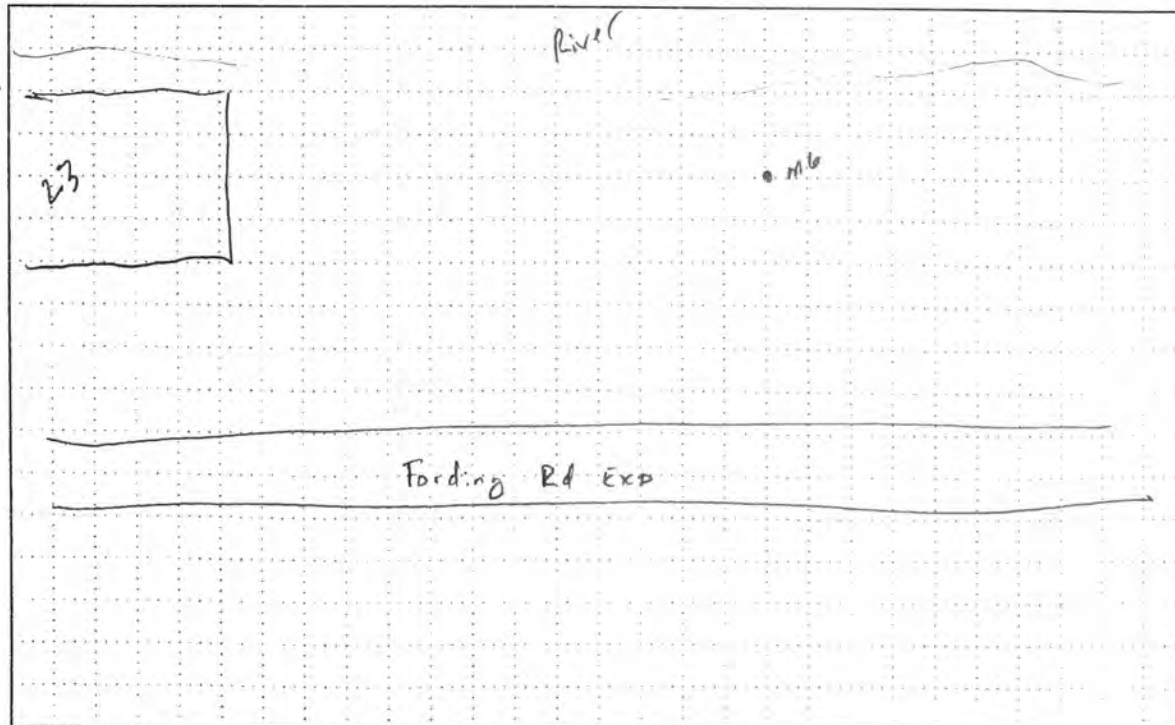
Weather: temperature 53°F wind speed 5.5 mph cloud cover cloudy  
 Time: 1st start 10:32 stop 10:52 total 20  
 2nd start \_\_\_\_\_ stop \_\_\_\_\_ total \_\_\_\_\_  
 Data: 1st Leq 65.1 Lmax \_\_\_\_\_ Lmin \_\_\_\_\_ SEL \_\_\_\_\_  
 2nd Leq \_\_\_\_\_ Lmax \_\_\_\_\_ Lmin \_\_\_\_\_ SEL \_\_\_\_\_

## Traffic Data

Roadway#1	Direction	1st	2nd	auto	med. trk.	hvy trk.	bus	motorcycle
<u>US 278</u>	<u>WB</u>	<u>502</u>						

NOTES: Wind blowing toward the meter from US 278.  
Some noise contribution from wind blowing palm fronds.

## SITE SKETCH



# Highway Noise Monitoring Sheet

DATE: 11/31/2020  
 PROJECT: US278  
 JOB #: \_\_\_\_\_  
 SITE ID: M7



ADDRESS: 1080 Fording Island Rd  
Bluffton SC

Meter Storage # \_\_\_\_\_

TYPE ☐ Residential ☐ Commercial ☐ Religion ☐ Educational ☒ Other Recreational

## Measurement Data

Photograph #'s \_\_\_\_\_

SLM NO. 4228 SLM Calibration before 99.1 after 99.1 GPS PT \_\_\_\_\_

Weather: temperature 51.5°F wind speed 7.4 mph cloud cover partly cloudy

Time: 1st start 11:20 stop 11:40 total 20

2nd start \_\_\_\_\_ stop \_\_\_\_\_ total \_\_\_\_\_

Data: 1st Leq 67.8 Lmax \_\_\_\_\_ Lmin \_\_\_\_\_ SEL \_\_\_\_\_

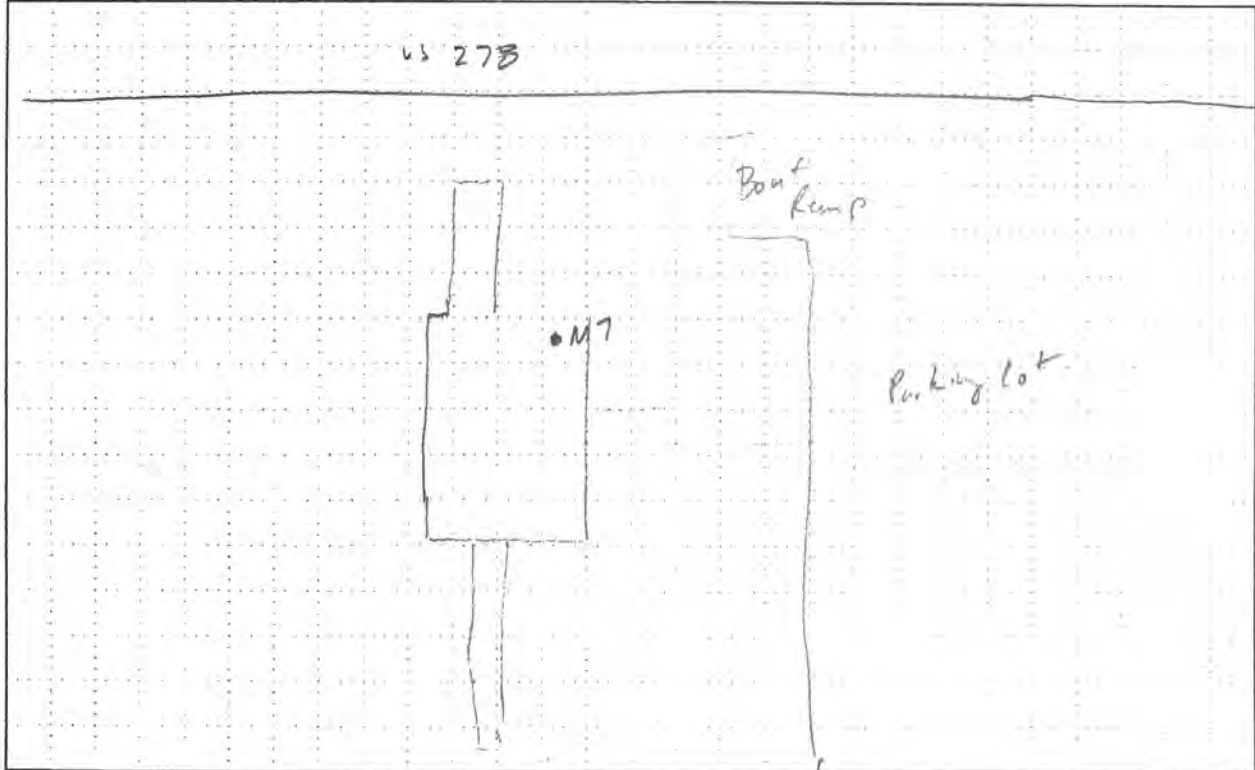
2nd Leq \_\_\_\_\_ Lmax \_\_\_\_\_ Lmin \_\_\_\_\_ SEL \_\_\_\_\_

## Traffic Data

Roadway#1	Roadway#2	Roadway#3	Roadway#4
<u>278</u>	<u>278</u>	_____	_____
Direction <u>EB</u>	Direction <u>WB</u>	Direction _____	Direction _____
1st 2nd	1st 2nd	1st 2nd	1st 2nd
auto <u>539</u>	auto <u>590</u>	auto _____	auto _____
med. trk. <u>10</u>	med. trk. <u>11</u>	med. trk. _____	med. trk. _____
hvy trk. <u>19</u>	hvy trk. <u>12</u>	hvy trk. _____	hvy trk. _____
bus _____	bus _____	bus _____	bus _____
motorcycle _____	motorcycle _____	motorcycle _____	motorcycle _____

