

# NOISE IMPACT ASSESSMENT

Northwoods Estates  
Charleston County, South Carolina

*Prepared For:*



Charleston County

*Prepared By:*



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**August 2020**



## EXECUTIVE SUMMARY

The following noise study is funded by Charleston County and follows the South Carolina Department of Transportation (SCDOT) Traffic Noise Abatement Policy due to the absence of a County Traffic Noise Abatement Policy. The current SCDOT Traffic Noise Abatement Policy, dated October 2019, was followed to analyze the potential noise impacts and mitigation as necessary. Any noise abatement measures constructed would have to be done through funding mechanisms other than SCDOT.

A noise impact analysis has been performed for the Northwoods Estates community in North Charleston, South Carolina. Charleston County authorized the noise study in response to concerns raised by the Northwoods Estates residents regarding noise impacts from traffic along I-26.

The purpose of the study is to evaluate future noise levels and impacts to Northwoods Estates residences, using future (2040) traffic along I-26. The noise study area extends approximately 1.7 miles along I-26, starting about 1.3 miles south of I-26/US 78 interchange and ending at US 52 Connector. A total of 279 houses were analyzed for potential noise impacts, these included residences along Bentwood Drive, Rollins Court, Brigham Drive, Delhi Road, Long Shadow Lane, and New Ryder Road.

The TNM 2.5 Noise Model was used to analyze the existing condition (2020) and future (2040) traffic noise models. The modeling results indicated that for future (2040) noise levels, there are 121 residential receivers that would have noise levels that approach or exceed the Noise Abatement Criteria (NAC) for its respective land use. Noise abatement was therefore considered for the Northwoods Estates community. As a result of the mitigation analysis, there were no feasible and reasonable solutions to mitigate for the noise according to the SCDOT Traffic Noise Abatement Policy.



TABLE OF CONTENTS

- I. INTRODUCTION AND PROJECT DESCRIPTION ..... 1
  - A. Purpose and Need ..... 1
  - B. Project Area and Existing Facility..... 1
- II. ANALYSIS METHODOLOGY..... 4
  - A. Model Used and Assumptions..... 4
  - B. Traffic Data..... 4
  - C. Receptor Locations ..... 4
  - D. Field Measurements ..... 4
  - E. Model Validation ..... 6
- III. TRAFFIC NOISE IMPACTS..... 13
  - A. Modeled Existing 2020 Noise Levels ..... 13
  - B. Modeled Future 2040 Noise Levels..... 13
- IV. FEASIBLE AND RESONABLE CONSIDERATION OF ABATEMENT..... 18
  - A. Acquisition of Right-of-Way..... 18
  - B. Traffic Management ..... 18
  - C. Alteration of Horizontal and Vertical Alignments ..... 18
  - D. Acquisition of real property or interests therein (predominately unimproved property) to serve as a buffer zone to preempt development ..... 18
  - E. Noise insulation of public use or nonprofit institutional structures..... 18
  - F. Noise Barriers ..... 18
- V. FINDINGS AND RECOMMENDATIONS ..... 22
- VI. CONSTRUCTION NOISE ..... 22

LIST OF TABLES

- Table 1: 23 CFR Part 772, Table 1 Noise Abatement Criteria (NAC) Hourly A Weighted Sound Level in Decibels (dB(A))..... 5
- Table 2: Field Data Count and Classification Summary ..... 6
- Table 3: Comparison of Measured Leq to TNM 2.5 Modeled Leq..... 6
- Table 4: Existing 2020 and Future 2040 Sound Levels ..... 14
- Table 5.1: Evaluation Summary: Barrier 1 ..... 21
- Table 5.2: Evaluation Summary: Barrier 2 ..... 22



## LIST OF FIGURES

|   |   |
|---|---|
| Figure 1: Project Location Map .....      | 2 |
| Figure 2: Typical Section.....            | 3 |
| Figure 3. Future 2040 Noise Analysis..... | 7 |

## APPENDICES

|   |    |
|---|----|
| Appendix A: Traffic Data.....                               | 23 |
| Appendix B: Field Measurements & Model Validation .....     | 27 |
| Appendix C: Project Specific Wall Cost Estimate .....       | 32 |
| Appendix D: SCDOT's Feasible and Reasonable Worksheets..... | 34 |

## I. INTRODUCTION AND PROJECT DESCRIPTION

A noise impact analysis has been performed for the Northwoods Estates community in North Charleston, South Carolina. Charleston County authorized the noise study in response to concerns raised by the Northwoods Estates residents regarding noise impacts from traffic along I-26.

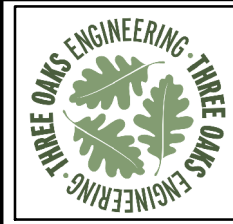
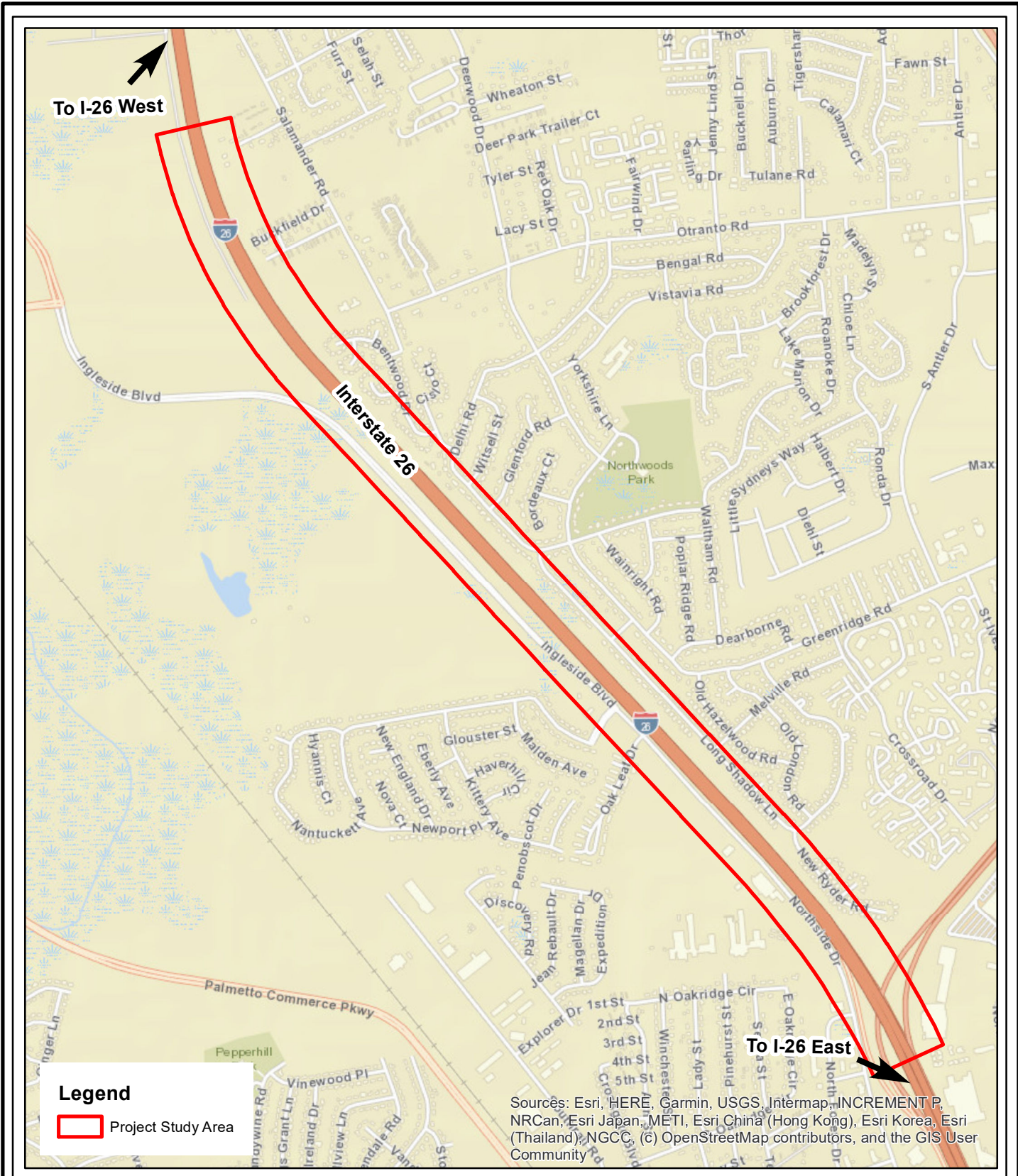
This study is funded by Charleston County and follows the South Carolina Department of Transportation (SCDOT) Traffic Noise Abatement Policy due to the absence of a County Traffic Noise Abatement Policy. The current SCDOT Traffic Noise Abatement Policy, dated October 2019, was followed to analyze the potential noise impacts and mitigation as necessary. Any noise abatement measures constructed would have to be done through funding mechanisms other than SCDOT.

### A. Purpose and Need

The purpose of the study is to evaluate future noise levels and impacts to Northwoods Estates residences, using future (2040) traffic along I-26. The Northwoods Estates community has expressed concerns regarding noise impacts from traffic on I-26. A noise analysis of the Northwoods Estates area was initiated by Charleston County.

### B. Project Area and Existing Facility

The noise study area extends approximately 1.7 miles along I-26, starting about 1.3 miles south of I-26/US 78 interchange and ending at US 52 Connector (Figure 1). This portion of I-26 has three 12-foot travel lanes in each direction, with shoulders to the inside and outside of the travel lanes, as shown in Figure 2. A total of 279 houses were analyzed for noise impacts, these included residences along Bentwood Drive, Rollins Court, Brigham Drive, Delhi Road, Long Shadow Lane, and New Ryder Road. Land uses in the study area are all residential.



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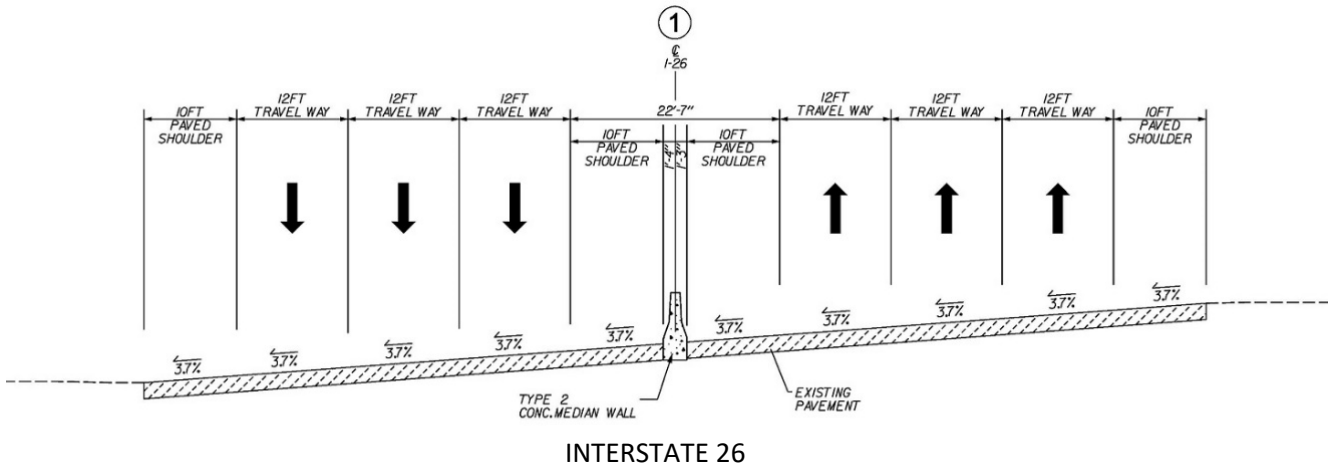
CHARLESTON COUNTY  
SOUTH CAROLINA

**Northwoods Estates Noise Analysis**  
**Location Map**  
 Charleston County, SC  
 0 375 750 1,500 Feet

Date: **December 2019**  
 Scale: **1 inch = 1,500 feet**  
 Job No.: **18-049**  
 Drawn By: **SMM**      Checked By: **HMR**

Figure  
1

Figure 2: Typical Section – I-26 Mainline



INTERSTATE 26

## II. ANALYSIS METHODOLOGY

### A. Model Used and Assumptions

Federal Highway Administration (FHWA) Traffic Noise Model (TNM 2.5) was used to derive existing and future noise levels.

A partial interchange, Palmetto Commerce Interchange, is proposed within the project study area and was therefore included in the future (2040) model. Applicable model features, such as shoulders, building barriers, shared-use paths, and control stops on ramps were added to the analysis to provide accurate sound level results. The first two rows of residences in Northwoods Estates were modeled as fixed height barriers with 3 sides. Single story houses were modeled at a fixed height of 15 feet, while two-story houses were modeled at 25 feet.

### B. Traffic Data

Existing (2020) and future (2040) traffic data (and design files) were provided by Stantec, refer to Appendix A. Due to the fact that I-26 operates at level of service (LOS) F during peak hour resulting in stop-and-go conditions, free flow traffic numbers were used for the existing condition (2020) as well as future (2040) models. The traffic report included the estimated Average Annual Daily Traffic (AADT) for the design year (2040) that included fleet mix percentages, directional splits, and free flow traffic numbers. There is a truck restriction along this section of the I-26 noise study area. Therefore, heavy trucks were modeled in the two outside lanes. A speed limit of 65 miles per hour (mph) was used for I-26.

