Appendix E

I-73 North Noise Report

NOISE IMPACT ASSESSMENT

I-73 North Section:
From Future I-74 in Richmond County, NC
to I-95 in Dillon County, SC
(Conceptual Design)

SCDOT PIN No.: 36358 RD01
NCDOT TIP No.: R-3421

Prepared For:

South Carolina Department of Transportation

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EXECUTIVE SUMMARY

In compliance with Title 23 of the Code of Federal Regulations, Part 772 (23 CFR Part 772), the following noise assessment has been prepared and will be provided by South Carolina Department of Transportation (SCDOT) to local officials in an attempt to prevent future impacts from traffic noise.

The proposed project is located on new alignment from the I-74/NC 38 interchange area (Richmond County, North Carolina) to I-95 in Dillon County, South Carolina. The proposed improvement would create a new 4-lane interstate highway (2-12' lanes with inside and outside shoulders and a grass median). This is the northern section of a two-part analysis with a southern section that is proposed to run from I-95 at the north section interchange, then traverse south to SC 22 near the Myrtle Beach area. The total north section project road length is just under 40 miles (approximately), with approximately 5 miles of I-73 being in North Carolina.

Please note that this analysis was performed with a conceptual design for reevaluation purposes. At this time, there has been no topographic elevation survey. The conceptual design was based off of USGS topo which is only good for 10 foot intervals in most places in South Carolina. The North Carolina section has more detailed contouring and it was applied where applicable. Nonetheless, the cut and fill slopes can change dramatically once the actual elevation data is obtained and may cause some shifts in the final design alignment to avoid impacts. There will also be a value engineering review after the revisions for final design and, subsequently, the design can change again as necessary.

The TNM2.5 Noise Model was used to analyze the existing condition and the 2040 design year No-build and Build Alternative based on traffic data provided by CDM Smith and SCDOT. Much of the project area is rural/undeveloped and has no appreciable roadway traffic. In these areas, field measurements were performed to establish a sound level baseline for which to compare possible sound level increases as a result of the proposed action.

The modeling results indicated that 26 receivers (all residential) would approach or exceed the noise abatement criteria (NAC) and/or meet or exceed the substantial increase criteria for the 2040 design year Build Alternative. (SCDOT and North Carolina Department of Transportation (NCDOT) criteria.) Noise abatement was therefore considered for the proposed project. As a result of the analysis, there were no feasible and reasonable solutions to mitigate for the noise according to SCDOT or NCDOT noise policy. The primary reason for the lack of mitigation to be forwarded to the construction phase is the sparsity of development throughout the entire rural project corridor. Essentially, there were not enough potentially benefited homes to meet the SCDOT noise reduction design goal and/or the SCDOT criteria for cost reasonableness. In North Carolina, square footage criteria per benefited receiver was used as per NCDOT policy.

Again, please note that this analysis was performed with a conceptual design for reevaluation purposes. It is expected that if this section of I-73 were moved forward, then a formal preliminary and (possibly) final design analysis would be performed at those times.

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In compliance with Title 23 of the Code of Federal Regulations, Part 772 (23 CFR Part 772), the following noise assessment has been prepared and will be provided by SCDOT to local officials in an attempt to prevent future impacts from traffic noise.

The current SCDOT Traffic Noise Abatement Policy (Policy) was followed to analyze the potential noise impacts and mitigation as necessary. It has been consolidated, where appropriate and/or applicable, to reduce the number of pages.

A. Proposed Project Description, Existing Facility and Purposes and Need

The proposed project is located on new alignment from the I-74/NC 38 interchange area (Richmond County, North Carolina) to I-95 in Dillon County, South Carolina. The proposed improvement would create a new 4-lane interstate highway (2-12' lanes with inside and outside shoulders and a grass median as shown in Figure 1). This is the northern section of a two-part analysis with a southern section that is proposed to run from I-95 at the north section interchange, then traverse south to SC 22 near the Myrtle Beach area. The total north section project road length is just under 40 miles (approximately), with approximately 5 miles of I-73 constructed in North Carolina as shown in Figure 2.

Please note that this analysis was performed with a conceptual design for reevaluation purposes. At this time, there has been no topographic elevation survey. The conceptual design was based off of USGS topo which is only good for 10 foot intervals in most places in South Carolina. The North Carolina section has more detailed contouring and it was applied where applicable. Nonetheless, the cut and fill slopes can change dramatically once the actual elevation data is obtained and may cause some shifts in the final design alignment to avoid impacts. There will also be a value engineering review after the revisions for final design and, subsequently, the design can change again as necessary.

The posted speed limit is expected to be 70 miles per hour (mph). The estimated average annual daily traffic (AADT) volume is expected to range from approximately 27,100 to 31,100 vehicles per day (vpd) for the Build Alternative. As a new alignment highway, there are no existing and design year no-build volumes.

B. Existing Land Uses

Land use adjacent to the highway is predominantly comprised of rural open land, farmland and industrial use. There is a scattering of residential units located throughout the project area. There are no places of worship, schools or parks in the project area. There are a few NAC Category F land uses in the project area (industrial/commercial-retail). These land uses were not analyzed since they do not have a sound level impact criteria.