NOTES: Moved measurement to platform because of choppy water  
 and movement of floating docks  
 Wind gusts up to 10 mph blowing to south (toward water from 278)

## SITE SKETCH



# Highway Noise Monitoring Sheet

DATE: 1/30/20  
 PROJECT: 65278  
 JOB # \_\_\_\_\_  
 SITE ID M8



ADDRESS: 7 Blue Heron way  
 \_\_\_\_\_  
 Meter Storage # \_\_\_\_\_

TYPE ☒ Residential ☐ Commercial ☐ Religion ☐ Educational ☐ Other \_\_\_\_\_

## Measurement Data

Photograph #'s \_\_\_\_\_

SLM NO. 4728 SLM Calibration before 94.1 after 94.1 GPS PT 32.22181 N, 80.77804 W

Weather: temperature 64°F wind speed 1 mph cloud cover clear

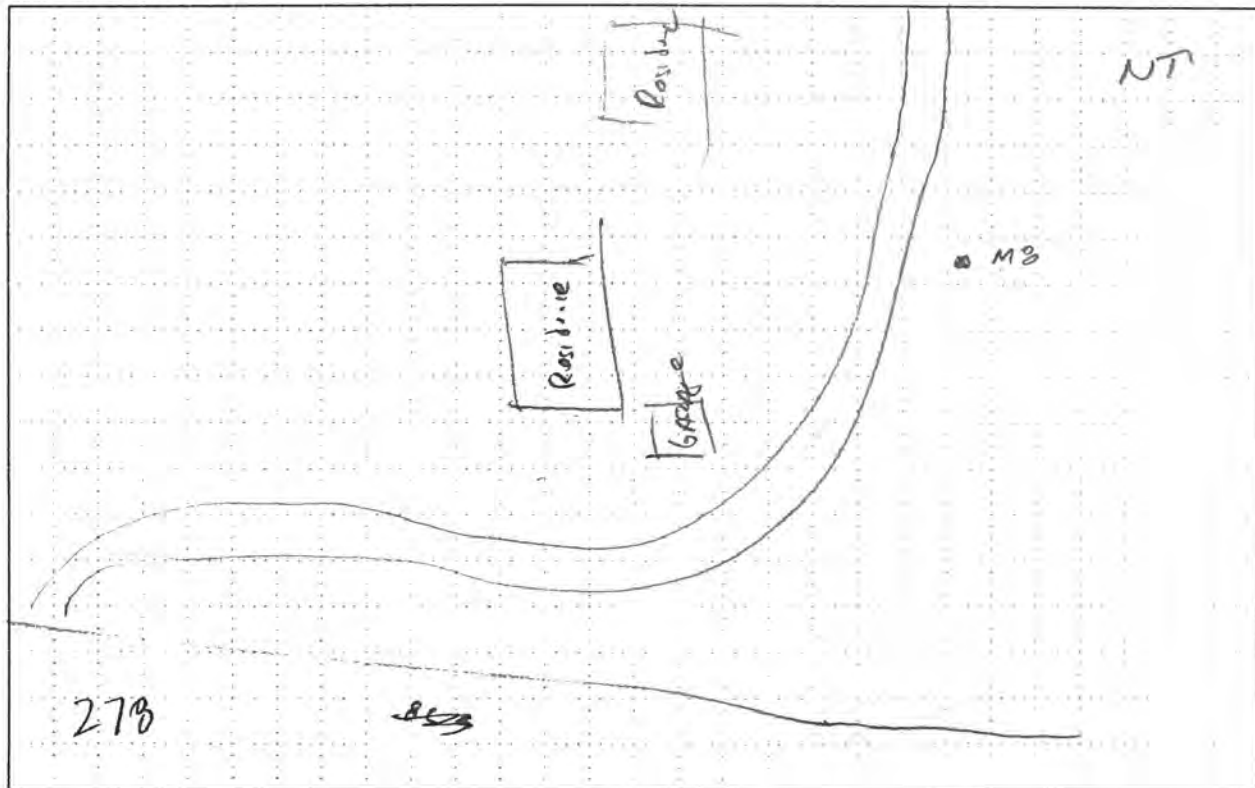
Time:	1st	start	<u>1243</u>	stop	<u>1303</u>	total	_____
	2nd	start	_____	stop	_____	total	_____
Data:	1st	Leq	<u>59.8</u>	Lmax	_____	Lmin	_____ SEL _____
	2nd	Leq	_____	Lmax	_____	Lmin	_____ SEL _____

## Traffic Data

Roadway#1	_____	Roadway#2	<u>P</u>	Roadway#3	<u>Blue Heron way</u>	Roadway#4	_____
Direction	<u>EB</u>	Direction	_____	Direction	_____	Direction	_____
	1st 2nd		1st 2nd		1st 2nd		1st 2nd
auto	<u>540</u>	auto	<u>553</u>	auto	<u>4</u>	auto	_____
med. trk.	<u>2</u>	med. trk.	<u>11</u>	med. trk.	<u>-</u>	med. trk.	_____
hvy trk.	<u>5</u>	hvy trk.	<u>11</u>	hvy trk.	<u>-</u>	hvy trk.	_____
bus	_____	bus	_____	bus	<u>-</u>	bus	_____
motorcycle	_____	motorcycle	_____	motorcycle	<u>-</u>	motorcycle	_____

NOTES: At approximately 9 minutes in there was intermittent power tool use at 9 Blue Heron - did not continue

## SITE SKETCH





# Highway Noise Monitoring Sheet

DATE: 1/30/20  
 PROJECT: US 278  
 JOB # \_\_\_\_\_  
 SITE ID M11



ADDRESS: 77 W48  
 \_\_\_\_\_  
 \_\_\_\_\_  
 Meter Storage # \_\_\_\_\_

TYPE ☒ Residential ☐ Commercial ☐ Religion ☐ Educational ☐ Other \_\_\_\_\_

## Measurement Data

Photograph #'s \_\_\_\_\_

SLM NO. 4228 SLM Calibration before 94.1 after 94.1 GPS PT \_\_\_\_\_

Weather: temperature 64°F wind speed 1 mph cloud cover partly cloudy

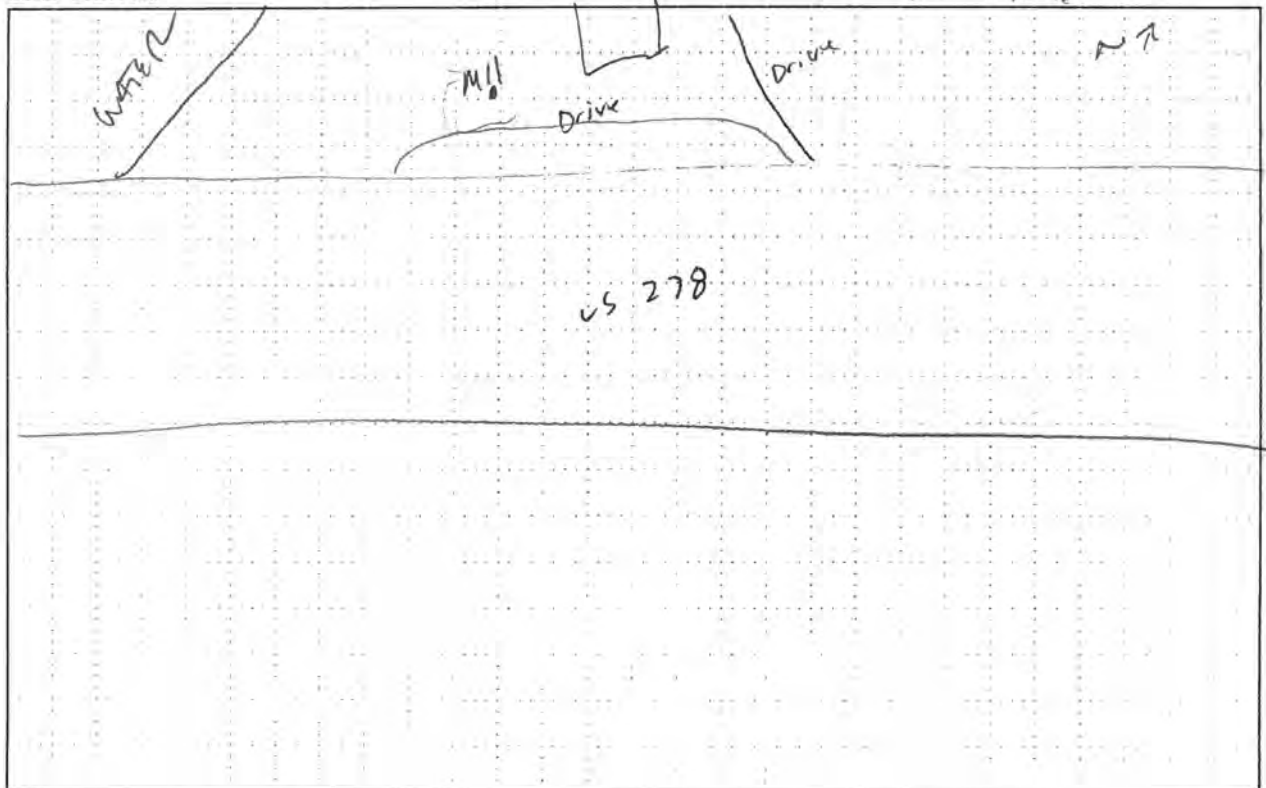
Time:	1st	start	<u>12:01 pm</u>	stop	<u>12:21 pm</u>	total	_____
	2nd	start	_____	stop	_____	total	_____
Data:	1st	Leq	<u>72.1</u>	Lmax	_____	Lmin	_____ SEL _____
	2nd	Leq	_____	Lmax	_____	Lmin	_____ SEL _____