### C. Receptor Locations

Sensitive receptors and/or land use types were first identified using aerial photography and street level views from <http://maps.google.com>, then field verified. Receptors were modeled in areas of frequent human use. Exterior usage receptor categories that are potentially impacted by the current and future traffic are residential land uses, which fall under FHWA-developed Noise Abatement Criteria (NAC) categories B, refer to Table 1. Figures 3-1 through 3-5 show all receptor locations evaluated for this project.

### D. Field Measurements

Ambient noise field measurements were taken at 4 locations within the Northwoods Estates community: 8687 Bentwood Drive, 8318 Delhi Road, 8139 Long Shadow Lane, and 7920 New Ryder Road. Noise measurements were taken on Wednesday, October



16, 2019 during PM peak traffic. These were performed in accordance with the FHWA publication “Measurement of Highway-related Noise.” Vehicles were counted on I-26 along the Northwoods Estate area and the type of vehicles were noted during the field measurements. Meteorological conditions and local features were noted for each site. Table 2 summarizes the information for the ambient noise field measurements and Appendix B contains the field measurement data sheets.

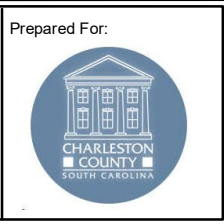
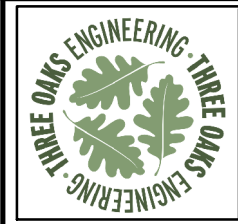
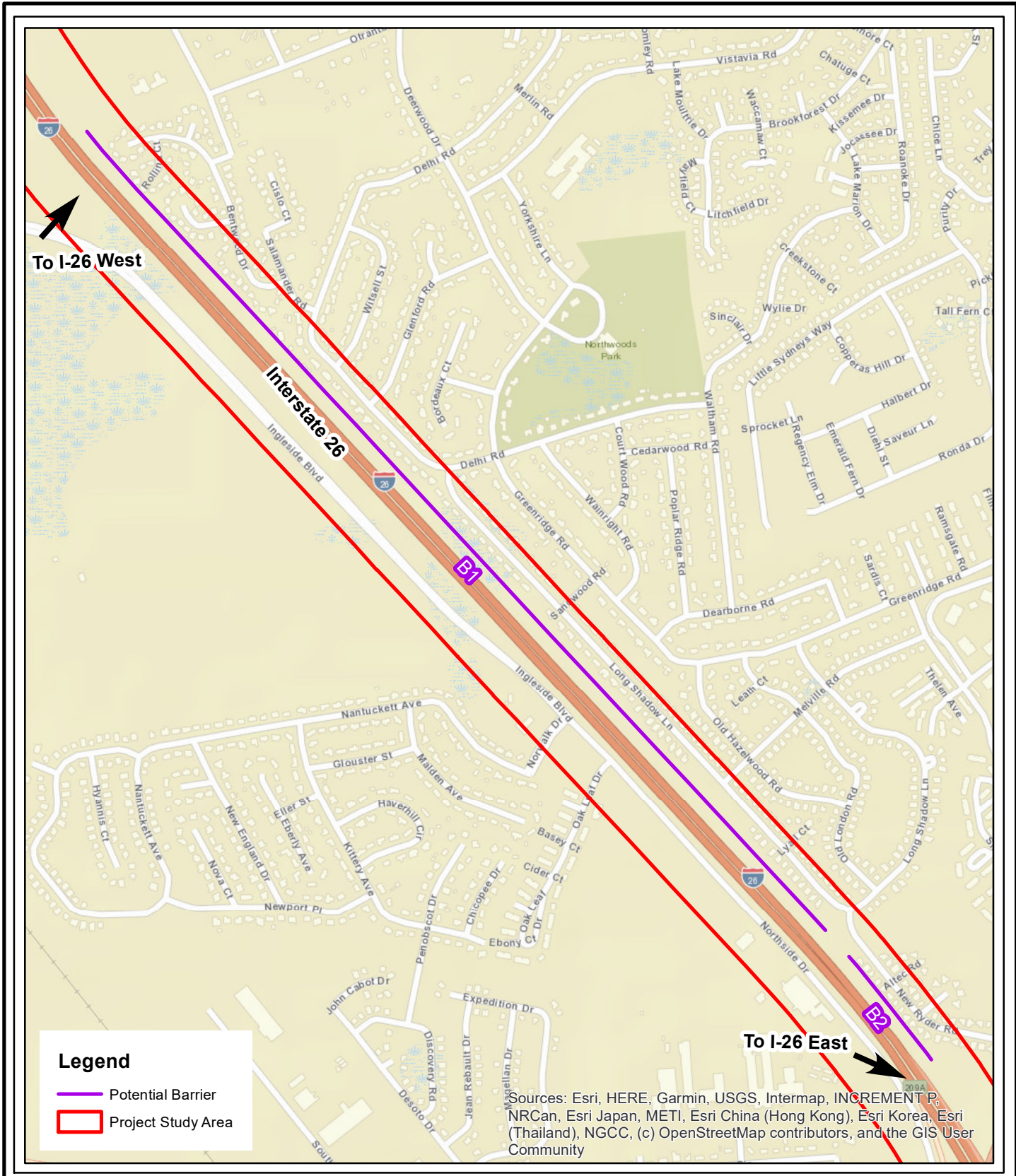
| <b>Table 1: 23 CFR Part 772, Table 1 Noise Abatement Criteria (NAC) Hourly A Weighted Sound Level in Decibels (dB(A))</b>  |                                |                                |                            |   |
|--|--------------------------------|--------------------------------|----------------------------|---|
| <b>Activity Category</b>   | <b>Leq (h)<sup>\1,2\</sup></b> | <b>L10 (h)<sup>\1,2\</sup></b> | <b>Evaluation Location</b> | <b>Description of Activity Category</b>   |
| A  | 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 <sup>\3\</sup>   | 67                             | 70                             | Exterior                   | Residential.  |
| C <sup>\3\</sup>   | 67                             | 70                             | Exterior                   | Active sport areas, amphitheatres, 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. |
| D  | 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.  |
| E <sup>\3\</sup>   | 72                             | 75                             | Exterior                   | Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.  |
| F  |                                |                                |                            | 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.  |
| G  |                                |                                |                            | Undeveloped lands that are not permitted.   |
| <p>SOURCE: 23 CFR Part 772</p> <p>\1\ Either Leq(h) or L10(h) (but not both) may be used on a project.</p> <p>\2\ The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.</p> <p>\3\ Includes undeveloped lands permitted for this activity category.</p> |                                |                                |                            |   |

| Table 2: Field Data Count and Classification Summary            |            |                   |                     |    |    |     |    |           |    |    |     |    |
|---|------------|-------------------|---------------------|----|----|-----|----|-----------|----|----|-----|----|
| Location  | Date       | Time Period (min) | Traffic Counts Data |    |    |     |    |           |    |    |     |    |
|   |            |                   | Eastbound           |    |    |     |    | Westbound |    |    |     |    |
|   |            |                   | Auto                | MT | HT | Bus | MC | Auto      | MT | HT | Bus | MC |
| Site #1<br>8687 Bentwood Dr.                                    | 10/16/2019 | 5:53 – 6:08 PM    | 733                 | 16 | 21 | 5   | 5  | 1136      | 8  | 39 | 1   | 2  |
| Site #2<br>8318 Delhi Rd.                                       | 10/16/2019 | 5:29 – 5:54 PM    | 873                 | 6  | 29 | 1   | 0  | 1288      | 11 | 34 | 0   | 1  |
| Site #3<br>8139 Long Shadow Ln.                                 | 10/16/2019 | 4:59 – 5:14 PM    | 844                 | 9  | 26 | 5   | 0  | 1242      | 18 | 57 | 1   | 2  |
| Site #4<br>7920 New Ryder Rd.                                   | 10/16/2019 | 4:29 – 4:44 PM    | 780                 | 11 | 26 | 0   | 0  | 1537      | 11 | 76 | 0   | 1  |
| Notes:<br>MT - Medium Trucks HT - Heavy Trucks MC – Motorcycles |            |                   |                     |    |    |     |    |           |    |    |     |    |

E. Model Validation

Using the ambient noise field measurements shown in Table 2, the TNM 2.5 model was validated per the requirements in 23 CFR §772.11(d)(2). Leq is defined as the equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq. Table 3 below compares the measured Leq versus modeled Leq for the sites during the measurement period. Based on SCDOT Policy, if the measured and modeled Leq are within 3 dBA, the model is validated. Table 3 shows that the difference between the modeled and measured Leq, where applicable, was ≤3.0 dBA at the sites; therefore, the model is validated.

| Table 3: Comparison of Measured Leq to TNM 2.5 Modeled Leq |              |             |            |
|--|--------------|-------------|------------|
| Location   | Measured Leq | Modeled Leq | Difference |
| Site #1<br>8684 Bentwood Drive                             | 74.3         | 71.3        | -3.0       |
| Site #2<br>8318 Delhi Road                                 | 68.0         | 70.2        | +2.2       |
| Site #3<br>8139 Long Shadow Lane                           | 71.3         | 70.6        | -0.7       |
| Site #4<br>7920 New Ryder Road                             | 71.5         | 74.4        | -2.9       |



**Northwoods Estates  
Future 2040 Noise Analysis**

Charleston County, SC

0 237.5475 950 Feet

Date: January 2020

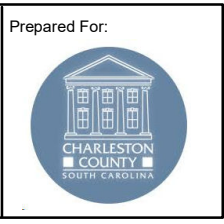
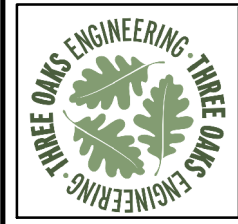
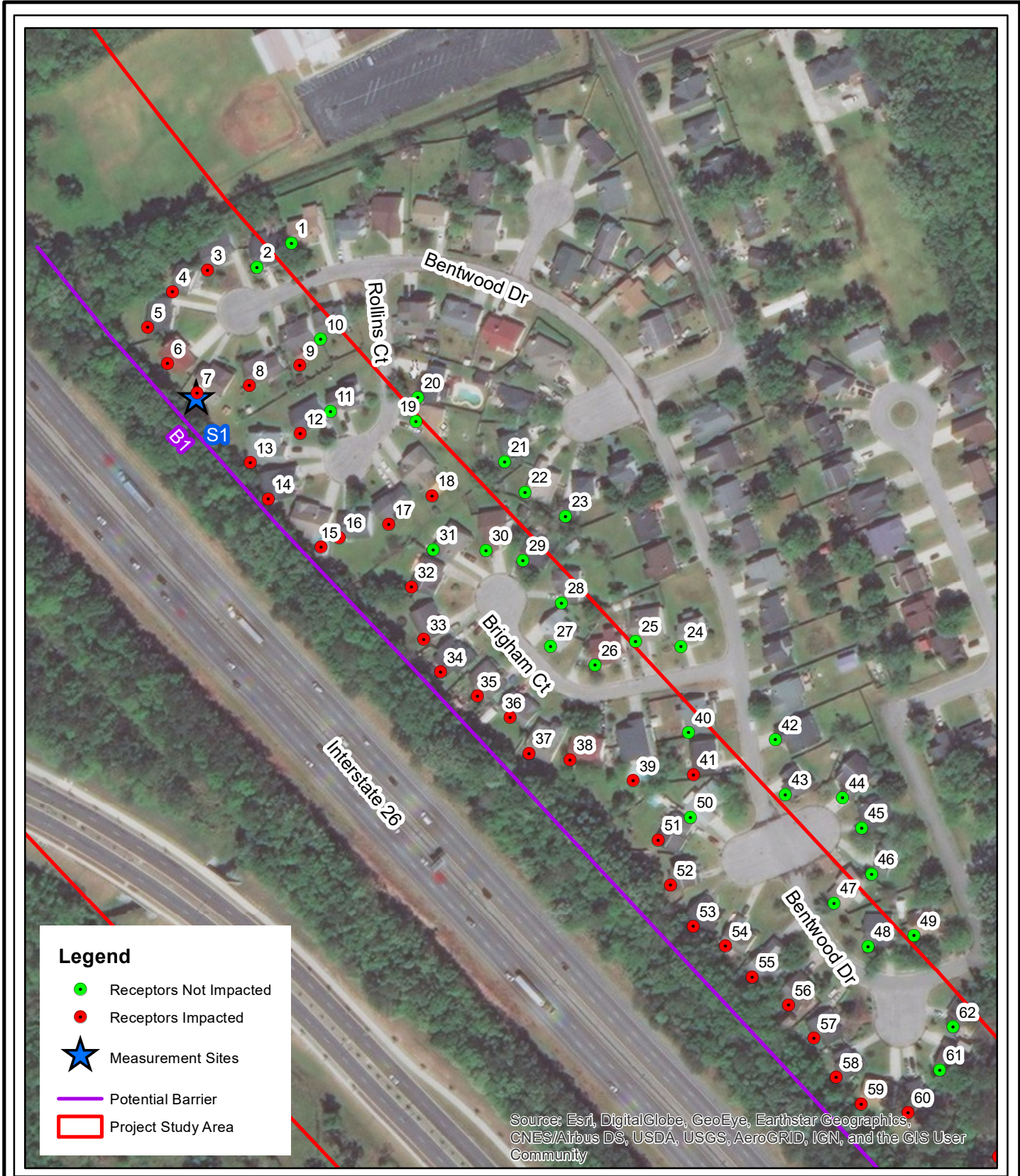
Scale: 1 inch = 950 feet