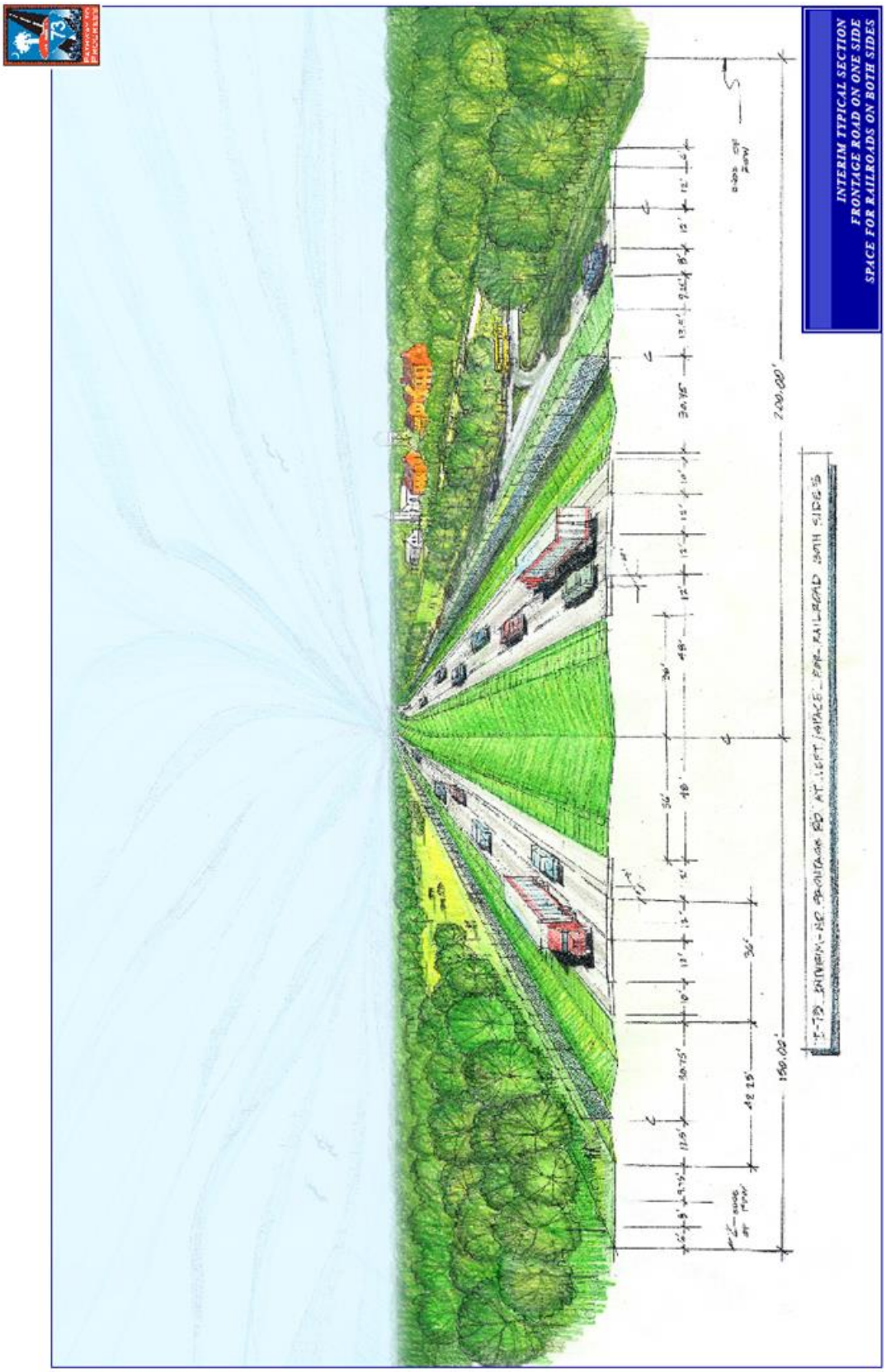


Figure 1 - I-73: I-74 to I-95 - Proposed Cross Section

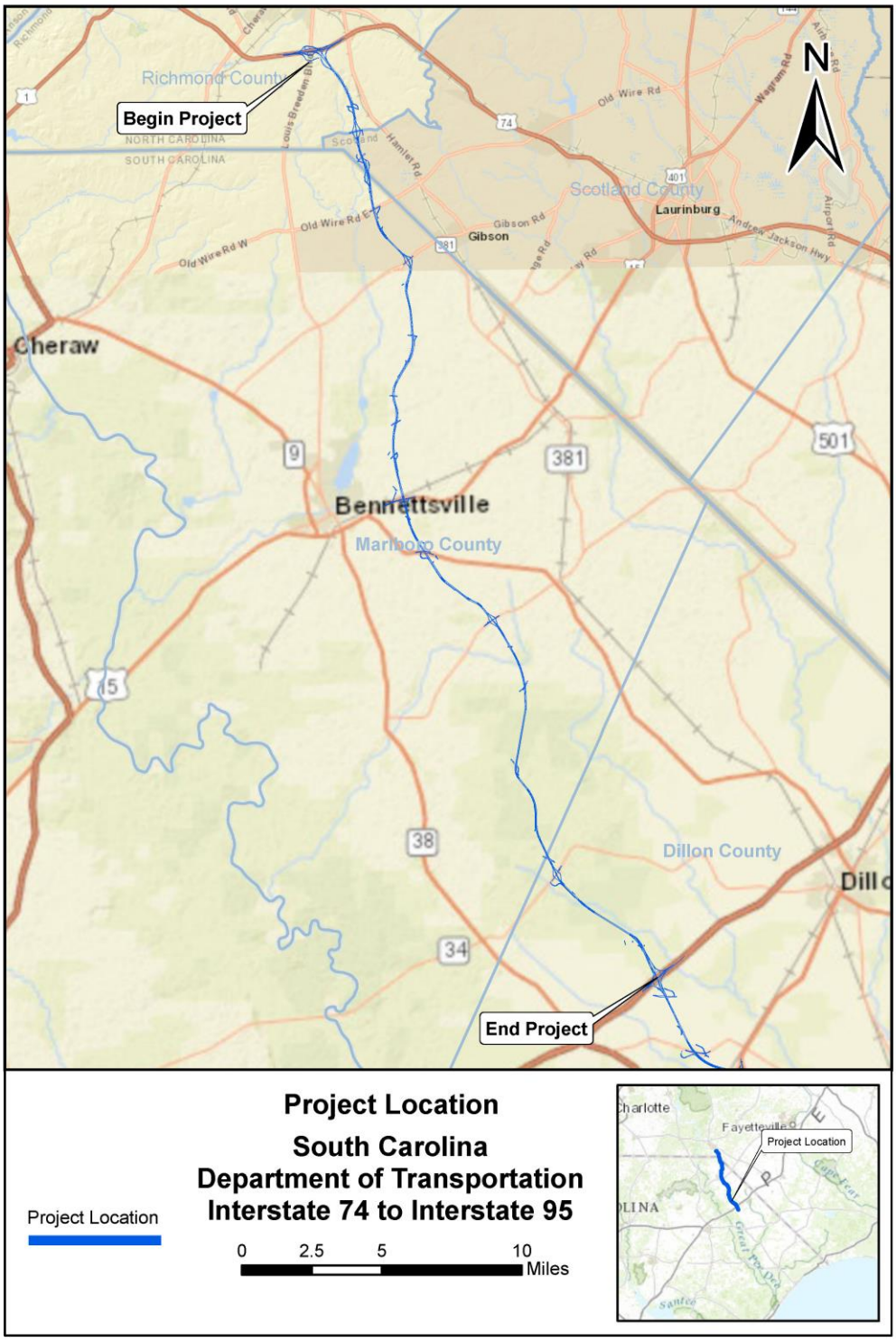


Figure 2 - I-73: I-74 to I-95 - Project Location

II. ANALYSIS METHODOLOGY

A. Model Used and Assumptions

The Federal Highway Administration (FHWA) Traffic Noise Model (TNM 2.5) was used to derive existing and future noise levels. The environmental traffic data used was developed, updated and approved by SCDOT. Applicable model features, such as building structure inputs, the multi-use trail and concrete traffic barriers (jersey barriers) were added to the analysis to provide accurate sound level reduction results.

B. Traffic Data

The traffic data (and design files) for the proposed project were provided by CDM Smith on behalf of SCDOT, including the estimated AADT, Design Hourly Volume (DHV) and fleet mix percentages for the existing year and the design year 2040 (shown in Appendix A). Ten percent of the AADT was used to approximate the DHV. For the Build Alternative and depending on the specific I-73 link, 72-75 percent of the DHV was automobiles, pickup trucks and SUV's. The percent of medium duty trucks of the DHV was assumed to be 5-6 and the percent of heavy duty trucks was assumed to range from 19-22. Appendix A identifies the fleet mix for each specific link. A speed limit of 70 miles per hour (mph) was used for I-73, I-74 and I-95. Cross-street and ramps speeds were modeled at 45 mph. In addition, an assumption of a 50/50 directional split was used for all scenarios, and 12-foot wide travel lane widths were used, plus inside and outside shoulders.

C. Receiver Locations

Sensitive receivers and/or land use types were first identified using aerial photography and street level views from http://maps.google.com, then field verified. Exterior usage receiver categories that are potentially impacted by the proposed project include residential, which fall under the FHWA-developed Noise Abatement Criteria (NAC) category B. NAC F land uses do not have a sound level criteria and are not studied for noise impacts. These uses include agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, commercial retail establishments, shipyards, utilities (water resources, water treatment, electrical), and warehouses.