## Traffic Data

Roadway#1 <u>278</u>	Roadway#2 <u>278</u>	Roadway#3 _____	Roadway#4 _____
Direction <u>WB</u>	Direction <u>WB</u>	Direction _____	Direction _____
auto 1st <u>553</u> 2nd _____	auto 1st <u>599</u> 2nd _____	auto 1st _____ 2nd _____	auto 1st _____ 2nd _____
med. trk. <u>13</u>	med. trk. <u>11</u>	med. trk. _____	med. trk. _____
hvy trk. <u>9</u>	hvy trk. <u>12</u>	hvy trk. _____	hvy trk. _____
bus <u>1</u>	bus <u>0</u>	bus _____	bus _____
motorcycle <u>0</u>	motorcycle <u>0</u>	motorcycle _____	motorcycle _____

NOTES: wind died significantly

## SITE SKETCH



# NOISE SURVEY SHEET

EQUIPMENT: METER NL 42 CALIBRATOR NC-74

CALIBRATION: START 93.7 dB END 93.7 dB

RESPONSE: FAST ☒ SLOW ☐ A-WEIGHTING ☒ BATTERY CHECK ☒

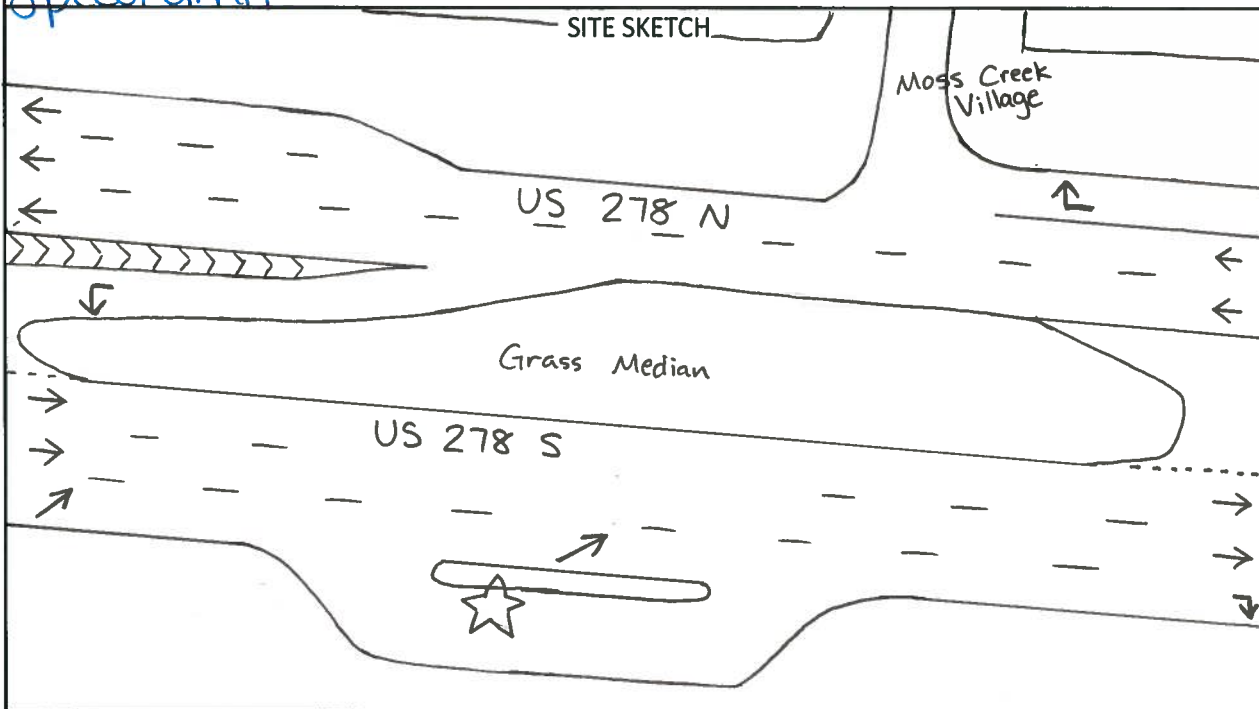
WEATHER DATA: 38°F. Wind 5-10 mph. Clear

Site	Time Period	Hourly Traffic Based on Concurrent Traffic Counts										Measured Leq
		Northbound Lanes					Southbound Lanes					
		Autos	MT	HT	Bus	MC	Autos	MT	HT	Bus	MC	
#1	7:20-7:35 AM	239	3	3	2	0	493	2	9	0	0	77.4
MT = Medium Trucks			HT = Heavy Trucks			MC = Motorcycles						