Job No.: 18-049

Drawn By: SMM

Checked By: HMR

Figure  
**3-0**



**Northwoods Estates  
Future 2040 Noise Analysis**

Charleston County, SC

0 50 100 200 Feet

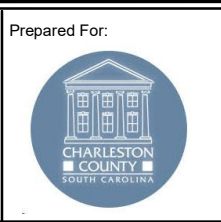
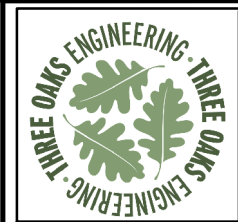
Date: **December 2019**

Scale: **1 inch = 200 feet**

Job No.: **18-049**

Drawn By: **SMM**      Checked By: **HMR**

Figure  
**3-1**



**Northwoods Estates  
Future 2040 Noise Analysis**

Charleston County, SC

0 50 100 200 Feet

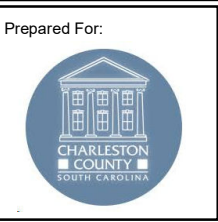
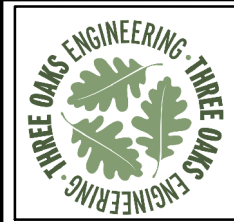
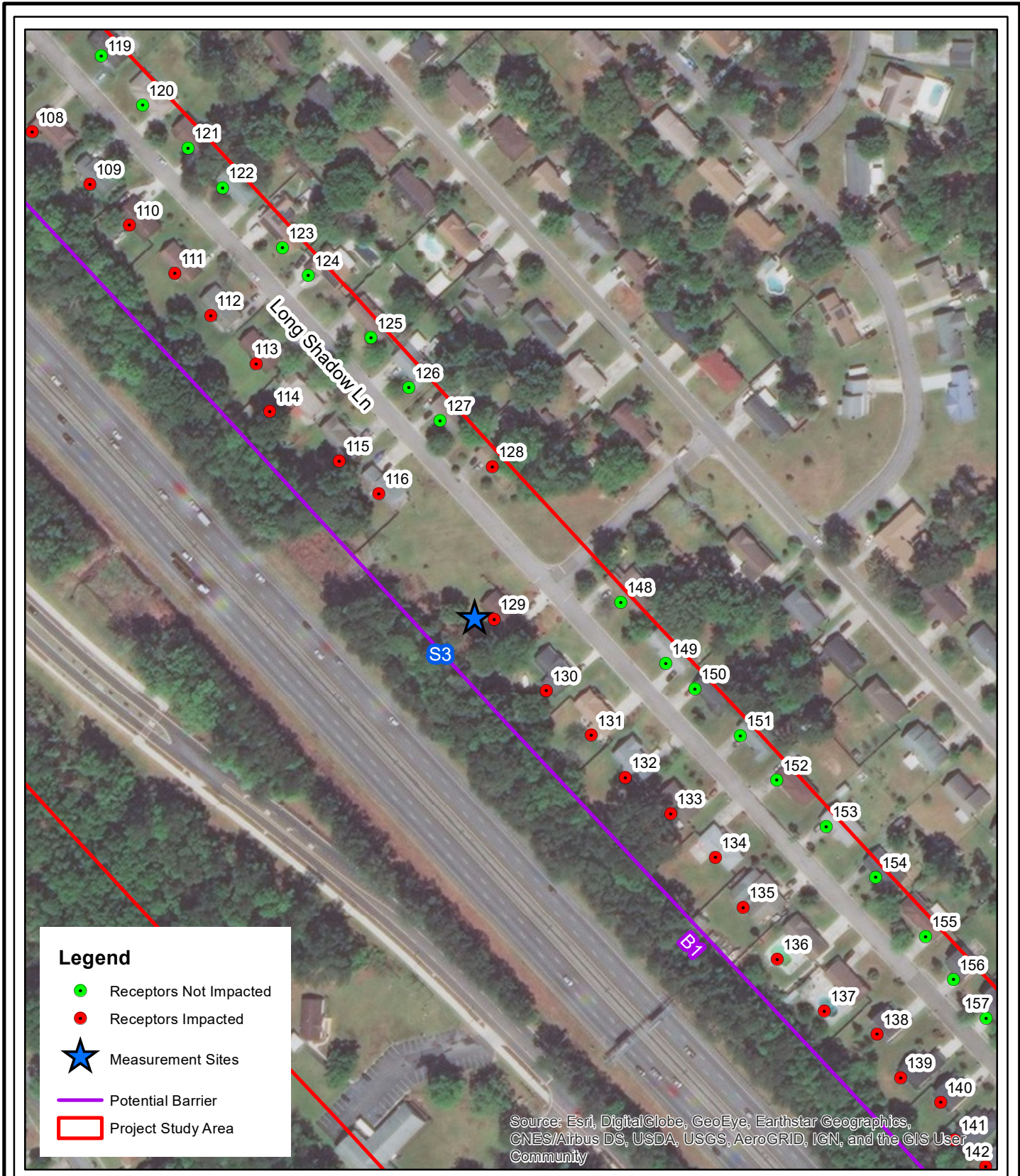
Date: **December 2019**

Scale: **1 inch = 200 feet**

Job No.: **18-049**

Drawn By: **SMM**      Checked By: **HMR**

Figure  
**3-2**



**Northwoods Estates  
Future 2040 Noise Analysis**

Charleston County, SC

0 50 100 200 Feet

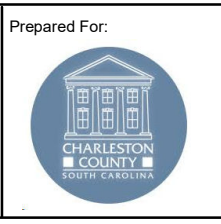
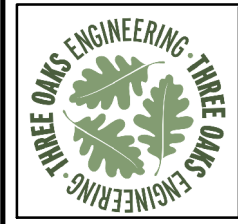
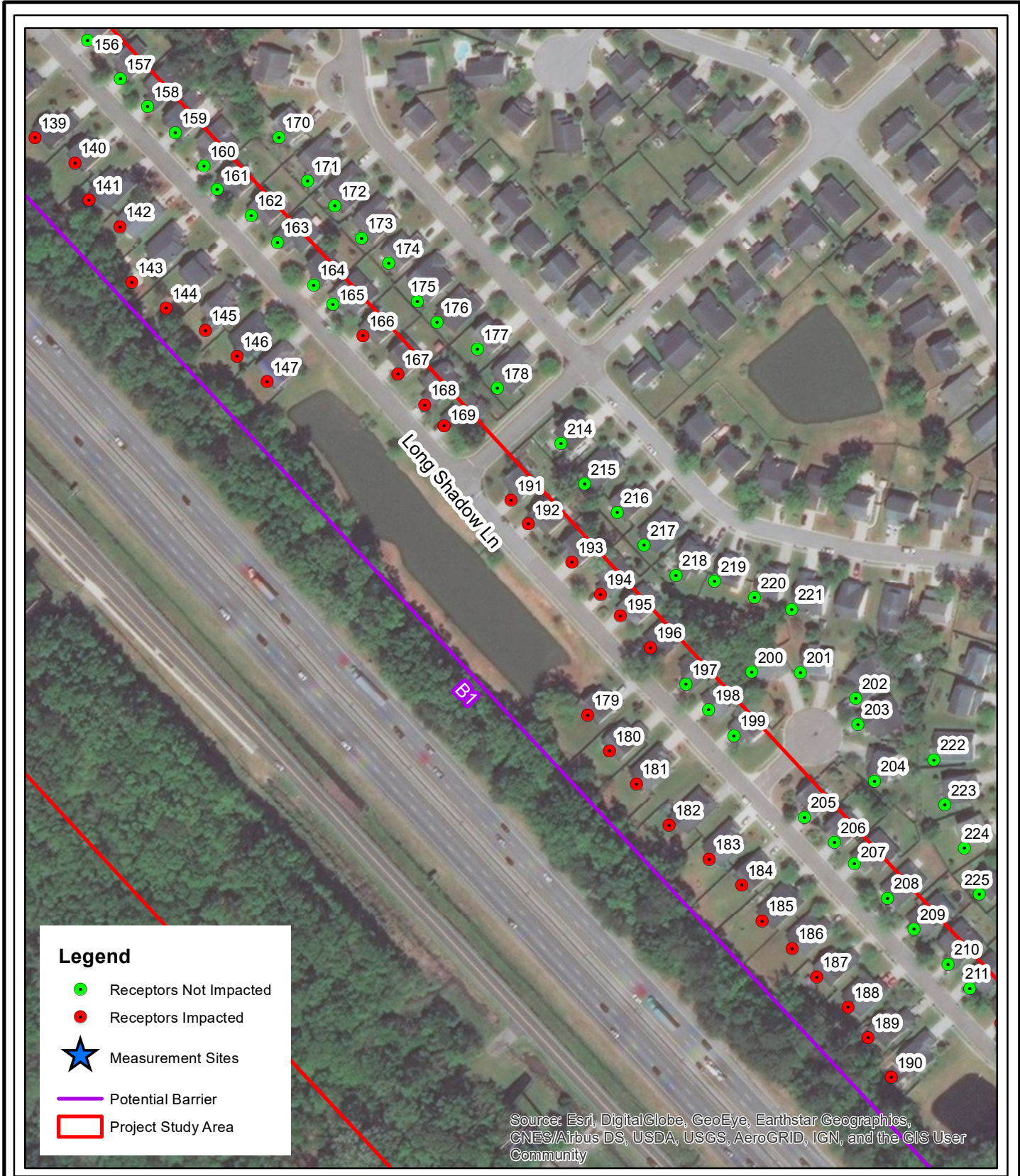
Date: **December 2019**

Scale: **1 inch = 200 feet**

Job No.: **18-049**

Drawn By: **SMM**      Checked By: **HMR**

Figure  
**3-3**



**Northwoods Estates  
Future 2040 Noise Analysis**

Charleston County, SC

0 50 100 200 Feet

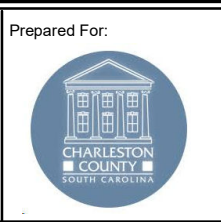
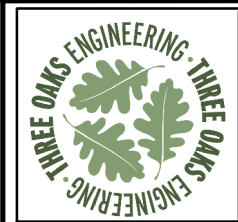
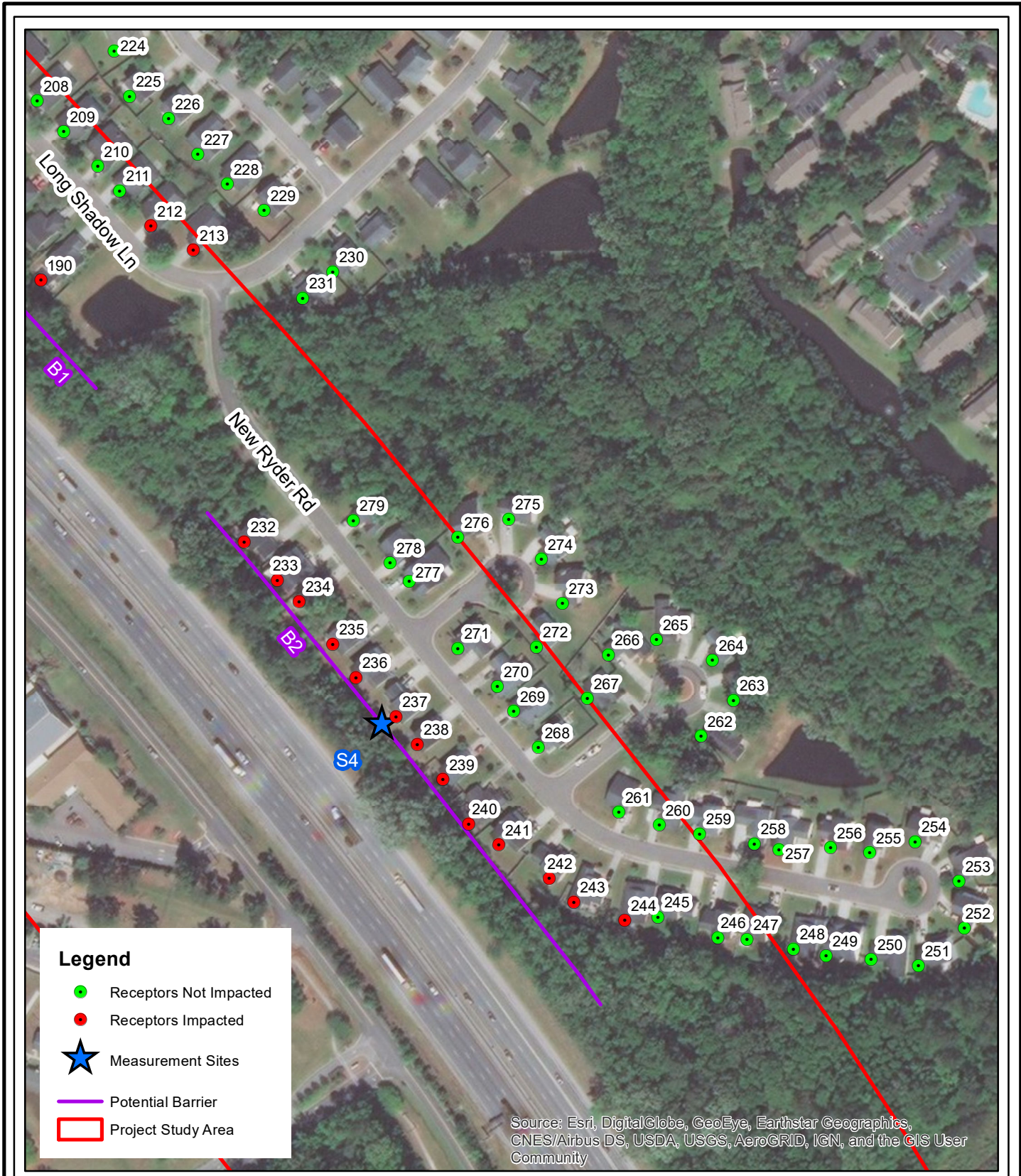
Date: **December 2019**

Scale: **1 inch = 200 feet**

Job No.: **18-049**

Drawn By: **SMM**      Checked By: **HMR**

Figure  
**3-4**



**Northwoods Estates  
Future 2040 Noise Analysis**

Charleston County, SC

0 50 100 200 Feet

Date: **December 2019**

Scale: **1 inch = 200 feet**

Job No.: **18-049**

Drawn By: **SMM**      Checked By: **HMR**

Figure  
**3-5**



### III. 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 (2020) and the future year (2040) can be found in Table 4. No receivers would have a substantial increase impact for the future year (2040).