D. Field Measurements

Ambient noise field measurements were taken at twenty-one different locations in the project corridor near the proposed I-73 alignment. These were performed in accordance with the FHWA publication "Measurement of Highway-related Noise." Noise measurements were taken during the weekday period between 9/26/2016 and 9/28/2016, and also between 10/25/2016 and 10/26/2016 during the AM and/or PM peak traffic periods, though some rural sites with no regular traffic were measured outside of these periods to establish baseline. Vehicles were counted and the type of vehicle was noted during the field measurements. Please note that many of the noise sensitive receivers are located in areas where there is little or no highway traffic as the proposed alignment location was developed to avoid developed areas. In addition, the meteorological conditions, local features (trees, nearby buildings, etc,) were noted for each site. Table 1 summarizes the information for the ambient noise field measurements. Figure 3 (shown later in the report) shows the measurement sites and Appendix B contains the field measurement data sheets.

Table 1 - Ambient Noise Field Measurements

Site	Time Period	Hourly Traffic Based on Concurrent Traffic Counts						Measured Leq
		North (or West) bound Lane			*South (or East) bound Lane*			
		Autos	MT	HT	Autos	MT	HT	
N1	3:46-4:26 PM	67	5	4	61	1	10	61.6
N2	4:32-4:52 PM	0	0	0	0	0	0	51.5
N3	5:06-5:26 PM	96	2	15	108	7	15	56.9
N4	5:40-6:07 PM	0	0	0	1	0	0	50.7
N5	6:15-6:35 PM	1	0	0	5	0	0	46.4
N6	6:50-7:10 PM	0	0	0	0	0	0	39.8
N7	7:25-7:45 PM	3	0	0	3	0	0	49.4
N8	8:53-9:08 AM	0	0	0	0	0	0	61.6
N9	8:21-8:36 AM	5	0	0	0	0	0	45.0
N10	7:49-8:04 AM	3	0	0	9	0	2	53.4
N11	7:18-7:33 AM	11	0	0	1	0	0	46.1
N12 (N13)	10:21-10:36 AM	0	0	0	0	0	0	44.6
N13 (N14)	9:25-9:45 AM	10	0	0	6	0	0	49.7
N14 (N15)	4:10-4:25 PM	56	2	4	43	0	4	56.5
N15 (N16)	4:46-5:01 PM	0	0	0	1	0	0	42.3
N16 (N18)	5:46-6:01 PM	6	0	0	8	1	0	56.5
N17 (N19)	6:46-7:01 AM	0	0	0	3	0	0	45.7
N18 (N20)	7:08-7:23 AM	0	0	0	2	0	0	45.6

SOURCE: Michael Baker International, September and October, 2016.
*Measurement sites were renumbered as a result of property owner refusal of entry and/or property site field views that were discovered to be industrial or maintenance land uses with no residence. Original site numbers are in parenthesis to match the field sheets and figures.

NOTES:
MT = Medium Trucks
HT = Heavy Trucks
Meteorological conditions: dry, 70-80s temperatures, light or zero-wind conditions.

E. Model Validation

Using the ambient noise field measurements shown in Table 1, the TNM2.5 model was validated per the requirements in 23 CFR §772.11(d)(2). Table 2 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. Based on NCDOT Policy, if the measured and modeled Leq are within 1.7 dBA, the model is validated. Table 2 shows that the difference between the modeled and measured Leq was ≤3.0 dBA ≤1.7 dBA at the respective state sites; therefore, the model is validated.

Table 2 - Comparison of Measured Leq to Modeled Leq for TNM2.5 Model Validation

Site	State	Time Period	Measured Leq	Modeled Leq	Difference[a]
N1	NC	3:46-4:26 PM	61.6	63.3	1.7
N2	NC	4:32-4:52 PM	48.8	N/A	N/A
N3	NC	5:06-5:26 PM	56.9	55.7	1.2
N4	NC	5:40-6:07 PM	46.6	45.7	1.1
N5	NC	6:15-6:35 PM	46.4	45.2	1.2
N6	NC	6:50-7:10 PM	39.8	N/A	N/A
N7	NC	7:25-7:45 PM	49.4	47.7	1.7
N8	SC	8:53-9:08 AM	44.9	N/A	N/A
N9	SC	8:21-8:36 AM	45.0	42.2	2.8
N10	SC	7:49-8:04 AM	47.5	44.6	2.9
N11	SC	7:18-7:33 AM	46.1	43.9	2.2
N12 (N13)	SC	10:21-10:36 AM	44.6	N/A	N/A
N13 (N14)	SC	9:25-9:45 AM	49.7	47.1	2.6
N14 (N15)	SC	4:10-4:25 PM	56.5	56.6	0.1
N15 (N16)	SC	4:46-5:01 PM	42.3	N/A	N/A
N16 (N18)	SC	5:46-6:01 PM	56.5	54.6	1.9
N17 (N19)	SC	6:46-7:01 AM	45.7	N/A	N/A
N18 (N20)	SC	7:08-7:23 AM	45.6	N/A	N/A

SOURCE: Michael Baker International, September and October, 2016.
*Measurement sites were renumbered as noted in Table 1. Original site numbers are in parenthesis to match the field sheets and figures.

[a]Difference = Measured Leq minus Modeled Leq. NCDOT difference criteria is 1.7 dBA; SCDOT difference criteria is 3.0 dBA.

Note1: Many receiver sites near the proposed I-73 highway are located in rural areas where there is little traffic volume.

III. TRAFFIC NOISE IMPACTS

The FHWA has developed noise abatement criteria and procedures in 23 CFR Part 772, as shown in Table 3, that states that traffic noise impacts occur when either:

1) the predicted traffic noise levels approach or exceed the FHWA Noise Abatement Criteria (NAC) for the applicable activity category shown below; or,
2) the predicted traffic noise levels substantially exceed the existing noise levels by ≥15 dBA.

Table 3 - 23 CFR 772 (Table 1) Noise Abatement Criteria (NAC)

Activity Category	L_{eq} (h)\1,2\	L_{10} (h) \1,2\	Evaluation Location	Description of Activity Category
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\3\	67	70	Exterior	Residential.
C\3\	67	70	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
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\3\	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.

SOURCE: 23 CFR Part 772

\1\ Either Leq(h) or L10(h) (but not both) may be used on a project.
\2\ The Leq(h) and L10(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.
\3\ Includes undeveloped lands permitted for this activity category.

The modeled and/or measured results for the existing condition, and the 2040 design year No-build and Build Alternatives can be found in Table 4 and shown in Figure 3. A total of 26 receivers would have an NAC impact and/or substantial increase impact for the 2040 Build Alternative. A CD with the TNM input and output files (as indicated in Appendix C) has been submitted to SCDOT for their review and records.

Many of the receivers in the project corridor are located in areas where there is little or zero traffic. In order to establish an existing baseline for determining potential substantial increase criteria, the greater of the sound levels either measured or modeled (if there were any available traffic volumes) was used as the existing condition sound level.

A. Modeled and/or Measured Existing Year Noise Levels

In the existing condition, there are zero (0) receivers that would have noise levels that approach or exceed the NAC criteria for its respective land use.

B. Modeled Design Year (Future 2040) No-Build Alternative Noise Levels

The sound levels are predicted to increase by 0.3 dBA, on average, over the existing condition as a result of the predicted traffic growth in the project area between 2010 and 2040. There are zero (0) receivers that would have noise levels that approach or exceed the NAC criteria for its respective land use.