## NOTES:

speed limit: 55 mph

## SITE SKETCH

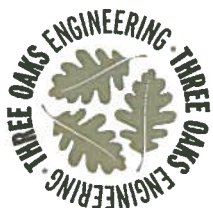


## BACKGROUND NOISE:

MAJOR SOURCES: US 278

## UNUSUAL EVENTS:

## OTHER NOTES:



THREE OAKS ENGINEERING

# NOISE SURVEY SHEET

EQUIPMENT: METER NL 42 CALIBRATOR NC-74

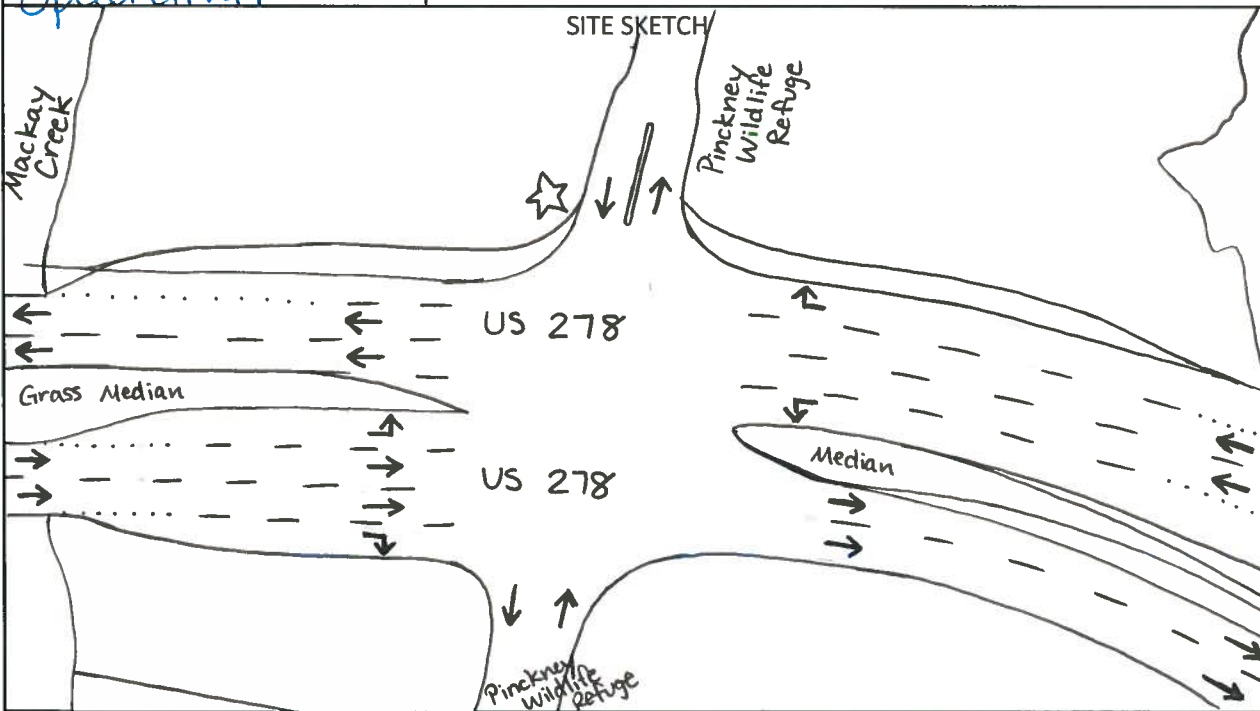
CALIBRATION: START 93.7 dB END 93.7 dB

RESPONSE: FAST ☒ SLOW ☐ A-WEIGHTING ☒ BATTERY CHECK ☒

WEATHER DATA: 39°F, Wind 5-10 mph, clear

Site	Time Period	Hourly Traffic Based on Concurrent Traffic Counts										Measured Leq
		Northbound Lanes					Southbound Lanes					
		Autos	MT	HT	Bus	MC	Autos	MT	HT	Bus	MC	
#2	8:35-8:50 Am	322	7	4	3	0	670	7	9	0	0	72.6
MT = Medium Trucks			HT = Heavy Trucks			MC = Motorcycles						

NOTES: Speed Limit 55 mph



BACKGROUND NOISE:

MAJOR SOURCES: US 278

UNUSUAL EVENTS:

OTHER NOTES:

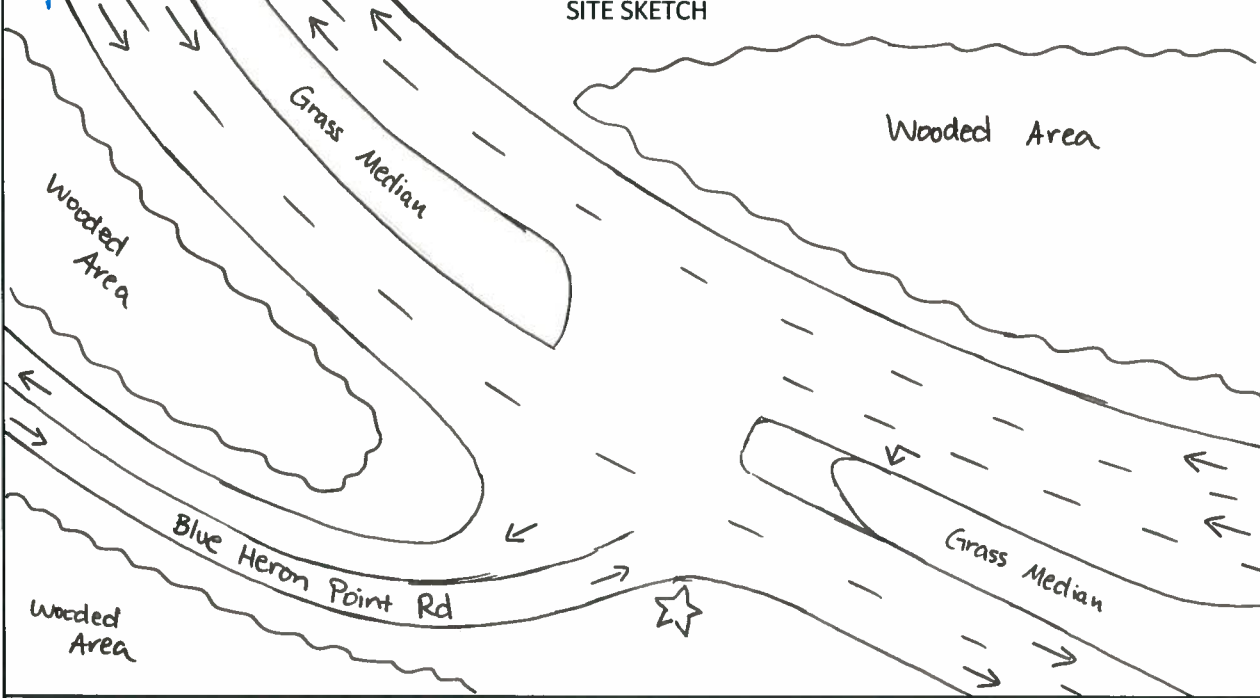


# NOISE SURVEY SHEET

EQUIPMENT: METER NL 42 CALIBRATOR NC-74  
 CALIBRATION: START 93.7 dB END 93.7 dB  
 RESPONSE: FAST ☒ SLOW ☐ A-WEIGHTING ☒ BATTERY CHECK ☒  
 WEATHER DATA: 38°F, Wind 5-10 mph, clear

Site	Time Period	Hourly Traffic Based on Concurrent Traffic Counts										Measured Leq
		Northbound Lanes					Southbound Lanes					
		Autos	MT	HT	Bus	MC	Autos	MT	HT	Bus	MC	
#3	7:40-7:55pm	419	10	8	4	0	735	5	8	0	0	74.0
MT = Medium Trucks			HT = Heavy Trucks			MC = Motorcycles						

NOTES: Speed Limit: 50 mph



BACKGROUND NOISE:  
 MAJOR SOURCES: US 278  
 UNUSUAL EVENTS:  
 OTHER NOTES:

# NOISE SURVEY SHEET

EQUIPMENT: METER NL 42 CALIBRATOR NC-74

CALIBRATION: START 93.7 dB END 93.7 dB

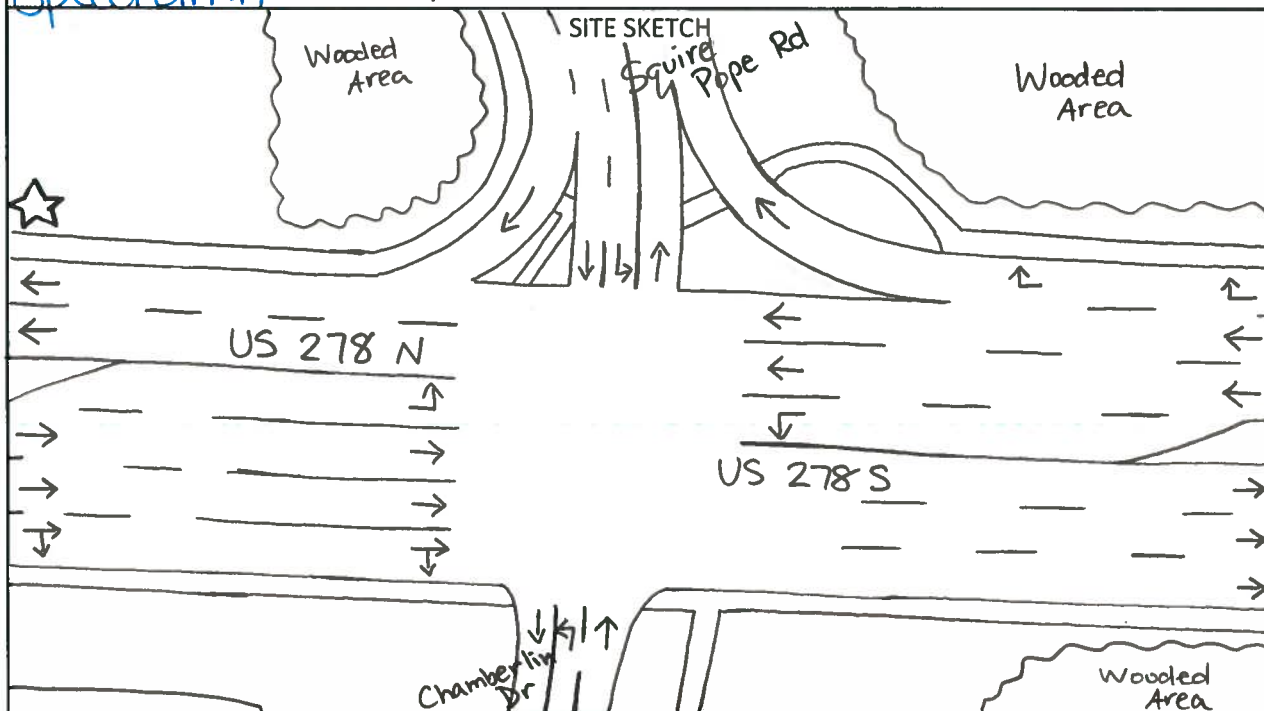
RESPONSE: FAST ☒ SLOW ☐ A-WEIGHTING ☒ BATTERY CHECK ☒

WEATHER DATA: 38°F, Wind 5-10 mph, Clear

Site	Time Period	Hourly Traffic Based on Concurrent Traffic Counts										Measured Leq
		Northbound Lanes					Southbound Lanes					
		Autos	MT	HT	Bus	MC	Autos	MT	HT	Bus	MC	
#4	8:10 - 8:25 pm	307	3	3	2	0	620	13	15	0	0	81.8
MT = Medium Trucks			HT = Heavy Trucks			MC = Motorcycles						

## NOTES:

Speed Limit: 45 mph



BACKGROUND NOISE:

MAJOR SOURCES: US 278

UNUSUAL EVENTS:

OTHER NOTES:



THREE OAKS ENGINEERING

# Appendix C

SCDOT Feasibility and Reasonableness Worksheets



# SCDOT Feasibility and Reasonableness Worksheet

Date: June 2020

Project Name US 278 Corridor Improvements Project

Highway Traffic Noise Abatement Measure NSA 3 - Noise Barrier

## Feasibility

Number of Impacted Receivers

1

Number of Benefited Receivers

0

Percentage of Impacted Receivers that would achieve a 5 dBA reduction from the proposed noise abatement measure

0

Is the proposed noise abatement measure acoustically feasible?

NOTE:SCDOT Policy indicates that 75% of the impacted receivers must achieve at least a 5 dBA reduction for it to be acoustically feasible.

☐ Yes

☒ No

Would any of the following issues limit the ability of the abatement measure to achieve the noise reduction goal?

Topography

☐ Yes

☐ No

Safety

☐ Yes

☐ No

Drainage

☐ Yes

☐ No

Utilities

☐ Yes

☐ No

Maintenance

☐ Yes

☐ No

Access

☐ Yes

☐ No

Exposed Height of Wall

☐ Yes

☐ No

If "Yes" was marked for any of the questions above, please explain below.

## Reasonableness

According to 23 CFR 772.13(d)(2)(iv) the abatement measure must collectively achieve each of these criteria to be reasonable. Therefore if any of the three mandatory reasonable factors are not achieved, then the abatement measure is determined NOT to be reasonable. When completing the form it is not necessary to detail each of the criteria if one was determined not to be reasonable.



### #1: Noise Reduction Design Goal

Number of Benefited Receivers

Number of Benefited Receivers that  
achieve at least an 8 dBA reduction

Percentage of Benefited Receivers in the first two building rows that would achieve at least a 8 dBA reduction from the proposed noise abatement measure. NOTE: SCDOT Policy indicates that 80% of the benefited receivers in the first two building rows must achieve at least a 8 dBA reduction for it to be reasonable.

Does the proposed noise abatement measure meet the noise reduction design goal? ☐ Yes ☐ No

*If "Yes" is marked, continue to #2. If "No" is marked, then abatement is determined NOT to be reasonable.*

### #2: Cost Effectiveness

Estimated cost per square foot for  
noise abatement measure

Estimated construction cost for noise  
abatement measure

Estimated cost per Benefited Receiver

Based on the SCDOT policy of \$30,000 per Benefited Receiver, would the abatement measure be reasonable?

NOTE: SCDOT Policy states that the preliminary noise analysis is based on \$35.00 per square foot and a more project-specific construction cost should be applied at a cost per square foot basis during the detailed noise abatement evaluation.

☐ Yes ☐ No

*If "Yes" is marked, continue to #3. If "No" is marked, then abatement is determined NOT to be reasonable.*

### #3: Viewpoints of the property owners and residents of the benefited receivers

Number of Benefited Receivers (same as above)

Number of Benefited Receivers  
in **support** of noise abatement measure

Percentage of Benefited Receivers  
in **support** of noise abatement measure

Number of Benefited Receivers  
**opposed** to noise abatement measure

Percentage of Benefited Receivers  
**opposed** to noise abatement measure

Number of Benefited Receivers **that did not  
respond** to solicitation on noise abatement  
measure

Percentage of Benefited Receivers **that  
did not respond** to solicitation on noise  
abatement measure

Based on the viewpoints of the property owners and residents of the Benefited Receivers, would the abatement measure be reasonable? NOTE: SCDOT Policy indicates that the noise abatement shall be constructed unless greater than 50% of the benefited receptors are opposed to noise abatement.

☐ Yes ☐ No

Final Determination for Noise Abatement Measure

# SCDOT Feasibility and Reasonableness Worksheet

Date: June 2020

Project Name US 278 Corridor Improvements Project

Highway Traffic Noise Abatement Measure NSA 9 - Noise Barrier

## Feasibility

Number of Impacted Receivers 3

Number of Benefited Receivers 1

Percentage of Impacted Receivers that would achieve a 5 dBA reduction from the proposed noise abatement measure

33

Is the proposed noise abatement measure acoustically feasible?

NOTE:SCDOT Policy indicates that 75% of the impacted receivers must achieve at least a 5 dBA reduction for it to be acoustically feasible.

☐ Yes

☒ No

Would any of the following issues limit the ability of the abatement measure to achieve the noise reduction goal?

Topography

☐ Yes

☒ No

Safety

☒ Yes

☐ No

Drainage

☐ Yes

☒ No

Utilities

☐ Yes

☒ No

Maintenance

☐ Yes

☒ No

Access

☒ Yes

☐ No

Exposed Height of Wall

☐ Yes

☒ No

If "Yes" was marked for any of the questions above, please explain below.

Barrier placed at right-of-way is not acoustically feasible due to necessary gaps for driveway access. Barrier would also unsafely obstruct visibility for vehicles pulling onto US 278.

## Reasonableness

According to 23 CFR 772.13(d)(2)(iv) the abatement measure must collectively achieve each of these criteria to be reasonable. Therefore if any of the three mandatory reasonable factors are not achieved, then the abatement measure is determined NOT to be reasonable. When completing the form it is not necessary to detail each of the criteria if one was determined not to be reasonable.

### #1: Noise Reduction Design Goal

Number of Benefited Receivers

Number of Benefited Receivers that  
achieve at least an 8 dBA reduction

Percentage of Benefited Receivers in the first two building rows that would achieve at least a 8 dBA reduction from the proposed noise abatement measure. NOTE: SCDOT Policy indicates that 80% of the benefited receivers in the first two building rows must achieve at least a 8 dBA reduction for it to be reasonable.

Does the proposed noise abatement measure meet the noise reduction design goal? ☐ Yes ☐ No

*If "Yes" is marked, continue to #2. If "No" is marked, then abatement is determined NOT to be reasonable.*

### #2: Cost Effectiveness

Estimated cost per square foot for  
noise abatement measure

Estimated construction cost for noise  
abatement measure

Estimated cost per Benefited Receiver

Based on the SCDOT policy of \$30,000 per Benefited Receiver, would the abatement measure be reasonable?

NOTE: SCDOT Policy states that the preliminary noise analysis is based on \$35.00 per square foot and a more project-specific construction cost should be applied at a cost per square foot basis during the detailed noise abatement evaluation.