#### A. Modeled Existing 2020 Noise Levels

In the existing condition (2020), there are 112 receivers that have noise levels that approach or exceed the NAC criteria for its respective land use.

#### B. Modeled Future 2040 Noise Levels

There are 121 residential receivers that would have noise levels that approach or exceed the NAC criteria for its respective land use.

Table 4: Existing 2020 and Future 2040 Sound Levels

| Receptor # | Existing 2020 | Future 2040 | Increase over Existing | Future NAC Impact? | NAC | Land Use | Receptor # | Existing | Future | Increase over Existing | Future NAC Impact? | NAC | Land Use |
|------------|---------------|-------------|------------------------|--------------------|-----|----------|------------|----------|--------|------------------------|--------------------|-----|----------|
| 1          | 54            | 56.7        | 2.7                    | N                  | 66  | B        | 40         | 63.5     | 64.4   | 0.9                    | N                  | 66  | B        |
| 2          | 60.5          | 63.4        | 2.9                    | N                  | 66  | B        | 41         | 65.6     | 66.3   | 0.7                    | Y                  | 66  | B        |
| 3          | 62.8          | 66.5        | 3.7                    | Y                  | 66  | B        | 42         | 56.9     | 57.9   | 1.0                    | N                  | 66  | B        |
| 4          | 66.5          | 69.8        | 3.3                    | Y                  | 66  | B        | 43         | 60.3     | 61.2   | 0.9                    | N                  | 66  | B        |
| 5          | 72.6          | 75.9        | 3.3                    | Y                  | 66  | B        | 44         | 59.6     | 60.6   | 1.0                    | N                  | 66  | B        |
| 6          | 73.3          | 76.4        | 3.1                    | Y                  | 66  | B        | 45         | 59.6     | 60.6   | 1.0                    | N                  | 66  | B        |
| 7          | 73            | 76.3        | 3.3                    | Y                  | 66  | B        | 46         | 55.6     | 56.7   | 1.1                    | N                  | 66  | B        |
| 8          | 68.7          | 71.9        | 3.2                    | Y                  | 66  | B        | 47         | 61.4     | 62.5   | 1.1                    | N                  | 66  | B        |
| 9          | 63.6          | 66.4        | 2.8                    | Y                  | 66  | B        | 48         | 61.2     | 62.2   | 1.0                    | N                  | 66  | B        |
| 10         | 60.4          | 63          | 2.6                    | N                  | 66  | B        | 49         | 59.5     | 60.5   | 1.0                    | N                  | 66  | B        |
| 11         | 60.5          | 62.4        | 1.9                    | N                  | 66  | B        | 50         | 59.4     | 61.8   | 2.4                    | N                  | 66  | B        |
| 12         | 62.8          | 66.1        | 3.3                    | Y                  | 66  | B        | 51         | 70.7     | 71.8   | 1.1                    | Y                  | 66  | B        |
| 13         | 73.1          | 76.3        | 3.2                    | Y                  | 66  | B        | 52         | 72.2     | 73.2   | 1.0                    | Y                  | 66  | B        |
| 14         | 73.9          | 76.6        | 2.7                    | Y                  | 66  | B        | 53         | 73       | 74     | 1.0                    | Y                  | 66  | B        |
| 15         | 73.9          | 76.6        | 2.7                    | Y                  | 66  | B        | 54         | 72.5     | 73.4   | 0.9                    | Y                  | 66  | B        |
| 16         | 72.3          | 74.7        | 2.4                    | Y                  | 66  | B        | 55         | 72.5     | 73.5   | 1.0                    | Y                  | 66  | B        |
| 17         | 68.6          | 70.7        | 2.1                    | Y                  | 66  | B        | 56         | 72.2     | 73.1   | 0.9                    | Y                  | 66  | B        |
| 18         | 63.9          | 67.2        | 3.3                    | Y                  | 66  | B        | 57         | 72.4     | 73.4   | 1.0                    | Y                  | 66  | B        |
| 19         | 57.7          | 59.8        | 2.1                    | N                  | 66  | B        | 58         | 73       | 73.9   | 0.9                    | Y                  | 66  | B        |
| 20         | 57            | 58.8        | 1.8                    | N                  | 66  | B        | 59         | 73       | 73.8   | 0.8                    | Y                  | 66  | B        |
| 21         | 58.8          | 62.3        | 3.5                    | N                  | 66  | B        | 60         | 70.8     | 71.7   | 0.9                    | Y                  | 66  | B        |
| 22         | 56            | 58.2        | 2.2                    | N                  | 66  | B        | 61         | 63.8     | 64.7   | 0.9                    | N                  | 66  | B        |
| 23         | 53.4          | 54.7        | 1.3                    | N                  | 66  | B        | 62         | 58.7     | 59.8   | 1.1                    | N                  | 66  | B        |
| 24         | 58.3          | 59.2        | 0.9                    | N                  | 66  | B        | 63         | 60.5     | 61.5   | 1.0                    | N                  | 66  | B        |
| 25         | 56.6          | 57.7        | 1.1                    | N                  | 66  | B        | 64         | 59.8     | 60.8   | 1.0                    | N                  | 66  | B        |
| 26         | 62            | 62.8        | 0.8                    | N                  | 66  | B        | 65         | 61.8     | 62.7   | 0.9                    | N                  | 66  | B        |
| 27         | 61.7          | 62.8        | 1.1                    | N                  | 66  | B        | 66         | 62.2     | 63.1   | 0.9                    | N                  | 66  | B        |
| 28         | 59.5          | 61.5        | 2.0                    | N                  | 66  | B        | 67         | 62.1     | 63.3   | 1.2                    | N                  | 66  | B        |
| 29         | 60.2          | 62.1        | 1.9                    | N                  | 66  | B        | 68         | 56.5     | 57.6   | 1.1                    | N                  | 66  | B        |
| 30         | 58.1          | 59.7        | 1.6                    | N                  | 66  | B        | 69         | 68.4     | 69.3   | 0.9                    | Y                  | 66  | B        |
| 31         | 61.7          | 64.4        | 2.7                    | N                  | 66  | B        | 70         | 67.6     | 68.5   | 0.9                    | Y                  | 66  | B        |
| 32         | 70.6          | 73.1        | 2.5                    | Y                  | 66  | B        | 71         | 74.2     | 75     | 0.8                    | Y                  | 66  | B        |
| 33         | 73.1          | 75.1        | 2.0                    | Y                  | 66  | B        | 72         | 71.9     | 72.7   | 0.8                    | Y                  | 66  | B        |
| 34         | 73.8          | 75.5        | 1.7                    | Y                  | 66  | B        | 73         | 72.2     | 73     | 0.8                    | Y                  | 66  | B        |
| 35         | 73.3          | 74.8        | 1.5                    | Y                  | 66  | B        | 74         | 72.7     | 73.6   | 0.9                    | Y                  | 66  | B        |
| 36         | 72.2          | 73.6        | 1.4                    | Y                  | 66  | B        | 75         | 72.5     | 73.4   | 0.9                    | Y                  | 66  | B        |
| 37         | 73.2          | 74.3        | 1.1                    | Y                  | 66  | B        | 76         | 60.4     | 61.6   | 1.2                    | N                  | 66  | B        |
| 38         | 71            | 71.7        | 0.7                    | Y                  | 66  | B        | 77         | 62.6     | 63.8   | 1.2                    | N                  | 66  | B        |
| 39         | 69.8          | 70.6        | 0.8                    | Y                  | 66  | B        | 78         | 61.6     | 62.6   | 1.0                    | N                  | 66  | B        |

Table 4: Existing 2020 and Future 2040 Sound Levels Continued

| Receptor # | Existing 2020 | Future 2040 | Increase over Existing | Future NAC Impact? | NAC | Land Use | Receptor # | Existing | Future | Increase over Existing | Future NAC Impact? | NAC | Land Use |
|------------|---------------|-------------|------------------------|--------------------|-----|----------|------------|----------|--------|------------------------|--------------------|-----|----------|
| 79         | 61.1          | 62.1        | 1.0                    | N                  | 66  | B        | 118        | 58.3     | 59.3   | 1.0                    | N                  | 66  | B        |
| 80         | 56.7          | 57.9        | 1.2                    | N                  | 66  | B        | 119        | 62.5     | 63.5   | 1.0                    | N                  | 66  | B        |
| 81         | 72.6          | 73.4        | 0.8                    | Y                  | 66  | B        | 120        | 62       | 63     | 1.0                    | N                  | 66  | B        |
| 82         | 71.7          | 72.6        | 0.9                    | Y                  | 66  | B        | 121        | 61.3     | 62.3   | 1.0                    | N                  | 66  | B        |
| 83         | 72.2          | 73.1        | 0.9                    | Y                  | 66  | B        | 122        | 61.4     | 62.3   | 0.9                    | N                  | 66  | B        |
| 84         | 72.5          | 73.5        | 1.0                    | Y                  | 66  | B        | 123        | 62.1     | 63     | 0.9                    | N                  | 66  | B        |
| 85         | 74.9          | 75.8        | 0.9                    | Y                  | 66  | B        | 124        | 61.9     | 62.7   | 0.8                    | N                  | 66  | B        |
| 86         | 72.2          | 73.2        | 1.0                    | Y                  | 66  | B        | 125        | 62       | 62.9   | 0.9                    | N                  | 66  | B        |
| 87         | 72.6          | 73.5        | 0.9                    | Y                  | 66  | B        | 126        | 62.5     | 63.5   | 1.0                    | N                  | 66  | B        |
| 88         | 72.6          | 73.5        | 0.9                    | Y                  | 66  | B        | 127        | 64.2     | 64.8   | 0.6                    | N                  | 66  | B        |
| 89         | 72.8          | 73.6        | 0.8                    | Y                  | 66  | B        | 128        | 65.3     | 66.1   | 0.8                    | Y                  | 66  | B        |
| 90         | 72            | 72.8        | 0.8                    | Y                  | 66  | B        | 129        | 71.8     | 72.6   | 0.8                    | Y                  | 66  | B        |
| 91         | 72.5          | 73.3        | 0.8                    | Y                  | 66  | B        | 130        | 72.1     | 72.9   | 0.8                    | Y                  | 66  | B        |
| 92         | 71.8          | 72.6        | 0.8                    | Y                  | 66  | B        | 131        | 71.9     | 72.7   | 0.8                    | Y                  | 66  | B        |
| 93         | 71.1          | 71.9        | 0.8                    | Y                  | 66  | B        | 132        | 72.3     | 73.1   | 0.8                    | Y                  | 66  | B        |
| 94         | 56            | 57.1        | 1.1                    | N                  | 66  | B        | 133        | 72       | 72.8   | 0.8                    | Y                  | 66  | B        |
| 95         | 62.3          | 63.3        | 1.0                    | N                  | 66  | B        | 134        | 71.8     | 72.6   | 0.8                    | Y                  | 66  | B        |
| 96         | 62.7          | 63.7        | 1.0                    | N                  | 66  | B        | 135        | 72.7     | 73.5   | 0.8                    | Y                  | 66  | B        |
| 97         | 62.9          | 64          | 1.1                    | N                  | 66  | B        | 136        | 73.4     | 74.2   | 0.8                    | Y                  | 66  | B        |
| 98         | 56.1          | 57.2        | 1.1                    | N                  | 66  | B        | 137        | 73.1     | 73.9   | 0.8                    | Y                  | 66  | B        |
| 99         | 56.7          | 57.8        | 1.1                    | N                  | 66  | B        | 138        | 72       | 72.7   | 0.7                    | Y                  | 66  | B        |
| 100        | 61.5          | 62.4        | 0.9                    | N                  | 66  | B        | 139        | 72.5     | 73.2   | 0.7                    | Y                  | 66  | B        |
| 101        | 61.6          | 62.5        | 0.9                    | N                  | 66  | B        | 140        | 71.4     | 72.1   | 0.7                    | Y                  | 66  | B        |
| 102        | 60.8          | 61.8        | 1.0                    | N                  | 66  | B        | 141        | 72.7     | 73.3   | 0.6                    | Y                  | 66  | B        |
| 103        | 61.7          | 62.6        | 0.9                    | N                  | 66  | B        | 142        | 72.3     | 72.9   | 0.6                    | Y                  | 66  | B        |
| 104        | 60            | 60.9        | 0.9                    | N                  | 66  | B        | 143        | 73.7     | 74.5   | 0.8                    | Y                  | 66  | B        |
| 105        | 59.5          | 60.5        | 1.0                    | N                  | 66  | B        | 144        | 73.3     | 74     | 0.7                    | Y                  | 66  | B        |
| 106        | 71.9          | 72.7        | 0.8                    | Y                  | 66  | B        | 145        | 72.5     | 73.3   | 0.8                    | Y                  | 66  | B        |
| 107        | 72.3          | 73.1        | 0.8                    | Y                  | 66  | B        | 146        | 72.4     | 73.1   | 0.7                    | Y                  | 66  | B        |
| 108        | 72.3          | 73.1        | 0.8                    | Y                  | 66  | B        | 147        | 72.2     | 73     | 0.8                    | Y                  | 66  | B        |
| 109        | 71.9          | 72.7        | 0.8                    | Y                  | 66  | B        | 148        | 63.6     | 64.4   | 0.8                    | N                  | 66  | B        |
| 110        | 71.7          | 72.5        | 0.8                    | Y                  | 66  | B        | 149        | 62.2     | 63     | 0.8                    | N                  | 66  | B        |
| 111        | 71.7          | 72.6        | 0.9                    | Y                  | 66  | B        | 150        | 62.4     | 63.2   | 0.8                    | N                  | 66  | B        |
| 112        | 71.8          | 72.7        | 0.9                    | Y                  | 66  | B        | 151        | 61.8     | 62.6   | 0.8                    | N                  | 66  | B        |
| 113        | 71.9          | 72.7        | 0.8                    | Y                  | 66  | B        | 152        | 60.3     | 61.2   | 0.9                    | N                  | 66  | B        |
| 114        | 73            | 73.8        | 0.8                    | Y                  | 66  | B        | 153        | 60.4     | 61.3   | 0.9                    | N                  | 66  | B        |
| 115        | 72            | 72.8        | 0.8                    | Y                  | 66  | B        | 154        | 59.7     | 60.6   | 0.9                    | N                  | 66  | B        |
| 116        | 71.7          | 72.6        | 0.9                    | Y                  | 66  | B        | 155        | 62.1     | 62.8   | 0.7                    | N                  | 66  | B        |
| 117        | 62.2          | 63.1        | 0.9                    | N                  | 66  | B        | 156        | 63       | 63.7   | 0.7                    | N                  | 66  | B        |