C. Modeled Design Year (Future 2040) Build Alternative Noise Levels

The noise levels for the 2040 Build Alternative are predicted to increase by 10.2 dBA on average over the existing condition, and by 9.9 dBA on average over the 2040 No-build Alternative. With the 2040 Build Alternative, the noise levels are predicted to approach or exceed the NAC criteria and/or meet or exceed the substantial increase criteria for 26 receivers. These receivers are all residential land uses.

Table 4 - I-73 New Alignment Reevaluation – Existing and Design Year Sound Levels

RECEPTOR NUMBER	EXISTING	2040 NO-BUILD	2040 BUILD	INCREASE OVER EXISTING	NAC IMPACT?	SUBSTANTIAL INCREASE IMPACT?	NAC	LAND USE
1	55	56	63	8	N	N	66	Residential
2	54	56	61	6	N	N	66	Residential
3	54	56	60	6	N	N	66	Residential
4	55	57	60	5	N	N	66	Residential
5	55	57	60	5	N	N	66	Residential
6	55	57	59	3	N	N	66	Residential
7	56	58	57	1	N	N	66	Residential
8	54	56	55	1	N	N	66	Residential
9	53	54	54	1	N	N	66	Residential
10	53	54	52	-1	N	N	66	Residential
11	51	52	52	1	N	N	66	Residential
12	51	52	53	2	N	N	66	Residential
13	51	52	53	2	N	N	66	Residential
14	57	58	58	1	N	N	66	Residential
15	53	54	54	1	N	N	66	Residential
16	60	61	61	1	N	N	66	Residential
17	54	55	55	1	N	N	66	Residential
18	58	60	59	1	N	N	66	Residential
19	55	57	56	1	N	N	66	Residential
20	60	60	**67**	7	**Y**	N	66	Residential
22	51	51	64	13	N	N	66	Residential
23	51	51	**65**	**14**	N	**Y**	66	Residential
25	51	51	62	12	N	N	66	Residential
26	40	40	58	**18**	N	**Y**	66	Residential
27	40	40	61	**21**	N	**Y**	66	Residential
28	40	40	65	**26**	N	**Y**	66	Residential
29	49	49	63	14	N	N	66	Residential
30	49	49	**72**	**22**	**Y**	**Y**	66	Residential
32	49	49	60	10	N	N	66	Residential
33	49	49	57	8	N	N	66	Residential
33A	44.9	44.9	65.7	**20.8**	N	**Y**	66	Residential
34	45.0	45.0	57.2	12.2	N	N	66	Residential
35	45.0	45.0	62.7	**17.7**	N	**Y**	66	Residential
36	45.0	45.0	57	12.0	N	N	66	Residential
37	47.5	47.5	55.7	8.2	N	N	66	Residential
39	46.1	46.1	62.8	**16.7**	N	**Y**	66	Residential
40	46.1	46.1	64.9	**18.8**	N	**Y**	66	Residential

Bold Red-shaded values indicate sound levels that either approach, meet or exceed the NAC or meet or exceed the substantial increase over existing criteria.

Green Shaded site numbers are indicative of sites in North Carolina. North Carolina has a graduated scale for determining substantial increase impacts based on how high or low the existing sound levels are.

Table 4 - I-73 New Alignment Reevaluation – Existing and Design Year Sound Levels

RECEPTOR NUMBER	EXISTING	2040 NO-BUILD	2040 BUILD	INCREASE OVER EXISTING	NAC IMPACT?	SUBSTANTIAL INCREASE IMPACT?	NAC	LAND USE
41	46.1	46.1	55.3	9.2	N	N	66	Residential
42	46.1	46.1	56.9	10.8	N	N	66	Residential
43	46.1	46.1	57.1	11.0	N	N	66	Residential
44	46.1	46.1	61.5	**15.4**	N	**Y**	66	Residential
45	46.1	46.1	**69.1**	**23.0**	**Y**	**Y**	66	Residential
47	46.1	46.1	61.4	**15.3**	N	**Y**	66	Residential
48	46.1	46.1	54.7	8.6	N	N	66	Residential
49	46.1	46.1	53.7	7.6	N	N	66	Residential
50	44.6	44.6	61.1	**16.5**	N	**Y**	66	Residential
51	44.6	44.6	**70.3**	**25.7**	**Y**	**Y**	66	Residential
52	44.6	44.6	**69.2**	**24.6**	**Y**	**Y**	66	Residential
54	44.6	44.6	**67.9**	**23.3**	**Y**	**Y**	66	Residential
55	44.6	44.6	60.8	**16.2**	N	**Y**	66	Residential
57	44.6	44.6	63.1	**18.5**	N	**Y**	66	Residential
58	49.7	49.7	60	10.3	N	N	66	Residential
59	49.7	49.7	64.1	14.4	N	N	66	Residential
60	49.7	49.7	**68.3**	**18.6**	**Y**	**Y**	66	Residential
61	49.7	49.7	60.8	11.1	N	N	66	Residential
62	49.7	49.7	56.1	6.4	N	N	66	Residential
63	49.7	49.7	57.6	7.9	N	N	66	Residential
64	49.7	49.7	59.5	9.8	N	N	66	Residential
65	56.3	56.3	62.8	6.5	N	N	66	Residential
66	55.6	55.6	61.1	5.5	N	N	66	Residential
67	59.5	59.4	62.1	2.6	N	N	66	Residential
69	42.3	42.3	62.2	**19.9**	N	**Y**	66	Residential
71	42.3	42.3	62.3	**20.0**	N	**Y**	66	Residential
72	49.7	49.7	57	7.3	N	N	66	Residential
73	49.7	49.7	55.3	5.6	N	N	66	Residential
74	49.7	49.7	55.5	5.8	N	N	66	Residential
75	49.7	49.7	55.9	6.2	N	N	66	Residential
76	49.7	49.7	56.9	7.2	N	N	66	Residential
77	49.7	49.7	58.6	8.9	N	N	66	Residential
78	56.5	56.5	58.7	2.2	N	N	66	Residential
79	56.5	56.5	61.1	4.6	N	N	66	Residential
80	56.5	56.5	59.9	3.4	N	N	66	Residential

Bold Red-shaded values indicate sound levels that either approach, meet or exceed the NAC or meet or exceed the substantial increase over existing criteria.

Table 4 - I-73 New Alignment Reevaluation – Existing and Design Year Sound Levels

RECEPTOR NUMBER	EXISTING	2040 NO-BUILD	2040 BUILD	INCREASE OVER EXISTING	NAC IMPACT?	SUBSTANTIAL INCREASE IMPACT?	NAC	LAND USE
81	56.5	56.5	59.4	2.9	N	N	66	Residential
82	49.7	49.7	**67.7**	**18.0**	**Y**	**Y**	66	Residential
84	49.7	49.7	52.9	3.2	N	N	66	Residential
85	49.7	49.7	52.6	2.9	N	N	66	Residential
87	49.7	49.7	58.2	8.5	N	N	66	Residential
88	49.7	49.7	62.3	12.6	N	N	66	Residential
89	49.7	49.7	57.7	8.0	N	N	66	Residential
92	52.5	52.5	54	1.5	N	N	66	Residential
93	44.5	44.5	60.1	**15.6**	N	**Y**	66	Residential
94	56.5	56.5	60.2	3.7	N	N	66	Residential
95	45.7	45.7	60.4	14.7	N	N	66	Residential
96	45.7	45.7	58.3	12.6	N	N	66	Residential
97	45.7	45.7	58.6	12.9	N	N	66	Residential
98	45.7	45.7	55.8	10.1	N	N	66	Residential
99	45.7	45.7	55.9	10.2	N	N	66	Residential
100	45.7	45.7	58.9	13.2	N	N	66	Residential
101	45.7	45.7	57.6	11.9	N	N	66	Residential
102	45.6	45.6	**66**	**20.4**	**Y**	**Y**	66	Residential
103	45.6	45.6	64.6	**19.0**	N	**Y**	66	Residential
104	53.6	56.2	60.6	7.0	N	N	66	Residential

Source: Michael Baker International, Inc.