☐ Yes ☐ No

*If "Yes" is marked, continue to #3. If "No" is marked, then abatement is determined NOT to be reasonable.*

### #3: Viewpoints of the property owners and residents of the benefited receivers

Number of Benefited Receivers (same as above)

Number of Benefited Receivers  
in **support** of noise abatement measure

Percentage of Benefited Receivers  
in **support** of noise abatement measure

Number of Benefited Receivers  
**opposed** to noise abatement measure

Percentage of Benefited Receivers  
**opposed** to noise abatement measure

Number of Benefited Receivers **that did not  
respond** to solicitation on noise abatement  
measure

Percentage of Benefited Receivers **that  
did not respond** to solicitation on noise  
abatement measure

Based on the viewpoints of the property owners and residents of the Benefited Receivers, would the abatement measure be reasonable? NOTE: SCDOT Policy indicates that the noise abatement shall be constructed unless greater than 50% of the benefited receptors are opposed to noise abatement.

☐ Yes ☐ No

Final Determination for Noise Abatement Measure

# SCDOT Feasibility and Reasonableness Worksheet

Date: June 2020

Project Name US 278 Corridor Improvements Project

Highway Traffic Noise Abatement Measure NSA 10 - Noise Barrier

## Feasibility

Number of Impacted Receivers 2 Number of Benefited Receivers 0

Percentage of Impacted Receivers that would achieve a 5 dBA reduction from the proposed noise abatement measure 0

Is the proposed noise abatement measure acoustically feasible?

NOTE:SCDOT Policy indicates that 75% of the impacted receivers must achieve at least a 5 dBA reduction for it to be acoustically feasible.

☐ Yes ☒ No

Would any of the following issues limit the ability of the abatement measure to achieve the noise reduction goal?

Topography	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Safety	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Drainage	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Utilities	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Maintenance	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Access	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
Exposed Height of Wall	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No

If "Yes" was marked for any of the questions above, please explain below.

## Reasonableness

According to 23 CFR 772.13(d)(2)(iv) the abatement measure must collectively achieve each of these criteria to be reasonable. Therefore if any of the three mandatory reasonable factors are not achieved, then the abatement measure is determined NOT to be reasonable. When completing the form it is not necessary to detail each of the criteria if one was determined not to be reasonable.

### #1: Noise Reduction Design Goal

Number of Benefited Receivers

Number of Benefited Receivers that  
achieve at least an 8 dBA reduction

Percentage of Benefited Receivers in the first two building rows that would achieve at least a 8 dBA reduction from the proposed noise abatement measure. NOTE: SCDOT Policy indicates that 80% of the benefited receivers in the first two building rows must achieve at least a 8 dBA reduction for it to be reasonable.

Does the proposed noise abatement measure meet the noise reduction design goal? ☐ Yes ☐ No

*If "Yes" is marked, continue to #2. If "No" is marked, then abatement is determined NOT to be reasonable.*

### #2: Cost Effectiveness

Estimated cost per square foot for  
noise abatement measure

Estimated construction cost for noise  
abatement measure

Estimated cost per Benefited Receiver

Based on the SCDOT policy of \$30,000 per Benefited Receiver, would the abatement measure be reasonable?

NOTE: SCDOT Policy states that the preliminary noise analysis is based on \$35.00 per square foot and a more project-specific construction cost should be applied at a cost per square foot basis during the detailed noise abatement evaluation.

☐ Yes ☐ No

*If "Yes" is marked, continue to #3. If "No" is marked, then abatement is determined NOT to be reasonable.*

### #3: Viewpoints of the property owners and residents of the benefited receivers

Number of Benefited Receivers (same as above)

Number of Benefited Receivers  
in **support** of noise abatement measure

Percentage of Benefited Receivers  
in **support** of noise abatement measure

Number of Benefited Receivers  
**opposed** to noise abatement measure

Percentage of Benefited Receivers  
**opposed** to noise abatement measure

Number of Benefited Receivers **that did not  
respond** to solicitation on noise abatement  
measure

Percentage of Benefited Receivers **that  
did not respond** to solicitation on noise  
abatement measure

Based on the viewpoints of the property owners and residents of the Benefited Receivers, would the abatement measure be reasonable? NOTE: SCDOT Policy indicates that the noise abatement shall be constructed unless greater than 50% of the benefited receptors are opposed to noise abatement.

☐ Yes ☐ No

Final Determination for Noise Abatement Measure

# SCDOT Feasibility and Reasonableness Worksheet

Date: June 2020

Project Name US 278 Corridor Improvements Project

Highway Traffic Noise Abatement Measure NSA 11 - Noise Barrier

## Feasibility

Number of Impacted Receivers

2

Number of Benefited Receivers

0

Percentage of Impacted Receivers that would achieve a 5 dBA reduction from the proposed noise abatement measure

0

Is the proposed noise abatement measure acoustically feasible?

NOTE:SCDOT Policy indicates that 75% of the impacted receivers must achieve at least a 5 dBA reduction for it to be acoustically feasible.

☐ Yes

☒ No

Would any of the following issues limit the ability of the abatement measure to achieve the noise reduction goal?

Topography

☐ Yes

☒ No

Safety

☐ Yes

☒ No

Drainage

☐ Yes

☒ No

Utilities

☐ Yes

☒ No

Maintenance

☐ Yes

☒ No

Access

☐ Yes

☒ No

Exposed Height of Wall

☐ Yes

☒ No

If "Yes" was marked for any of the questions above, please explain below.

## Reasonableness

According to 23 CFR 772.13(d)(2)(iv) the abatement measure must collectively achieve each of these criteria to be reasonable. Therefore if any of the three mandatory reasonable factors are not achieved, then the abatement measure is determined NOT to be reasonable. When completing the form it is not necessary to detail each of the criteria if one was determined not to be reasonable.

### #1: Noise Reduction Design Goal

Number of Benefited Receivers

Number of Benefited Receivers that  
achieve at least an 8 dBA reduction

Percentage of Benefited Receivers in the first two building rows that would achieve at least a 8 dBA reduction from the proposed noise abatement measure. NOTE: SCDOT Policy indicates that 80% of the benefited receivers in the first two building rows must achieve at least a 8 dBA reduction for it to be reasonable.

Does the proposed noise abatement measure meet the noise reduction design goal? ☐ Yes ☐ No

*If "Yes" is marked, continue to #2. If "No" is marked, then abatement is determined NOT to be reasonable.*

### #2: Cost Effectiveness

Estimated cost per square foot for  
noise abatement measure

Estimated construction cost for noise  
abatement measure

Estimated cost per Benefited Receiver

Based on the SCDOT policy of \$30,000 per Benefited Receiver, would the abatement measure be reasonable?

NOTE: SCDOT Policy states that the preliminary noise analysis is based on \$35.00 per square foot and a more project-specific construction cost should be applied at a cost per square foot basis during the detailed noise abatement evaluation.

☐ Yes ☐ No

*If "Yes" is marked, continue to #3. If "No" is marked, then abatement is determined NOT to be reasonable.*

### #3: Viewpoints of the property owners and residents of the benefited receivers

Number of Benefited Receivers (same as above)

Number of Benefited Receivers  
in **support** of noise abatement measure

Percentage of Benefited Receivers  
in **support** of noise abatement measure

Number of Benefited Receivers  
**opposed** to noise abatement measure

Percentage of Benefited Receivers  
**opposed** to noise abatement measure

Number of Benefited Receivers **that did not  
respond** to solicitation on noise abatement  
measure

Percentage of Benefited Receivers **that  
did not respond** to solicitation on noise  
abatement measure

Based on the viewpoints of the property owners and residents of the Benefited Receivers, would the abatement measure be reasonable? NOTE: SCDOT Policy indicates that the noise abatement shall be constructed unless greater than 50% of the benefited receptors are opposed to noise abatement.