Table 4: Existing 2020 and Future 2040 Sound Levels Continued

| Receptor # | Existing 2020 | Future 2040 | Increase over Existing | Future NAC Impact? | NAC | Land Use | Receptor # | Existing | Future | Increase over Existing | Future NAC Impact? | NAC | Land Use |
|------------|---------------|-------------|------------------------|--------------------|-----|----------|------------|----------|--------|------------------------|--------------------|-----|----------|
| 157        | 63.1          | 63.9        | 0.8                    | N                  | 66  | B        | 196        | 65.6     | 66.5   | 0.9                    | Y                  | 66  | B        |
| 158        | 61.8          | 62.7        | 0.9                    | N                  | 66  | B        | 197        | 63.7     | 64.7   | 1.0                    | N                  | 66  | B        |
| 159        | 61.2          | 61.8        | 0.6                    | N                  | 66  | B        | 198        | 63.4     | 64.1   | 0.7                    | N                  | 66  | B        |
| 160        | 60.5          | 61          | 0.5                    | N                  | 66  | B        | 199        | 62.9     | 63.9   | 1.0                    | N                  | 66  | B        |
| 161        | 60.9          | 61.7        | 0.8                    | N                  | 66  | B        | 200        | 53.3     | 54.3   | 1.0                    | N                  | 66  | B        |
| 162        | 61.3          | 62.1        | 0.8                    | N                  | 66  | B        | 201        | 57.6     | 58.6   | 1.0                    | N                  | 66  | B        |
| 163        | 62            | 62.8        | 0.8                    | N                  | 66  | B        | 202        | 58.2     | 59.2   | 1.0                    | N                  | 66  | B        |
| 164        | 63.4          | 64.4        | 1.0                    | N                  | 66  | B        | 203        | 58.5     | 59.3   | 0.8                    | N                  | 66  | B        |
| 165        | 64.7          | 65.7        | 1.0                    | N                  | 66  | B        | 204        | 55.7     | 56.6   | 0.9                    | N                  | 66  | B        |
| 166        | 66.3          | 67.3        | 1.0                    | Y                  | 66  | B        | 205        | 61.6     | 62.5   | 0.9                    | N                  | 66  | B        |
| 167        | 67.2          | 68.2        | 1.0                    | Y                  | 66  | B        | 206        | 61.2     | 62.1   | 0.9                    | N                  | 66  | B        |
| 168        | 67.6          | 68.5        | 0.9                    | Y                  | 66  | B        | 207        | 61.1     | 61.9   | 0.8                    | N                  | 66  | B        |
| 169        | 67.9          | 68.7        | 0.8                    | Y                  | 66  | B        | 208        | 61.9     | 62.7   | 0.8                    | N                  | 66  | B        |
| 170        | 54.9          | 55.7        | 0.8                    | N                  | 66  | B        | 209        | 62.1     | 62.9   | 0.8                    | N                  | 66  | B        |
| 171        | 55.2          | 56.2        | 1.0                    | N                  | 66  | B        | 210        | 63       | 63.9   | 0.9                    | N                  | 66  | B        |
| 172        | 53.4          | 54.4        | 1.0                    | N                  | 66  | B        | 211        | 63.9     | 64.8   | 0.9                    | N                  | 66  | B        |
| 173        | 54.9          | 55.8        | 0.9                    | N                  | 66  | B        | 212        | 65       | 66     | 1.0                    | Y                  | 66  | B        |
| 174        | 54.5          | 55.4        | 0.9                    | N                  | 66  | B        | 213        | 64.9     | 66     | 1.1                    | Y                  | 66  | B        |
| 175        | 59            | 59.9        | 0.9                    | N                  | 66  | B        | 214        | 61.7     | 62.5   | 0.8                    | N                  | 66  | B        |
| 176        | 57.4          | 58.5        | 1.1                    | N                  | 66  | B        | 215        | 60.1     | 61     | 0.9                    | N                  | 66  | B        |
| 177        | 55.8          | 56.8        | 1.0                    | N                  | 66  | B        | 216        | 58.3     | 59.5   | 1.2                    | N                  | 66  | B        |
| 178        | 60            | 60.9        | 0.9                    | N                  | 66  | B        | 217        | 56.6     | 58     | 1.4                    | N                  | 66  | B        |
| 179        | 71.7          | 72.4        | 0.7                    | Y                  | 66  | B        | 218        | 53.8     | 54.7   | 0.9                    | N                  | 66  | B        |
| 180        | 72.1          | 72.8        | 0.7                    | Y                  | 66  | B        | 219        | 57.1     | 57.9   | 0.8                    | N                  | 66  | B        |
| 181        | 72.1          | 72.9        | 0.8                    | Y                  | 66  | B        | 220        | 55.8     | 56.5   | 0.7                    | N                  | 66  | B        |
| 182        | 72.6          | 73.4        | 0.8                    | Y                  | 66  | B        | 221        | 56.2     | 57.2   | 1.0                    | N                  | 66  | B        |
| 183        | 72.2          | 73          | 0.8                    | Y                  | 66  | B        | 222        | 55.8     | 56.8   | 1.0                    | N                  | 66  | B        |
| 184        | 71.8          | 72.6        | 0.8                    | Y                  | 66  | B        | 223        | 56.2     | 57     | 0.8                    | N                  | 66  | B        |
| 185        | 72.5          | 73.3        | 0.8                    | Y                  | 66  | B        | 224        | 56.6     | 57.4   | 0.8                    | N                  | 66  | B        |
| 186        | 71.5          | 72.3        | 0.8                    | Y                  | 66  | B        | 225        | 56.3     | 57.3   | 1.0                    | N                  | 66  | B        |
| 187        | 71.5          | 72.3        | 0.8                    | Y                  | 66  | B        | 226        | 56.7     | 57.6   | 0.9                    | N                  | 66  | B        |
| 188        | 72.4          | 73.1        | 0.7                    | Y                  | 66  | B        | 227        | 57.2     | 58.1   | 0.9                    | N                  | 66  | B        |
| 189        | 71.5          | 72.3        | 0.8                    | Y                  | 66  | B        | 228        | 59.2     | 60     | 0.8                    | N                  | 66  | B        |
| 190        | 70.9          | 71.8        | 0.9                    | Y                  | 66  | B        | 229        | 62       | 63     | 1.0                    | N                  | 66  | B        |
| 191        | 68.1          | 68.9        | 0.8                    | Y                  | 66  | B        | 230        | 57.2     | 58     | 0.8                    | N                  | 66  | B        |
| 192        | 68.2          | 69          | 0.8                    | Y                  | 66  | B        | 231        | 63.3     | 64.3   | 1.0                    | N                  | 66  | B        |
| 193        | 67.6          | 68.4        | 0.8                    | Y                  | 66  | B        | 232        | 74.8     | 75.5   | 0.7                    | Y                  | 66  | B        |
| 194        | 67.3          | 68.1        | 0.8                    | Y                  | 66  | B        | 233        | 74.6     | 75.2   | 0.6                    | Y                  | 66  | B        |
| 195        | 66.9          | 67.7        | 0.8                    | Y                  | 66  | B        | 234        | 74.7     | 75.3   | 0.6                    | Y                  | 66  | B        |

Table 4: Existing 2020 and Future 2040 Sound Levels Continued

| Receptor # | Existing 2020 | Future 2040 | Increase over Existing | Future NAC Impact? | NAC | Land Use | Receptor # | Existing | Future | Increase over Existing | Future NAC Impact? | NAC | Land Use |
|------------|---------------|-------------|------------------------|--------------------|-----|----------|------------|----------|--------|------------------------|--------------------|-----|----------|
| 235        | 74.9          | 75.4        | 0.5                    | Y                  | 66  | B        | 258        | 55.3     | 55.5   | 0.2                    | N                  | 66  | B        |
| 236        | 75.1          | 75.6        | 0.5                    | Y                  | 66  | B        | 259        | 56.3     | 56.7   | 0.4                    | N                  | 66  | B        |
| 237        | 74.5          | 74.9        | 0.4                    | Y                  | 66  | B        | 260        | 58.2     | 58.7   | 0.5                    | N                  | 66  | B        |
| 238        | 74.6          | 75          | 0.4                    | Y                  | 66  | B        | 261        | 60.3     | 60.9   | 0.6                    | N                  | 66  | B        |
| 239        | 74.3          | 74.8        | 0.5                    | Y                  | 66  | B        | 262        | 55.8     | 56.3   | 0.5                    | N                  | 66  | B        |
| 240        | 71.9          | 72.5        | 0.6                    | Y                  | 66  | B        | 263        | 55.9     | 56     | 0.1                    | N                  | 66  | B        |
| 241        | 70.8          | 71.5        | 0.7                    | Y                  | 66  | B        | 264        | 56.1     | 56.5   | 0.4                    | N                  | 66  | B        |
| 242        | 69.2          | 69.9        | 0.7                    | Y                  | 66  | B        | 265        | 55.4     | 55.8   | 0.4                    | N                  | 66  | B        |
| 243        | 68.6          | 69.3        | 0.7                    | Y                  | 66  | B        | 266        | 54.1     | 54.5   | 0.4                    | N                  | 66  | B        |
| 244        | 66.3          | 66.9        | 0.6                    | Y                  | 66  | B        | 267        | 57.6     | 58.1   | 0.5                    | N                  | 66  | B        |
| 245        | 63.4          | 64          | 0.6                    | N                  | 66  | B        | 268        | 60.6     | 61.1   | 0.5                    | N                  | 66  | B        |
| 246        | 62.4          | 63          | 0.6                    | N                  | 66  | B        | 269        | 62.5     | 63     | 0.5                    | N                  | 66  | B        |
| 247        | 61.1          | 61.7        | 0.6                    | N                  | 66  | B        | 270        | 62.6     | 63     | 0.4                    | N                  | 66  | B        |
| 248        | 59.9          | 60.4        | 0.5                    | N                  | 66  | B        | 271        | 59.9     | 60.4   | 0.5                    | N                  | 66  | B        |
| 249        | 59.1          | 59.5        | 0.4                    | N                  | 66  | B        | 272        | 52.2     | 52.6   | 0.4                    | N                  | 66  | B        |
| 250        | 56.3          | 56.7        | 0.4                    | N                  | 66  | B        | 273        | 54.3     | 54.8   | 0.5                    | N                  | 66  | B        |
| 251        | 59.5          | 58.6        | -0.9                   | N                  | 66  | B        | 274        | 56.5     | 57.1   | 0.6                    | N                  | 66  | B        |
| 252        | 60.4          | 59.3        | -1.1                   | N                  | 66  | B        | 275        | 55.9     | 56.4   | 0.5                    | N                  | 66  | B        |
| 253        | 58.3          | 57          | -1.3                   | N                  | 66  | B        | 276        | 55.9     | 56.6   | 0.7                    | N                  | 66  | B        |
| 254        | 53.6          | 53.6        | 0.0                    | N                  | 66  | B        | 277        | 63       | 63.6   | 0.6                    | N                  | 66  | B        |
| 255        | 55.4          | 55.2        | -0.2                   | N                  | 66  | B        | 278        | 62.8     | 63.5   | 0.7                    | N                  | 66  | B        |
| 256        | 55.3          | 55.3        | 0.0                    | N                  | 66  | B        | 279        | 64.4     | 65.1   | 0.7                    | N                  | 66  | B        |
| 257        | 55.5          | 55.7        | 0.2                    | N                  | 66  | B        |            |          |        |                        |                    |     |          |

#### IV. FEASIBLE AND RESONABLE CONSIDERATION OF ABATEMENT

Since there are receivers that would be impacted by noise for the future year (2040), abatement measures were considered.