Bold Red-shaded values indicate sound levels that either approach, meet or exceed the NAC or meet or exceed the substantial increase over existing criteria.

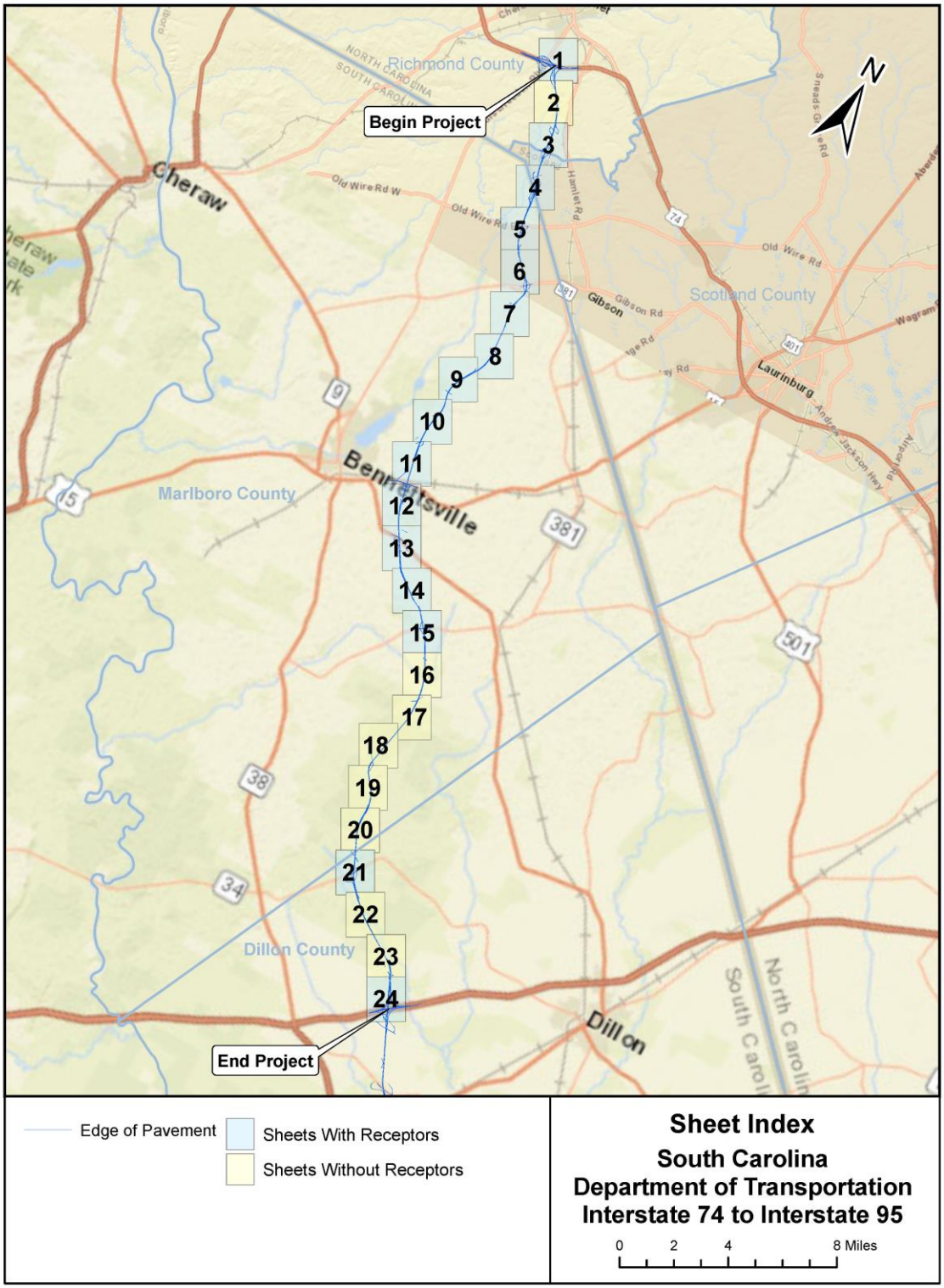
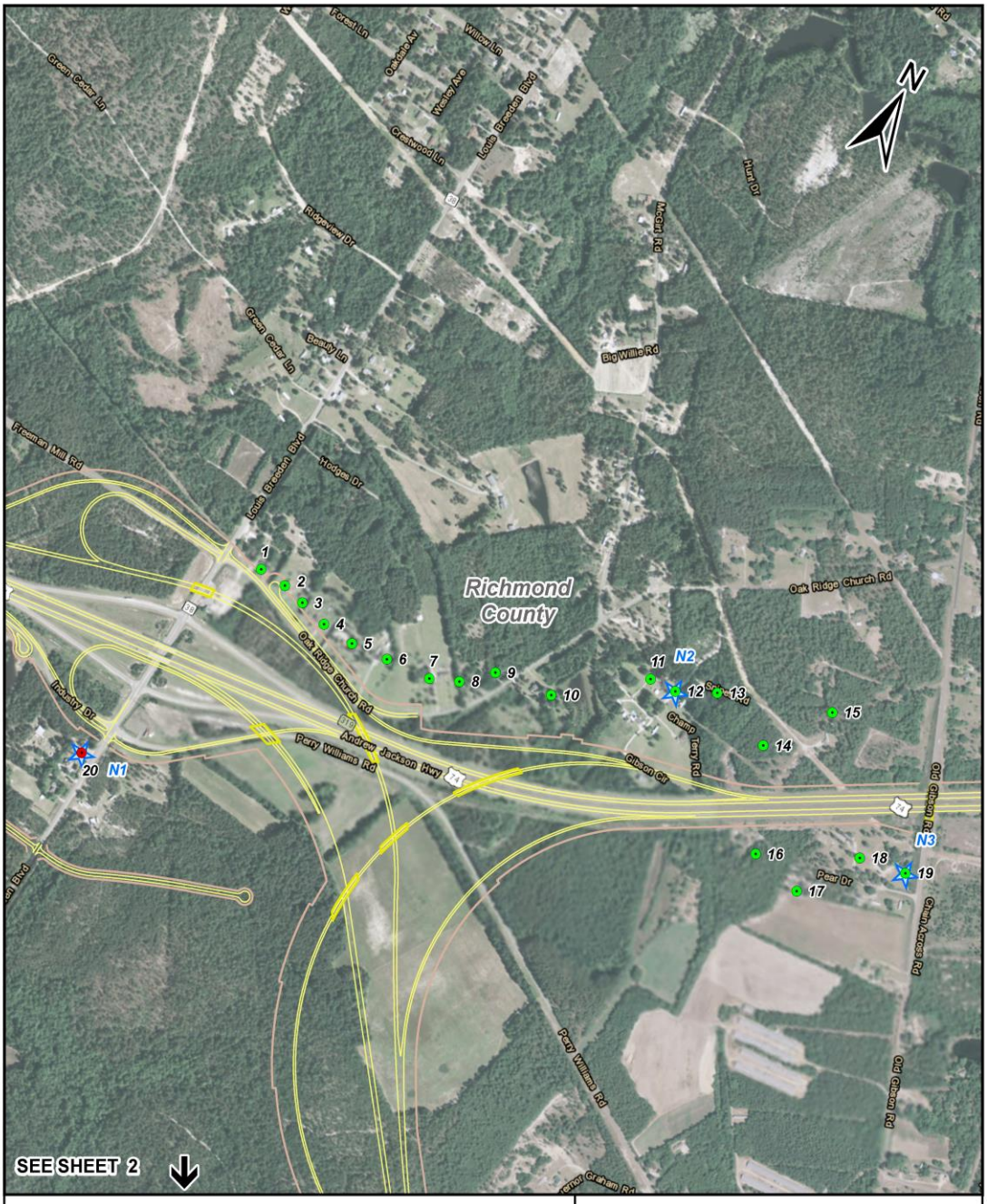