☐ Yes ☐ No

Final Determination for Noise Abatement Measure



# Appendix D

## SLM Calibration Certificates



**Scantek, Inc.**

CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCCL Z540:1994 Part 1  
ACCREDITED by NVLAP (an ILAC MRA signatory)**NVLAP**<sup>®</sup>  
CALIBRATION  
NVLAP Lab Code: 200625-0

## Calibration Certificate No.41355

Instrument: **Acoustical Calibrator**  
Model: **NC-74**  
Manufacturer: **Rion**  
Serial number: **34536122**  
Class (IEC 60942): **1**  
Barometer type:  
Barometer s/n:  
Customer: **Scantek, Inc.**  
Tel/Fax: **410-290-7726 / 410-290-9167**

Date Calibrated: **8/22/2018** Cal Due: **8/22/2019**  
Status: 

Received	Sent
<b>X</b>	<b>X</b>

  
In tolerance: **X**  
Out of tolerance:  
See comments:  
Contains non-accredited tests: Yes X No

Address: **6430 Dobbins Road, Suite C,  
Columbia, MD 21045**

Tested in accordance with the following procedures and standards:  
Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31052	Oct 30, 2017	Scantek, Inc. / NVLAP	Oct 30, 2018
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 25, 2017	ACR Env. / A2LA	Oct 25, 2018
HM30-Thommen	Meteo Station	1040170/39633	Oct 25, 2017	ACR Env./ A2LA	Oct 25, 2018
140-Norsonic	Real Time Analyzer	1406423	Oct 31, 2017	Scantek / NVLAP	Oct 31, 2018
PC Program 1018 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	173368	Nov 10, 2017	Scantek, Inc. / NVLAP	Nov 10, 2018
1203-Norsonic	Preamplifier	14059	Feb 12, 2018	Scantek, Inc. / NVLAP	Feb 12, 2019

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)

Calibrated by:	Lydon Dawkins	Authorized signatory:	Steven E. Marshall
Signature	<i>Lydon Dawkins</i>	Signature	<i>Steven E. Marshall</i>
Date	8/22/2018	Date	8/22/2018

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.  
This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.

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Page 1 of 2



**Results summary:** Device was tested and complies with following clauses of mentioned specifications:

CLAUSES <sup>1</sup> FROM STANDARDS REFERENCED IN PROCEDURES:	MET <sup>2</sup>	NOT MET	COMMENTS
<b>Manufacturer specifications</b>			
Manufacturer specifications: Sound pressure level	X		
Manufacturer specifications: Frequency	X		
Manufacturer specifications: Total harmonic distortion	X		
<b>Current standards</b>			
ANSI S1.40:2006 B.3 / IEC 60942: 2003 B.2 - Preliminary inspection	X		
ANSI S1.40:2006 B.4.4 / IEC 60942: 2003 B.3.4 - Sound pressure level	X		
ANSI S1.40:2006 A.5.4 / IEC 60942: 2003 A.4.4 - Sound pressure level stability	-	-	
ANSI S1.40:2006 B.4.5 / IEC 60942: 2003 B.3.5 - Frequency	X		
ANSI S1.40:2006 B.4.6 / IEC 60942: 2003 B.3.6 - Total harmonic distortion	X		

<sup>1</sup> The results of this calibration apply only to the instrument type with serial number identified in this report.

<sup>2</sup> The tests marked with (\*) are not covered by the current NVLAP accreditation.

**Main measured parameters <sup>3</sup>:**

Measured <sup>4</sup> /Acceptable <sup>5</sup> Tone frequency (Hz):	Measured <sup>4</sup> /Acceptable <sup>5</sup> Total Harmonic Distortion (%):	Measured <sup>4</sup> /Acceptable Level <sup>5</sup> (dB):
1002.82 ± 1.0/1000.0 ± 10.0	1.60 ± 0.10/ < 3	94.17 ± 0.12/94.0 ± 0.4

<sup>3</sup> The stated level is valid at measurement conditions.

<sup>4</sup> The above expanded uncertainties for frequency and distortion are calculated with a coverage factor k=2; for level k=2.00

<sup>5</sup> Acceptable parameters values are from the current standards

**Environmental conditions:**

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.4 ± 1.0	99.47 ± 0.025	55.6 ± 2.1

**Tests made with following attachments to instrument:**

Calibrator ½" Adaptor Type: NC-74-002
Other:

**Adjustments:** Unit was not adjusted.

**Comments:** The instrument was tested and met all specifications found in the referenced procedures.

*Note:* The instrument was tested for the parameters listed in the table above, using the test methods described in the listed standards. All tests were performed around the reference conditions. The test results were compared with the manufacturer's or with the standard's specifications, whichever are larger.

Compliance with any standard cannot be claimed based solely on the periodic tests.

**Measured Data:** in Acoustical Calibrator Test Report # 41355 of one page.

**Place of Calibration:** Scantek, Inc.

6430 Dobbin Road, Suite C  
Columbia, MD 21045 USA

Ph/Fax: 410-290-7726/ -9167  
[callab@scantekinc.com](mailto:callab@scantekinc.com)

Calibration Certificates or Test Reports shall not be reproduced, except in full, without written approval of the laboratory.

This Calibration Certificate or Test Reports shall not be used to claim product certification, approval or endorsement by NVLAP, NIST, or any agency of the federal government.

Document stored as: Z:\Calibration Lab\Cal 2018\RIONNC74-0.5in\_34536122\_M1.doc

Page 2 of 2



**Scantek, Inc.**

CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCCL Z540:1994 Part 1  
ACCREDITED by NVLAP (an ILAC MRA signatory)**NVLAP**<sup>®</sup>  
CALIBRATION  
NVLAP Lab Code: 200625-0

## Calibration Certificate No.44106

**Instrument:** Acoustical Calibrator**Model:** CAL200**Manufacturer:** Larson Davis**Serial number:** 16398**Class (IEC 60942):** 1**Barometer type:****Barometer s/n:****Customer:** Environmental Acoustics**Tel/Fax:** 717-763-7212 x2480 / 717-763-8150**Date Calibrated:** 12/20/2019 **Cal Due:** 12/20/2020**Status:**

Received

Sent

**In tolerance:** X X**Out of tolerance:****See comments:****Contains non-accredited tests:** ☐ Yes ☒ No**Address:** 207 Senate Avenue,  
Camp Hill, PA 17011**Tested in accordance with the following procedures and standards:**

Calibration of Acoustical Calibrators, Scantek Inc., Rev. 10/1/2010

**Instrumentation used for calibration: Nor-1504 Norsonic Test System:**

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence	Cal. Due
				Cal. Lab / Accreditation	
483B-Norsonic	SME Cal Unit	31052	Oct 31, 2019	Scantek, Inc. / NVLAP	Oct 31, 2020
DS-360-SRS	Function Generator	33584	Oct 23, 2019	ACR Env. / A2LA	Oct 23, 2021
34401A-Agilent Technologies	Digital Voltmeter	MY47011118	Oct 22, 2019	ACR Env. / A2LA	Oct 22, 2020
HM30-Thommen	Meteo Station	1040170/39633	Oct 24, 2019	ACR Env. / A2LA	Oct 24, 2020
140-Norsonic	Real Time Analyzer	1406423	Oct 31, 2019	Scantek / NVLAP	Oct 31, 2020
PC Program 1018 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
4134-Brüel&Kjær	Microphone	173368	Oct 23, 2019	Scantek, Inc. / NVLAP	Oct 23, 2020
1203-Norsonic	Preamplifier	14059	Feb 28, 2019	Scantek, Inc. / NVLAP	Feb 28, 2020

**Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK)**

<b>Calibrated by:</b>	Lydon Dawkins	<b>Authorized signatory:</b>	Steven E. Marshall
Signature	<i>Lydon Dawkins</i>	Signature	<i>Steven E. Marshall</i>
Date	12/20/2019	Date	01/02/2020

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# **US 278 Corridor Improvements Project Noise Analysis Addendum**

**April 2021**

This addendum documents additional noise analysis completed for the US 278 Corridor Improvements Project from the original east terminus of the project at Squire Pope Road to the updated east terminus of the project at Wild Horse Road. The expanded noise analysis includes additional receptors in Noise Study Area (NSA) 11 and adds two new NSAs designated NSA 12 and NSA 13.

Please see the US 278 Corridor Improvements Project Noise Analysis Report dated July 2020 for details on analysis methodology. This addendum documents Traffic Noise Impacts, Consideration of Abatement and Findings and Recommendations from the additional analysis.

## **1) TRAFFIC NOISE IMPACTS**

FHWA has developed noise abatement criteria and procedures in 23 CFR Part 772, as shown in Table 1, that states that traffic noise impacts occur when either:

- 1) The predicted traffic noise levels approach (within 1 dBA) or exceed the FHWA NAC for the applicable activity category shown in Table 1; or,
- 2) The predicted traffic noise levels substantially exceed the existing noise levels by  $\geq 15$  dBA.