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. 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:

- A. Acquisition of Right-of-Way - The acquisition of rights-of-way to mitigate the noise levels at the affected site would result in disruptive relocations.
- B. Traffic Management - Measures such as exclusive lane designations and signing for prohibition of certain vehicle type would prevent the project from serving its intended purpose, such as moving people, goods and services.
- C. Alteration of Horizontal and Vertical Alignments - Alignment modifications as a means of noise abatement would result in disruptive relocations for this neighborhood and is not a feasible abatement strategy.
- D. Acquisition of real property or interests therein (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 roadway and the impacted receivers.
- E. Noise insulation of public use or nonprofit institutional structures – No public use or nonprofit institutional structures would be impacted.
- F. Noise Barriers - Among the most common noise barriers are earthen berms and freestanding walls. 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, one barrier can protect many people at a relatively low cost per impacted site.

When considering abatement, the SCDOT Noise Policy Guidelines state that noise abatement measures must be both feasible and reasonable. The feasibility and reasonableness of a noise barrier is determined by the following factors for Feasibility and Reasonableness.

##### 1. Feasibility:

There are two mandatory feasibility factors that must be met for a noise abatement measure to be considered reasonable. The two mandatory factors must collectively be achieved in order for a noise abatement measure to be deemed reasonable.

Failure to achieve any one of the factors will result in the noise abatement measure being deemed not feasible.

a. Acoustic Feasibility - It is SCDOT's policy that a noise reduction of at least 5 dBA must be achieved for at least 75 percent of impacted receivers for the noise abatement measure to be acoustically feasible. If this goal is not met, then abatement is determined not to be feasible and no further analysis is required.

b. Engineering Feasibility - Feasibility also includes engineering considerations. The ability to achieve noise reduction may be limited by engineering considerations such as the topographical features of the area, safety, drainage, utilities, maintenance and access. In addition, due to constructability constraints, the height of the noise abatement measure cannot exceed 25 feet.

## 2. Reasonableness:

There are three mandatory reasonable factors that must be met for a noise abatement measure to be considered reasonable. The three mandatory reasonable factors must collectively be achieved in order for a noise abatement measure to be deemed reasonable. Failure to achieve any one of the reasonable factors will result in the noise abatement measure being deemed not reasonable.

a. Noise Reduction Design Goal - It is SCDOT's policy that a noise reduction of at least 8 dBA must be achieved for 80% of those receivers determined to be in the first two building rows and considered benefited. Please note that the first two building rows will only be applicable if they are within 500 feet from the edge of pavement noise source. If the design goal is not met, then abatement is determined not to be reasonable and no further analysis is required.

b. Cost Effectiveness - The allowable cost of the abatement will be based on \$35.00 per square foot. This allowable cost is based on actual construction costs on recent SCDOT projects. This construction cost will be divided by the number of benefited receivers. If the cost per benefited receiver is less than \$30,000 then the barrier is determined to be cost effective, per SCDOT policy. During the noise abatement evaluation, a more project-specific construction cost should be applied at a cost per square foot basis. The estimation will take into consideration the cost of the actual noise barrier, required hydrology, additional right-of-way, and other aspects associated with the noise barrier construction.

c. Viewpoints of the Property Owners and Residents of the Benefited Receivers – If the noise reduction design goal and cost-effective criteria are met, SCDOT shall solicit the viewpoints of all of the benefited receivers and document a decision on either desiring or not desiring the noise abatement measure. The viewpoints will be solicited as part of the public involvement process through a voting procedure if a barrier is proposed. The voting ballot will explain that the noise abatement shall be constructed unless a majority (greater than 50% of the benefited receivers) of

votes not desiring noise abatement is received. For non-owner-occupied benefited receivers, both the property owner and the renter may vote on whether the noise abatement is desired.

For this noise analysis, the mitigation analysis determined that all the barriers either did not meet the design goal or the cost effectiveness criteria. Therefore, the voting process of the benefited property owners is not applicable.

### 3. Noise Barrier Evaluation:

As directed by Charleston County, noise abatement barriers analyzed were placed just inside of the SCDOT right-of-way (ROW), approximately 160 feet from the centerline of I-26.

Barrier 1 was modeled to abate noise impacts to residences along Bentwood Drive, Rollins Court, Brigham Drive, Delhi Road, and Long Shadow Lane. Barrier 1 was modeled at 7,559 feet in length and was evaluated at 3 fixed heights of 25 feet, 20 feet, and 15 feet. The addition of a noise barrier would achieve overall feasibility requirements as well as meet the noise reduction goal regardless of wall height. Based on SCDOT policy for estimating barrier costs at \$35/ square foot, the cost per benefited receiver would be \$35,751.84 at 25 feet, \$29,894.15 at 20 feet, and \$30,526.46 at 15 feet.

Even though Barrier 1 at a fixed height of 20 feet meets the SCDOT reasonableness criteria, the Policy also states that *“During the detailed noise abatement evaluation, a more project-specific construction cost should be applied at a cost per square foot basis.”* The project-specific construction cost includes several other items in addition to the noise wall itself, refer to Appendix C. Based on the project-specific cost at \$67.05/ square foot, the cost per benefitted receiver would be \$57,268.66. The cost per benefitted receiver exceeds the SCDOT allowable cost of \$30,000 and therefore, is not reasonable.

Barrier 2 was modeled to abate noise impacts to residences along New Ryder Road. Barrier 2 was modeled at 918 feet in length and was evaluated at 5 fixed heights of 25 feet, 20 feet, 15 feet, 12 feet, and 10 feet. The addition of a noise barrier would achieve overall feasibility requirements as well as meet the noise reduction goal for wall heights of 25, 20, 15, and 12 feet. Barrier 2 modeled at 10 feet achieved the overall feasibility requirements, but did not meet the noise reduction goal, and therefore is not reasonable. Based on SCDOT policy for estimating barrier costs at \$35/ square foot, the cost per benefited receiver would be \$50,207.50 at 25 feet, \$42,844.66 at 20 feet, \$37,075.77 at 15 feet, and \$32,132.92 at 12 feet. The cost per benefitted receiver exceeds the SCDOT allowable cost of \$30,000 for all wall heights, and therefore, is not reasonable. Using a higher unit rate would increase the project-specific cost even further but is not necessary since the allowable cost is already exceeded.



Table 5 includes a summary of the barrier evaluations. The SCDOT Feasible and Reasonable Worksheets as well as the barrier descriptions are located in Appendix D. Overall, as a result of the mitigation analysis, there were no feasible and reasonable solutions to mitigate for the predicted noise impacts according to the SCDOT Traffic Noise Abatement Policy.

**Table 5.1: Barrier 1  
Evaluation Summary**

Wall Length (ft) = 7,609

Total # of Impacts = 108

| Wall Height (feet) | Total Area (sq. ft.) | Cost per Square Foot \$ | Total Wall Cost \$ | Acoustically Feasible? (Y/N) | Engineering Feasibility? (Y/N) | Overall Feasible? (Y/N) | Meets Noise Reduction Goal? (Y/N) | Number of Benefitted Receivers | Cost per Benefitted Receiver \$ | Is Barrier Cost Effective? (Y/N) | Overall Reasonable? (Y/N) | Conclusion                   |
|--------------------|----------------------|-------------------------|--------------------|------------------------------|--------------------------------|-------------------------|-----------------------------------|--------------------------------|---------------------------------|----------------------------------|---------------------------|------------------------------|
| 25                 | 188,974              | 35                      | 6,614,090          | Y                            | Y                              | Y                       | Y                                 | 185                            | 35,751.84                       | N                                | N                         | Feasible, but not reasonable |
| 20                 | 151,179              | 35                      | 5,291,265          | Y                            | Y                              | Y                       | Y                                 | 177                            | 29,894.15                       | Y                                | Y                         | Feasible and reasonable      |
| 20                 | 151,179              | 67.05                   | 10,136,552         | Y                            | Y                              | Y                       | Y                                 | 177                            | 57,268.66                       | N                                | N                         | Feasible, but not reasonable |
| 15                 | 113,384              | 35                      | 3,968,440          | Y                            | Y                              | Y                       | Y                                 | 130                            | 30,526.46                       | N                                | N                         | Feasible, but not reasonable |

\*\*The Evaluation Summary is based on the SCDOT Traffic Noise Abatement Policy.

**Table 5.2: Barrier 2  
Evaluation Summary**

Wall Length (ft) = 918

Total # of Impacts = 13

| Wall Height (feet) | Total Area (sq. ft.) | Cost per Square Foot \$ | Total Wall Cost \$ | Acoustically Feasible? (Y/N) | Engineering Feasibility? (Y/N) | Overall Feasible? (Y/N) | Meets Noise Reduction Goal? (Y/N) | Number of Benefitted Receivers | Cost per Benefitted Receiver \$ | Is Barrier Cost Effective? (Y/N) | Overall Reasonable? (Y/N) | Conclusion                   |
|--------------------|----------------------|-------------------------|--------------------|------------------------------|--------------------------------|-------------------------|-----------------------------------|--------------------------------|---------------------------------|----------------------------------|---------------------------|------------------------------|
| 25                 | 22,952               | 35                      | 803,320            | Y                            | Y                              | Y                       | Y                                 | 16                             | 50,207.50                       | N                                | N                         | Feasible, but not reasonable |
| 20                 | 18,362               | 35                      | 642,670            | Y                            | Y                              | Y                       | Y                                 | 15                             | 42,844.66                       | N                                | N                         | Feasible, but not reasonable |
| 15                 | 13,771               | 35                      | 481,985            | Y                            | Y                              | Y                       | Y                                 | 13                             | 37,075.77                       | N                                | N                         | Feasible, but not reasonable |
| 12                 | 11,017               | 35                      | 385,595            | Y                            | Y                              | Y                       | Y                                 | 12                             | 32,132.92                       | N                                | N                         | Feasible, but not reasonable |
| 10                 | 9,181                | 35                      | -                  | Y                            | Y                              | Y                       | N                                 | -                              | -                               | -                                | N                         | Feasible, but not reasonable |

\*\*The Evaluation Summary is based on the SCDOT Traffic Noise Abatement Policy.

## V. FINDINGS AND RECOMMENDATIONS

Overall, there were 121 receivers impacted in the noise study area for the future year (2040) condition. As a result, mitigation analysis was warranted according to the SCDOT Traffic Noise Abatement Policy. None of the barrier analyses results met both of the feasible and reasonable criteria per the SCDOT Traffic Noise Abatement Policy.

## VI. CONSTRUCTION NOISE

If Charleston County decides to construct noise barrier walls for the Northwoods Estates community, temporary increases in noise levels would occur during the time period that construction takes place. Noise levels due to construction, although temporary, can impact areas adjacent to the project.

# APPENDIX A

## Traffic Data

## TNM Traffic Data - Northwoods Estates

| 2020 Existing Traffic       |  |           |
|-----------------------------|--|-----------|
|                             | I-26 Mainline                                  |           |
| Speed                       | 65 mph   |           |
| Lane Width                  | 6 lanes at 12 feet                             |           |
| Directional Split           | By Traffic Count                               |           |
|                             | Eastbound                                      | Westbound |
| Vehicle Mix                 | 90% Autos + 3% Medium Trucks + 7% Heavy Trucks |           |
| Free Flow                   | 3,430  | 3,430     |
| Autos (per lane)            | 1,029  | 1,029     |
| Medium Trucks (per lane)    | 34   | 34        |
| Heavy Trucks (outside lane) | 120  | 120       |
| Heavy Trucks (middle lane)  | 120  | 120       |
| Heavy Trucks (inside lane)  | 0  | 0         |
| Source: Stantec 2019        |  |           |

| 2020 Existing Traffic       |                                  |                                  |
|-----------------------------|----------------------------------|----------------------------------|
|                             | US 52 Connector                  |                                  |
| Speed                       | 40 mph                           |                                  |
| Lane Width                  | 2 lanes at 12 feet               |                                  |
| Directional Split           | Traffic Model                    |                                  |
|                             | Eastbound                        | Westbound                        |
| Vehicle Mix                 | 87.7% Autos + 12.3% Heavy Trucks | 89.2% Autos + 10.8% Heavy Trucks |
| PM Peak Hour                | 1495                             | 1707                             |
| Autos (per lane)            | 656                              | 761                              |
| Medium Trucks (per lane)    | 0                                | 0                                |
| Heavy Trucks (outside lane) | 92                               | 92                               |
| Source: Stantec 2019        |                                  |                                  |

| 2020 Existing Traffic       |                                 |
|-----------------------------|---------------------------------|
|                             | Diverge to Ashley Phosphate     |
| Speed                       | 65                              |
| Lane Width                  | 1 lane 12 feet                  |
| Directional Split           | Traffic Model                   |
|                             | Eastbound                       |
| Vehicle Mix                 | 91.7% Autos + 8.3% Heavy Trucks |
| Free Flow                   | 674                             |
| Autos (per lane)            | 618                             |
| Medium Trucks (per lane)    | 0                               |
| Heavy Trucks (outside lane) | 56                              |
| Source: Stantec 2019        |                                 |