Figure 3 - I-73: I-74 to I-95 - Impacted Noise Receiver Locations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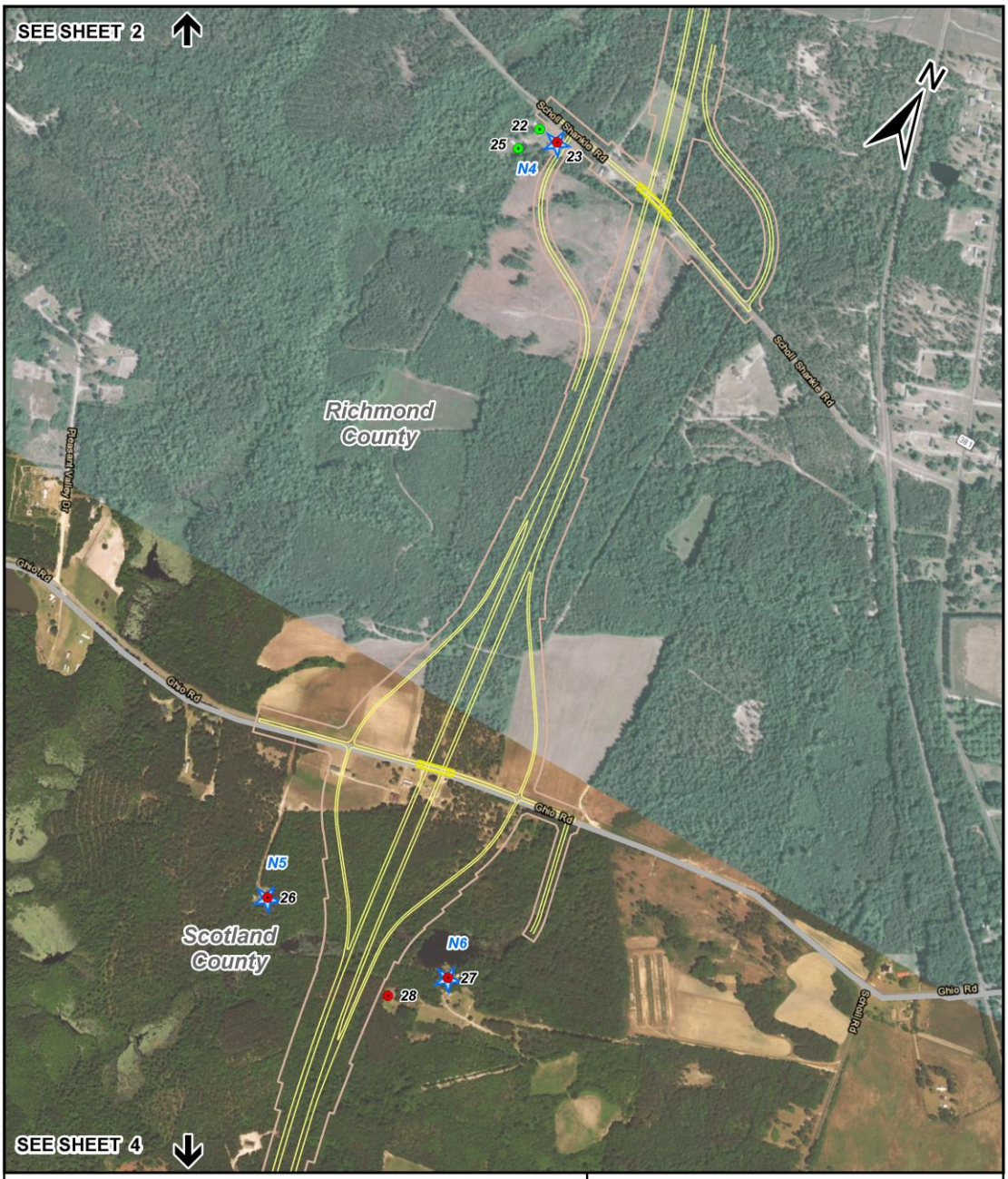
Big Willie Rd
Louis Bresden Blvd
Green Cedar Ln
Ridgeview Dr
Beauty Ln
Hodges Dr
Freeman Mill Rd
Industry Dr
Andrew Jackson Hwy
Perry Williams Rd
Champ Terry Rd
Gibson Cir
Old Gibson Rd
Pear Dr
Chain Across Rd
Mccall Rd
Hurst Dr
Forest Ln
Willow Ln
Wesley Ave
Creekwood Ln
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
N1
N2
N3
SEE SHEET 2
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