The TNM 2.5 model results for the existing condition, the 2045 design year no-build condition, and 2045 Reasonable Alternative 4 build condition can be found in Table 4.

### **a) Existing Year Noise Levels**

In the existing condition (2018), there are (3) receivers that have noise levels that approach or exceed the NAC criterion for its respective land use.

### **b) Design Year (2045) No-Build Alternative Noise Levels**

There are (3) receivers that have noise levels that approach or exceed the NAC criterion for its respective land use.

### **c) Design Year (2045) Build Alternative Noise Levels**

There are (3) residential receivers that have noise levels that approach or exceed the NAC criterion for its respective land use.

## **2) CONSIDERATION OF ABATEMENT**

Since there are impacted receivers due to the 2045 design year build alternative, abatement measures were considered for the proposed project.





When considering noise abatement measures, primary consideration shall be given to exterior areas where frequent human use occurs. Since South Carolina is not part of the FHWA-approved Quiet Pavement Pilot Program, the use of quieter pavements was not considered as an abatement measure for the proposed project. In addition, the planting of vegetation or landscaping was not considered as a potential abatement measure since it is not an acceptable Federal-aid noise abatement measure due to the fact that only dense stands of evergreen vegetation planted 100 feet deep will reduce noise levels. In accordance with 23 CFR §772.13(c), the following measures were considered and evaluated as a means to reduce or eliminate the traffic noise impacts:

- Acquisition of Right-of-Way - The acquisition of additional rights-of-way to mitigate the noise levels at the affected site would result in disruptive relocations.
- Traffic Management - Measures such as exclusive lane designations and signing for prohibition of certain vehicle type would prevent the project from serving its sole purpose of moving people, goods and services in and out of Hilton Head Island.
- Alteration of Horizontal and Vertical Alignments - Alignment modifications as a means of noise abatement would result in disruptive relocations for this project and would not be cost effective.
- Acquisition of real property (predominately unimproved property) to serve as a buffer zone to preempt development – Adequate property is not available to create an effective buffer zone between the proposed roadway and the impacted receivers.
- Noise insulation of public use or nonprofit institutional structures – There are no facilities within the study area that are eligible for consideration for noise insulation.
- Noise Barriers – The optimum situation for the use of free-standing noise barriers is when a dense concentration of impacted receivers lies directly adjacent to and parallel with the highway right-of-way. In these instances, a single barrier can protect many people at a relatively low cost per impacted site.

In consideration of abatement, SCDOT Noise Policy Guidelines state that proposed methods must be both feasible and reasonable. The feasibility and reasonableness of a noise barrier is determined by the following factors.

a) Feasibility

- i) Acoustic Feasibility – In accordance with SCDOT policy, a noise reduction of  $\geq 5$  dBA must be achieved for at least 75% of impacted receivers to consider the noise abatement method to be acoustically feasible. At minimum, at least three (3) impacted receivers must achieve a 5 dB(A) reduction. If this goal is not met, the method is determined not to be feasible and further analysis is not required.
- ii) Engineering Feasibility – Abatement methods must also meet engineering and environmental criteria such as drainage and topographical requirements, in addition to allowing safe access for maintenance, utilities, and property owners. Due to constructability limitations, noise abatement methods cannot exceed 25 feet in height.



b) Reasonableness

The following three reasonableness factors must all be met collectively for a noise abatement method to be considered reasonable. Failure to meet any single reasonableness factor will result in the noise abatement method to be deemed as not reasonable.

- i) Noise Reduction Design Goal (NRDG) – SCDOT policy states that a noise reduction design goal of  $\geq 8$  dBA must be met for 80% of receivers determined to be in the first two building rows, that are also considered benefited.
- ii) Cost Effectiveness – The allowable cost of noise barrier will be based on \$35.00 per square foot; this is based on actual construction costs of recent SCDOT projects. The total barrier construction cost is to be divided by the total number of receivers benefitted, which must remain below \$30,000 per benefited receptor to be considered cost effective.
- iii) Viewpoint of the Benefited Receptors – If the NRDG and the cost effectiveness criteria are met, SCDOT is to collect a verdict from all benefited receivers, obtaining enough responses to document a decision on either ‘desiring’ or ‘not desiring’ the noise abatement measure. It will be stated that the measure shall be constructed unless a majority (greater than 50% of benefited receivers) of votes for ‘not desiring’ noise abatement is collected.

For this noise analysis it was determined that none of the barriers met the design goal or necessary cost effectiveness. The need for a voting process by the residents of the benefited receivers is void.

c) Noise Barrier Evaluation

- i) NSA 12 – A noise barrier in NSA 12 did not meet feasibility criteria due to the NSA not containing the minimum of (3) impacts necessary as listed in the SCDOT Traffic Noise Abatement Policy.
- ii) NSA 13 – The noise barrier in NSA 13 did not meet feasibility criteria due to the NSA not containing the minimum of (3) impacts necessary as listed in the SCDOT Traffic Noise Abatement Policy.

### 3) FINDINGS AND RECOMMENDATIONS

The noise analysis determined there to be a total of 3 additional impacted receptors for the 2045 Build Alternative. All impacted receptors are activity category ‘B,’ or residential impacts. Accordingly, mitigation analysis was warranted under the SCDOT Traffic Noise Abatement Policy. Barrier analysis was considered for NSA 12 and NSA 13. However, none of the noise mitigation methods met feasibility and reasonableness criteria as listed in the SCDOT Traffic Noise Abatement Policy.



**Table 1:**  
**US 278 Fording Island Rd, Hilton Head, SC**  
**Summary of Modeled Noise Levels**

NSA	Site ID	NAC	Existing (2018)	Future No-Build (2045)		Future Build No-Barrier (2045)	
				Noise Levels	Increase Over Existing	Noise Levels	Increase Over Existing
NSA 11	R11.4	B	61.0	61.0	0	62.6	2
	R11.5	B	56.7	56.7	0	58.3	2
	R11.6	B	55.4	55.4	0	57.8	2
	R11.7	B	52.5	52.5	0	56.7	4
	R11.8	B	53.2	53.2	0	55.9	3
	R11.9	B	50.0	50.0	0	53.2	3
NSA 12	R12.1	B	55.7	55.7	0	58.0	2
	R12.2	B	54.0	54.0	0	56.3	2
	R12.3	B	69.9	69.9	0	71.6	2
	R12.4	B	63.9	63.9	0	65.0	1
	R12.5	B	62.3	62.3	0	63.4	1
	R12.6 (Basketball Court)	C	56.8	56.8	0	58.4	2
	R12.7 (Tennis Court)	C	58.2	58.2	0	59.4	1
	R12.8	B	58.4	58.4	0	59.3	1
NSA 13	R13.1	B	47.1	47.1	0	49.7	3
	R13.2	B	51.4	51.4	0	54.6	3
	R13.3	B	48.2	48.2	0	51.2	3
	R13.4	B	53.1	53.1	0	56.1	3
	R13.5	B	55.7	55.7	0	58.1	2
	R13.6	B	56.3	56.3	0	58.7	2
	R13.7	B	50.2	50.2	0	53.6	3
	R13.8	B	54.2	54.2	0	56.9	3
	R13.9	B	57.0	57.0	0	59.6	3
	R13.10	B	60.5	60.5	0	62.8	2
	R13.11	B	64.5	64.5	0	65.3	1
	R13.12	B	54.9	54.9	0	56.7	2
	R13.13	B	61.9	61.9	0	62.4	1
	R13.14	B	68.7	68.7	0	70.7	2
	R13.15	B	60.8	60.8	0	62.2	1
	R13.16	B	68.0	68.0	0	70.2	2
	R13.17	B	55.3	55.3	0	56.6	1
	R13.18	B	53.5	53.5	0	54.6	1
	R13.19	B	57.6	57.6	0	58.6	1





0 125 250 500 US Feet



### US 278 Realignment Noise Analysis

Hilton Head, SC  
Beaufort County

#### Addendum Figure



#### Modeling Sites

- Impacted, Not Benefited
- Not Impacted, Not Benefited
- ⊕ Acquired
- ★ Measurement Sites

- Design Edge of Travel
- Proposed Right-of-way (April 2021)
- - - 66dBA\_contour
- NSAs