## TNM Traffic Data - Northwoods Estates

| Future Year 2040 Traffic                 |   |   |
|--|---|---|
| Speed<br>Lane Width<br>Directional Split | I-26 Mainline   |   |
|  | 65 mph  |   |
|  | 6 lanes at 12 feet<br>By Traffic Count                |   |
|  | Eastbound   | Westbound   |
| Vehicle Mix                              | 86% Autos + 4%<br>Medium Trucks +<br>10% Heavy Trucks | 85% Autos + 4%<br>Medium Trucks +<br>11% Heavy Trucks |
| Free Flow                                | 3,430   | 3,430   |
| Autos (per lane)                         | 983   | 972   |
| Medium Trucks (per lane)                 | 46  | 46  |
| Heavy Trucks (outside lane)              | 172   | 189   |
| Heavy Trucks (middle lane)               | 172   | 189   |
| Heavy Trucks (inside lane)               | 0   | 0   |
| Source: Stantec 2019                     |   |   |

| Future Year 2040 Traffic                 |                                     |                                    |
|--|-------------------------------------|------------------------------------|
| Speed<br>Lane Width<br>Directional Split | US 52 Connector                     |                                    |
|  | 40 mph                              |                                    |
|  | 2 lanes at 12 feet<br>Traffic Model |                                    |
|  | Eastbound                           | Westbound                          |
| Vehicle Mix                              | 87.3% Autos + 12.7%<br>Heavy Trucks | 90.9% Autos +<br>9.1% Heavy Trucks |
| Free Flow                                | 1779                                | 1984                               |
| Autos (per lane)                         | 780                                 | 902                                |
| Medium Trucks (per lane)                 | 0                                   | 0                                  |
| Heavy Trucks (outside lane)              | 113                                 | 90                                 |
| Source: Stantec 2019                     |                                     |                                    |

| Future Year 2040 Traffic                 |                                  |           |
|--|----------------------------------|-----------|
| Speed<br>Lane Width<br>Directional Split | Diverge to Ashley Phosphate      |           |
|  | 65                               |           |
|  | 1 lane 12 feet<br>Traffic Model  |           |
|  | Eastbound                        | Westbound |
| Vehicle Mix                              | 89.3% Autos + 10.7% Heavy Trucks |           |
| Free Flow                                | 579                              |           |
| Autos (per lane)                         | 259                              |           |
| Medium Trucks (per lane)                 | 0                                |           |
| Heavy Trucks (outside lane)              | 31                               |           |
| Source: Stantec 2019                     |                                  |           |

| Future Year 2040 Traffic                 |   |           |
|--|---|-----------|
| Speed<br>Lane Width<br>Directional Split | Weber Drive                                       |           |
|  | 40 mph  |           |
|  | 2 lanes at 12 feet<br>Traffic Model               |           |
|  | Eastbound   | Westbound |
| Vehicle Mix                              | 93% Autos + 2% Medium Trucks + 5%<br>Heavy Trucks |           |
| Free Flow                                | 1320  | 1179      |
| Autos (per lane)                         | 614   | 548       |
| Medium Trucks (per lane)                 | 13  | 12        |
| Heavy Trucks (outside lane)              | 33  | 29        |
| Source: Stantec 2019                     |   |           |

## TNM Traffic Data - Northwoods Estates

| Future Year 2040 Traffic - PCI Ramps & Exits |                                    |                                    |                                    |                                    |
|--|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
|  | I-26 WB to Weber                   | Weber to I-26 WB                   | I-26 EB to Weber                   | Weber to I-26 EB                   |
| Speed  | 45 mph                             | 45 mph                             | 45 mph                             | 45 mph                             |
| Lane Width                                   | 1 lane at 12 feet                  | 1 lane at 12 feet                  | 1 lane at 12 feet                  | 1 lane at 12 feet                  |
| Directional Split                            | Traffic Model                      | Traffic Model                      | Traffic Model                      | Traffic Model                      |
| Vehicle Mix                                  | Medium Trucks + 2%<br>Heavy Trucks | Medium Trucks + 4%<br>Heavy Trucks | Medium Trucks + 4%<br>Heavy Trucks | Medium Trucks + 5%<br>Heavy Trucks |
|  | I-26 WB Exit Ramp                  | I-26 WB On Ramp                    | I-26 EB Exit Ramp                  | I-26 EB On Ramp                    |
| Peak Hour                                    | 926                                | 125                                | 279                                | 1255                               |
| Autos (per lane)                             | 898                                | 119                                | 265                                | 1,167                              |
| Medium Trucks (per lane)                     | 9                                  | 1                                  | 3                                  | 25                                 |
| Heavy Trucks (per lane)                      | 19                                 | 5                                  | 11                                 | 63                                 |
| Source: Stantec 2019                         |                                    |                                    |                                    |                                    |

# APPENDIX B

## Field Measurement Data Sheets

Date: 10/16/19

**NOISE SURVEY SHEET**

EQUIPMENT: METER NLS2 CALIBRATOR NC-74

CALIBRATION: START 93.9 dB END 93.9 dB

RESPONSE: FAST \_\_\_\_\_ SLOW  A-WEIGHTING  BATTERY CHECK

WEATHER DATA: 80°F, Wind 11mph West

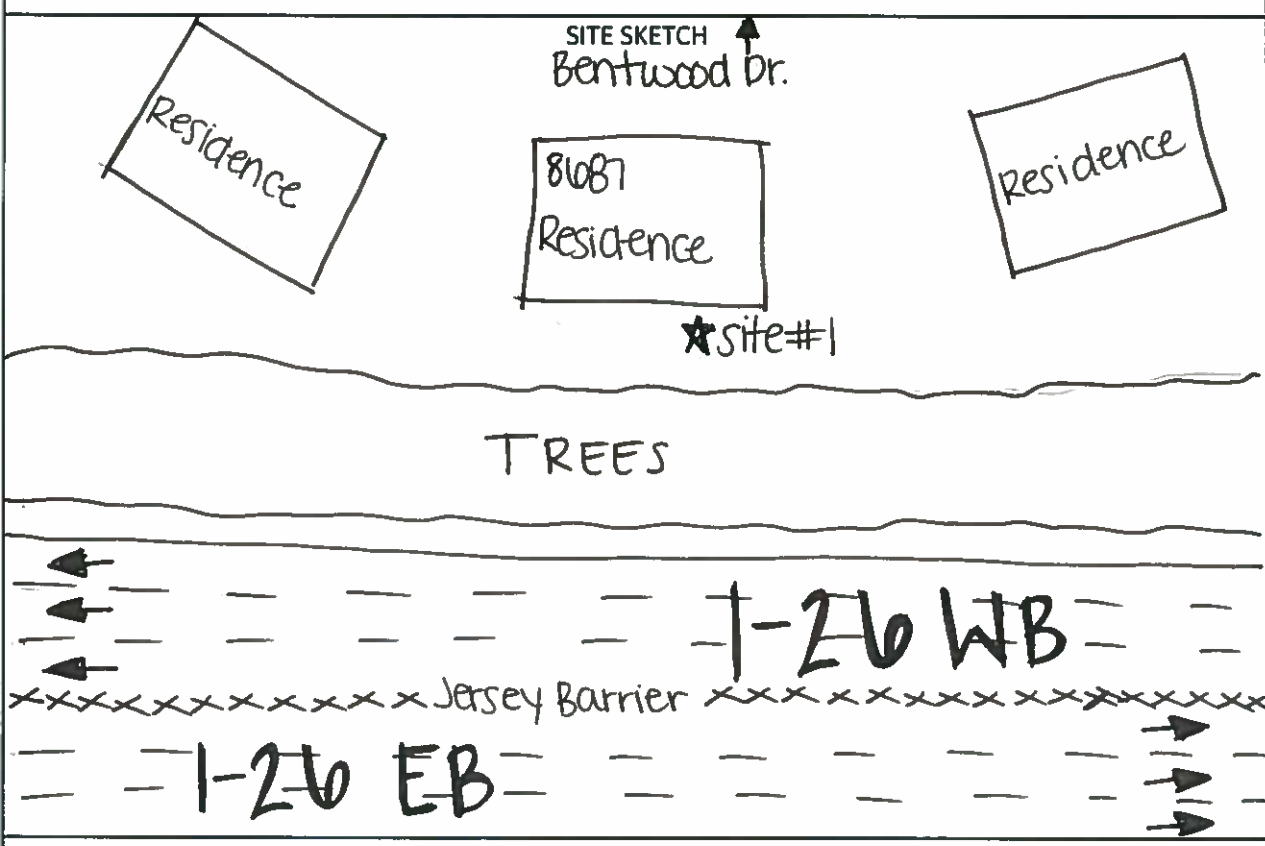
| Site | Time Period     | Hourly Traffic Based on Concurrent Traffic Counts |    |    |     |    |                 |    |    |     |    | Measured Leq |
|------|-----------------|---|----|----|-----|----|-----------------|----|----|-----|----|--------------|
|      |                 | Eastbound Lanes                                   |    |    |     |    | Westbound Lanes |    |    |     |    |              |
|      |                 | Autos   | MT | HT | Bus | MC | Autos           | MT | HT | Bus | MC |              |
| #1   | 5:53-<br>6:08pm | 733   | 10 | 21 | 1   | 5  | 1,136           | 8  | 39 | 1   | 2  | 74.3         |

MT = Medium Trucks

HT = Heavy Trucks

MC = Motorcycles

NOTES (Speed Limit, etc.):



BACKGROUND NOISE: fighter jet

MAJOR SOURCES: 1-26

UNUSUAL EVENTS:

OTHER NOTES:





Date: 10/10/19

**NOISE SURVEY SHEET**

EQUIPMENT: METER NL52 CALIBRATOR NC-74  
 CALIBRATION: START 93.9 dB END 93.9 dB  
 RESPONSE: FAST \_\_\_\_\_ SLOW  A-WEIGHTING  BATTERY CHECK

WEATHER DATA: 80F, Wind 11 mph West

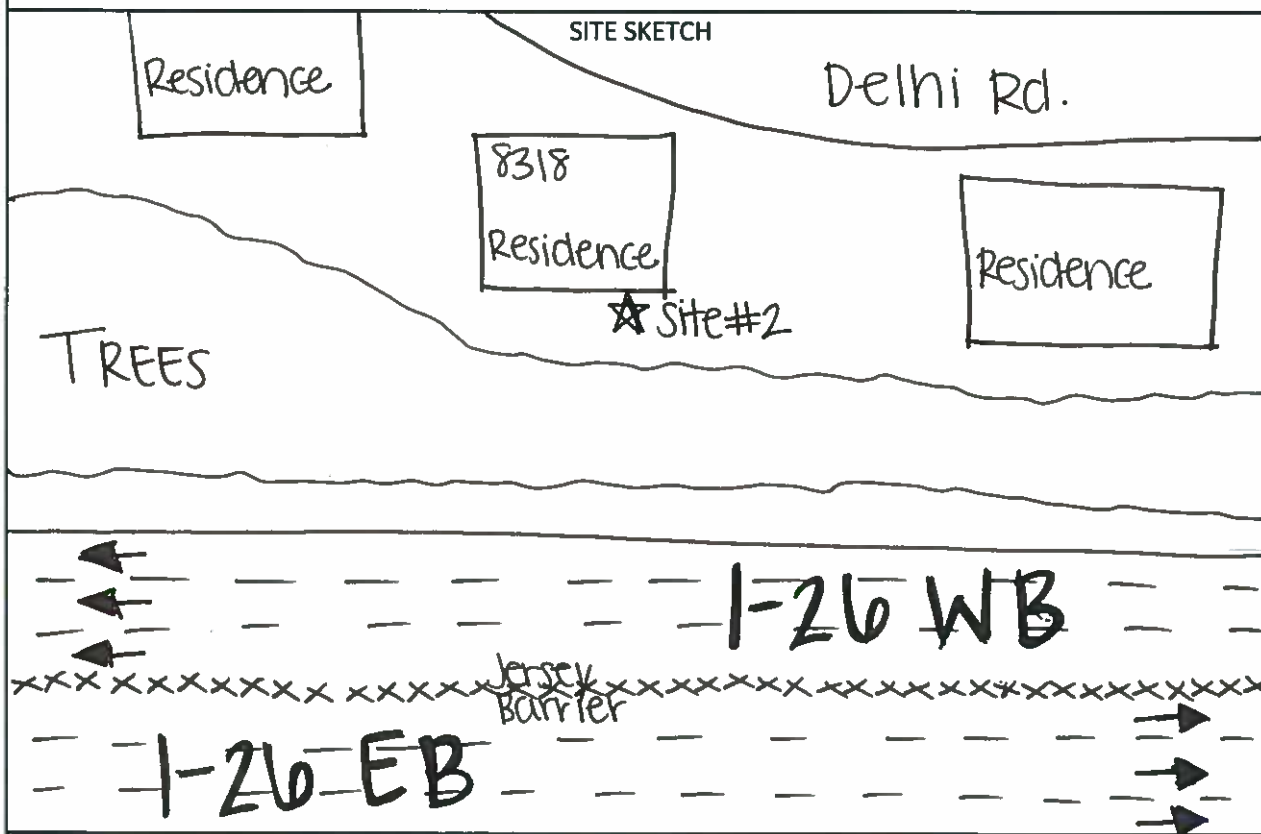
| Site | Time Period | Hourly Traffic Based on Concurrent Traffic Counts |    |    |     |    |                 |    |    |     |    | Measured Leq |
|------|-------------|---|----|----|-----|----|-----------------|----|----|-----|----|--------------|
|      |             | Eastbound Lanes                                   |    |    |     |    | Westbound Lanes |    |    |     |    |              |
|      |             | Autos   | MT | HT | Bus | MC | Autos           | MT | HT | Bus | MC |              |
| #2   | 5:29-5:44pm | 873   | 0  | 29 | 1   | 0  | 1288            | 11 | 34 | 0   | 1  | 68.0         |