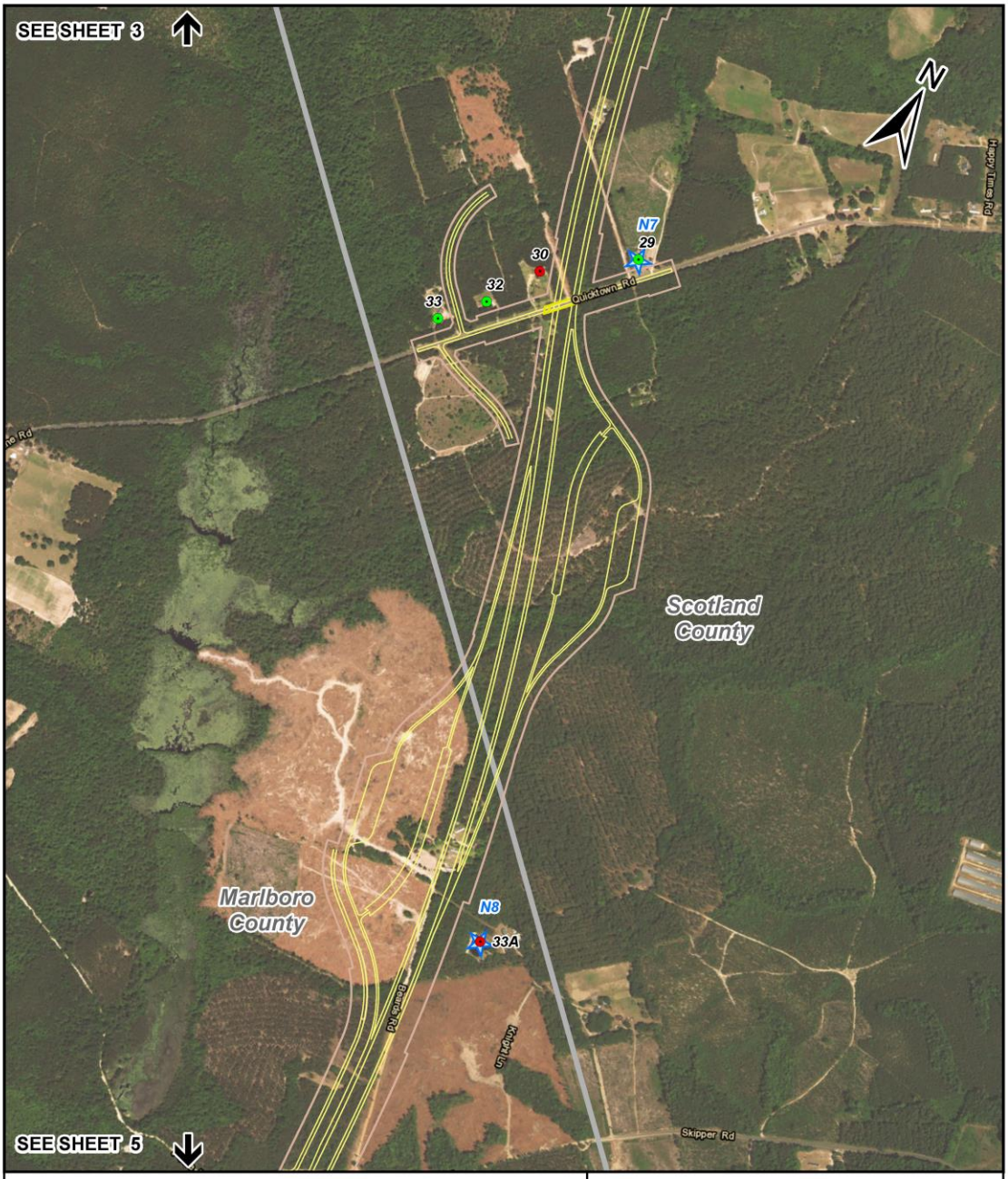
Sheet 1


SEE SHEET 1
SEE SHEET 3
N
Richmond County
Governor Graham Rd
Springhill Church Rd
Sapphire Dr
Peggy Williams Rd
Ingram Dr
Miracle Ln
Springhill Church Rd
Asbury Dr
Oasis Blvd
Kersey Dr
Springhill Church Rd
Romans D
Lewhaws Rd
Roberts Rd
Smith Hill Dr
Schell Shanks Rd
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 2


SEE SHEET 2
N
22
25
23
N4
Richmond County
Scotland County
N5
26
N6
27
28
Ohio Rd
School Shamrock Rd
Pleasant Valley Dr
SEE SHEET 4
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 3


SEE SHEET 3
N7
29
30
32
33
Quicktown Rd
Scotland
County
Marlboro
County
N8
33A
Pearson Rd
Skipper Rd
SEE SHEET 5
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 4


SEE SHEET 4
Scotland County
Peele Rd
Barnhardt Ln
34
N9
35
36
Old Wire Rd E
Marlboro County
Barrington Rd
Pearson Rd
Lott Ln
SEE SHEET 6
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 5

North Receptors
- Not Impacted
- Impacted
- Measurement Site

Interstate 73
- Bridge
- Edge of Pavement
- Right of Way

Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95

0 500 1,000 2,000 Feet

Sheet 6


SEE SHEET 6
N
Sluden Town Rd
Newton Rd
Newton Rd
Plantation Rd
B Rd
Marlboro County
Newton Rd
Railroad Rd
Newton Rd
C Rd
39
N11
40
SEE SHEET 8
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 7


SEE SHEET 7
41
42
43
44
45
47
48
49
50
Middle Rd
Bolan Rd
Family Farm Rd
Marlboro County
Sawdust Ln
Bradley Rd
SEE SHEET 9
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 8


SEE SHEET 8
Ford Rd
Burton Fork Church Rd
Marlboro County
Bradley Rd
51
52
54
55
N13
57
Beverly Creek Rd
Tara Ln
SEE SHEET 10
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet
Sheet 9


SEE SHEET 9
SEE SHEET 11
N
61
60
62
63
N14
59
58
Academy Rd
Donna Ln
Marlboro County
E Main St Ext
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 10