MT = Medium Trucks

HT = Heavy Trucks

MC = Motorcycles

NOTES (Speed Limit, etc.):



BACKGROUND NOISE:

MAJOR SOURCES: 1-26

UNUSUAL EVENTS:

OTHER NOTES:



Date: 10/10/19

**NOISE SURVEY SHEET**

EQUIPMENT: METER NLS2 CALIBRATOR NC-74

CALIBRATION: START 93.9 dB END 93.9 dB

RESPONSE: FAST  SLOW  A-WEIGHTING  BATTERY CHECK

WEATHER DATA: 81°F, ~~wind~~ wind 12 mph West

| Site | Time Period | Hourly Traffic Based on Concurrent Traffic Counts |    |    |     |    |                 |    |    |     |    | Measured Leq |
|------|-------------|---|----|----|-----|----|-----------------|----|----|-----|----|--------------|
|      |             | Eastbound Lanes                                   |    |    |     |    | Westbound Lanes |    |    |     |    |              |
|      |             | Autos   | MT | HT | Bus | MC | Autos           | MT | HT | Bus | MC |              |
| #3   | 4:59-5:14pm | 844   | 9  | 20 | 5   | 0  | 1242            | 18 | 57 | 1   | 2  | 71.3         |

MT = Medium Trucks

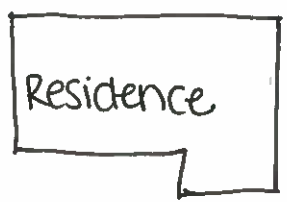
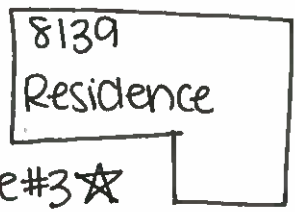
HT = Heavy Trucks

MC = Motorcycles

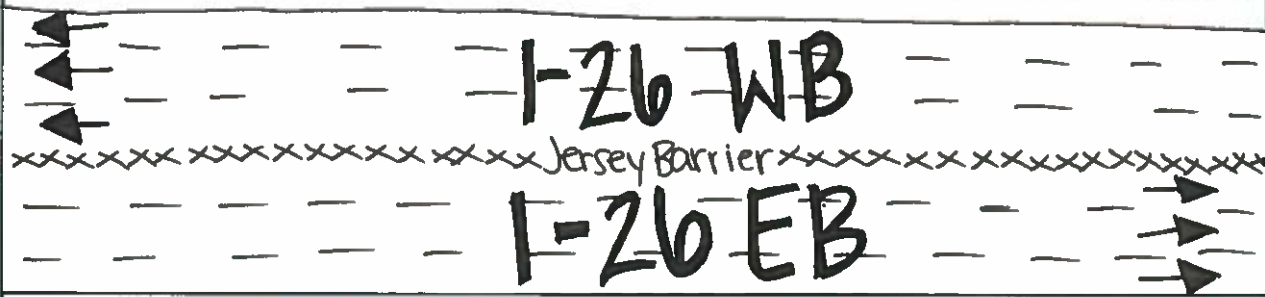
NOTES (Speed Limit, etc.):

SITE SKETCH

Long Shadow Ln.



TREES



BACKGROUND NOISE: airplane

MAJOR SOURCES: I-26

UNUSUAL EVENTS:

OTHER NOTES:



Date: 10/10/19

**NOISE SURVEY SHEET**

EQUIPMENT: METER NL52 CALIBRATOR NC-74  
 CALIBRATION: START 93.9 dB END 93.9 dB  
 RESPONSE: FAST \_\_\_\_\_ SLOW  A-WEIGHTING  BATTERY CHECK

WEATHER DATA: 81°F, wind 10 mph West

| Site | Time Period | Hourly Traffic Based on Concurrent Traffic Counts |    |    |     |    |                 |    |    |     |    | Measured Leq |
|------|-------------|---|----|----|-----|----|-----------------|----|----|-----|----|--------------|
|      |             | Eastbound Lanes                                   |    |    |     |    | Westbound Lanes |    |    |     |    |              |
|      |             | Autos   | MT | HT | Bus | MC | Autos           | MT | HT | Bus | MC |              |
| #4   | 4:29-4:44pm | 780   | 11 | 26 | 0   | 0  | 1537            | 11 | 70 | 0   | 1  | 71.5         |

MT = Medium Trucks

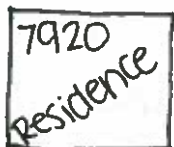
HT = Heavy Trucks

MC = Motorcycles

NOTES (Speed Limit, etc.):

SITE SKETCH

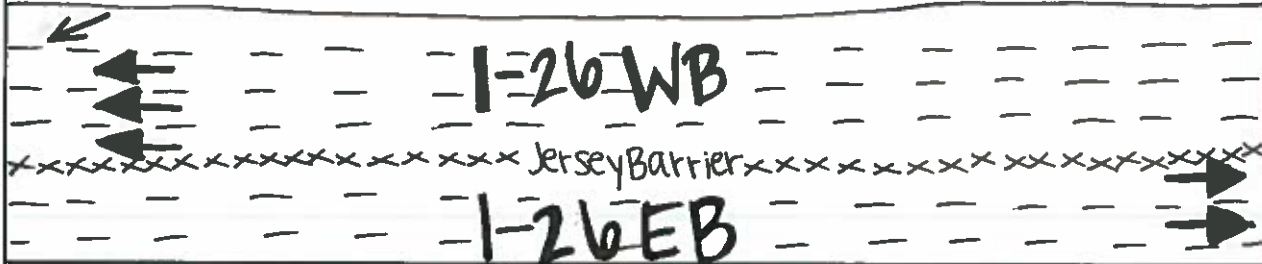
New Ryder Rd.



☆ site #4



TREES



BACKGROUND NOISE: airplane, homeowner

MAJOR SOURCES: f26

UNUSUAL EVENTS:

OTHER NOTES:



# APPENDIX C

## Project Specific Wall Cost Estimate

**Northwoods Estates Noise Barrier Wall B1 along I-26 WB  
Pipe Pile Foundations**

|                        |         |                   |
|------------------------|---------|-------------------|
| Length of Wall:        | 7559 ft |                   |
| Concrete Panel Width:  | 20 ft   | from post to post |
| Concrete Panel Height: | 20 ft   | from ground line  |
| Pile Spacing           | 20 ft   |                   |
| Average Pile Length:   | 55 ft   | per pile          |
| Clearing Width         | 20 ft   |                   |

| <b>Item</b>  | <b>Quantity</b> | <b>Unit</b> | <b>Unit Price</b> | <b>Total Cost</b> |
|--|-----------------|-------------|-------------------|-------------------|
| 20' x 20' Concrete Panel including post                                      | 151200          | SF          | \$ 25.00          | \$ 3,780,000.00   |
| Steel Pipe Piling  | 20845           | LF          | \$ 150.00         | \$ 3,126,750.00   |
| Pile Driving Setup   | 379             | EA          | \$ 1,000.00       | \$ 379,000.00     |
|  |                 |             |                   |                   |
| Noise Wall Design- Survey, Drainage, Geotech, Seismic and Hurricane Analysis | 1               | LS          | \$ 550,000.00     | \$ 550,000.00     |
| Culvert #1 - Extension (50')   | 1               | LS          | \$ 75,000.00      | \$ 75,000.00      |
| Culvert #1 - Design, Geotech & H&H Analysis                                  | 1               | LS          | \$ 20,000.00      | \$ 20,000.00      |
| Culvert #2 - Extension (85')   | 1               | LS          | \$ 125,000.00     | \$ 125,000.00     |
| Culvert #2 - Design, Geotech & H&H Analysis                                  | 1               | LS          | \$ 40,000.00      | \$ 40,000.00      |
| Stream Mitigation Credits - Culvert #1                                       | 50              | FT          | \$ 1,000.00       | \$ 50,000.00      |
| Stream Mitigation Credits - Culvert #2                                       | 85              | FT          | \$ 1,000.00       | \$ 85,000.00      |
| Erosion Control  | 1               | LS          | \$ 25,000.00      | \$ 25,000.00      |
| Clearing and Grubbing  | 3.5             | AC          | \$ 50,000.00      | \$ 175,000.00     |
| Maintenance of Traffic (5% of Construction)                                  | 1               | LS          | \$ 384,287.50     | \$ 384,287.50     |

\$ 8,815,037.50

+15% Contingency \$ 1,322,255.63

**Total Wall Cost \$ 10,137,293.13**

Linear Footage Cost= \$ 1,341.09

Cost per SF with 20' average height= \$ 67.05

# APPENDIX D

## Feasible and Reasonable Worksheets

# SCDOT Feasibility and Reasonableness Worksheet

Date: January 2020

Project Name

Highway Traffic Noise Abatement Measure

## Feasibility

Number of Impacted Receivers

Number of Benefited Receivers

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

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  
Feasible, but not reasonable.



# SCDOT Feasibility and Reasonableness Worksheet

Date: January 2020

Project Name Northwoods Estates Charleston County

Highway Traffic Noise Abatement Measure Barrier 1: 20 feet

## Feasibility

Number of Impacted Receivers 108

Number of Benefited Receivers 106

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

98.15

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 Feasible and reasonable.

# SCDOT Feasibility and Reasonableness Worksheet

Date: April 2020

**Project Name**

**Highway Traffic Noise Abatement Measure**

## Feasibility

Number of Impacted Receivers

Number of Benefited Receivers

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

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

106

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

103

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.

97.17

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

67.05

Estimated construction cost for noise abatement measure

10,136,552

Estimated cost per Benefited Receiver

57,268.66

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  
Feasible, but not reasonable.

# SCDOT Feasibility and Reasonableness Worksheet

Date: January 2020

Project Name

Highway Traffic Noise Abatement Measure

## Feasibility

Number of Impacted Receivers

Number of Benefited Receivers

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

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  
Feasible, but not reasonable.

# SCDOT Feasibility and Reasonableness Worksheet

Date: December 2019

Project Name

Highway Traffic Noise Abatement Measure

## Feasibility

Number of Impacted Receivers

Number of Benefited Receivers

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

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 12

Number of Benefited Receivers that achieve at least an 8 dBA reduction 12

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. 100

Does the proposed noise abatement measure meet the noise reduction design goal? [X] 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 35

Estimated construction cost for noise abatement measure 803,320

Estimated cost per Benefited Receiver 50,207.5

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 [X] 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 benefitted 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 Feasible, but not reasonable.



# SCDOT Feasibility and Reasonableness Worksheet

Date: December 2019

Project Name Northwoods Estates, Charleston County

Highway Traffic Noise Abatement Measure Barrier 2: 20 feet

## Feasibility

Number of Impacted Receivers 13

Number of Benefited Receivers 12

Percentage of Impacted Receivers that would achieve a 5 dBA reduction from the proposed noise abatement measure 92.3

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 benefitted 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  
Feasible, but not reasonable.

# SCDOT Feasibility and Reasonableness Worksheet

Date: December 2019

Project Name Northwoods Estates, Charleston County

Highway Traffic Noise Abatement Measure Barrier 2: 15 feet

## Feasibility

Number of Impacted Receivers 13

Number of Benefited Receivers 12

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

92.3

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

12

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

12

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.

100

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

35

Estimated construction cost for noise abatement measure

481,985

Estimated cost per Benefited Receiver

37,075.77

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 benefitted receivers

Number of Benefited Receivers (same as above)

Number of Benefited Receivers in support of noise abatement measure

Number 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 in support of noise abatement measure

Percentage of Benefited Receivers opposed to 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  
Feasible, but not reasonable.

# SCDOT Feasibility and Reasonableness Worksheet

Date: December 2019

Project Name Northwoods Estates, Charleston County

Highway Traffic Noise Abatement Measure Barrier 2: 12 feet

## Feasibility

Number of Impacted Receivers 13

Number of Benefited Receivers 12

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

92.3

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 12

Number of Benefited Receivers that achieve at least an 8 dBA reduction 11

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. 91.66

Does the proposed noise abatement measure meet the noise reduction design goal? [X] 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 35

Estimated construction cost for noise abatement measure 385,595

Estimated cost per Benefited Receiver 32,132.92

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 [X] 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 benefitted 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 Feasible, but not reasonable.

# SCDOT Feasibility and Reasonableness Worksheet

Date: December 2019

Project Name

Highway Traffic Noise Abatement Measure

## Feasibility

Number of Impacted Receivers

Number of Benefited Receivers

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

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

11

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

8

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.

72.72

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  
Feasible, but not reasonable.