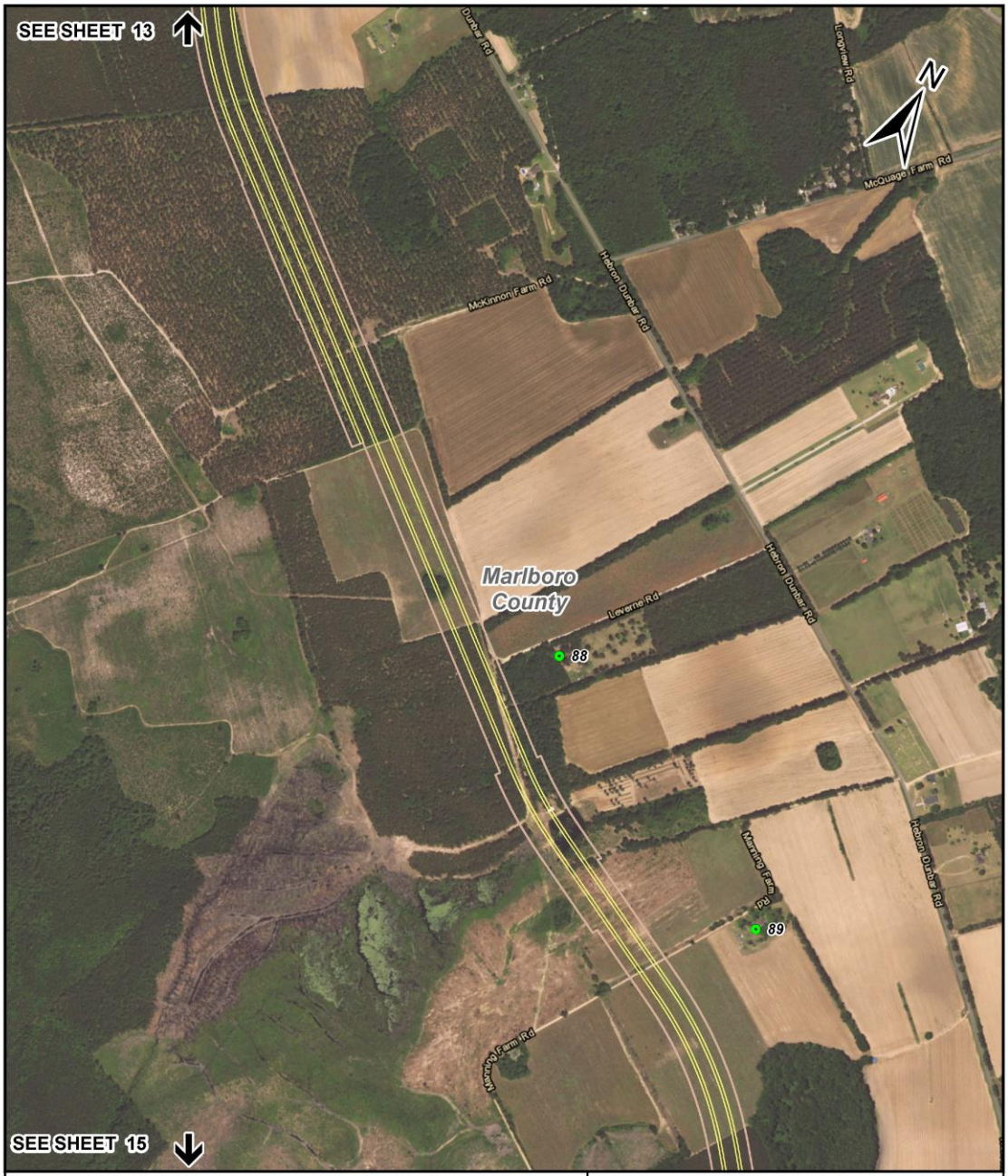

SEE SHEET 10
E Main St Ext
E Main St Ext
E Main St Ext
Laney Ln
Laney Ln
Beauty Spot Rd E
Beauty Spot Rd E
Beauty Spot Rd E
Marlboro County
Road D
Road D
Bigfoot Rd
Bigfoot Rd
64
66
N15
67
65
Highway 15-401 E
SEE SHEET 12
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 11


SEE SHEET 11
Covington Mill Pond Rd
Highway 13-401
N
69
N16
71
Marlboro County
Covington Mill Pond Rd
Covington Mill Pond Rd
Covington Rd
SEE SHEET 13
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 12


SEE SHEET 12
SEE SHEET 14
N
Spears Church Rd
Covington Rd
Covington Rd
Spears Church Rd
72
73
74
75
76
77
78
79
80
81
82
84
85
87
N17
Marlboro County
Sandy Grove Church Rd
Sandy Grove Church Rd
Hebron Dunbar Rd
Hebron Dunbar Rd
Old Bundy Rd
Old Bundy Rd
Ridgeway Ln
McLean Farm Rd
Cemetery Rd
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet
Sheet 13


SEE SHEET 13
Dunbar Rd
Longview Rd
McQuage Farm Rd
McKinnon Farm Rd
Heiron Dunbar Rd
Marlboro County
Leverne Rd
88
Heiron Dunbar Rd
Manning Farm Rd
89
Heiron Dunbar Rd
Manning Farm Rd
SEE SHEET 15
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet
Sheet 14


SEE SHEET 14
SEE SHEET 16
N
Marlboro County
N18
92
93
94
Heyron Dunbar Rd
Hamer Smith Rd
Rogers Farm Rd
Coco Rd E
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 15


SEE SHEET 15
Rogers Farm Rd
Coxe Rd E
Hebron Dunbar Rd
Marlboro County
Norton Cir
Dunbar Hwy
Rogers Rd
4th St
3rd St
SEE SHEET 17
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 16

North Receptors
- Not Impacted
- Impacted
- Measurement Site

Interstate 73
- Bridge
- Edge of Pavement
- Right of Way

Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95

0 500 1,000 2,000 Feet

Sheet 17

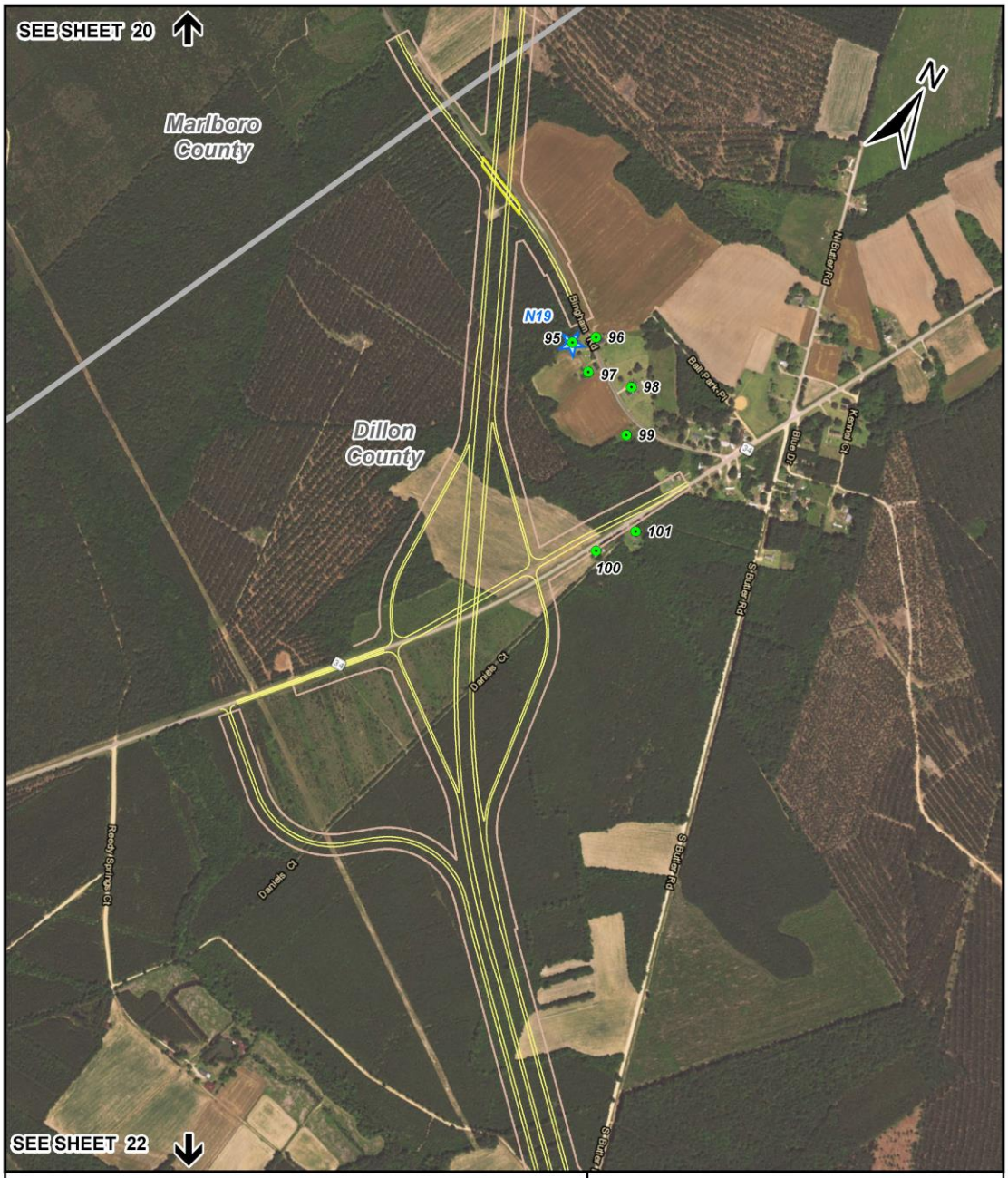

SEE SHEET 17
Firetower Rd
Marlboro County
Firetower Rd
Firetower Rd
SEE SHEET 19
N
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet
Sheet 18


SEE SHEET 18
N
Firetower Rd
Marlboro County
Firetower Rd
SEE SHEET 20
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 19


SEE SHEET 19
N
Firetower Rd
Foxhaven Rd
Foxhaven Rd
Foxhaven Rd
Firetower Rd
Marlboro County
Bingham Rd
Bingham Rd
Dillon County
SEE SHEET 21
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 20


SEE SHEET 20
Marlboro County
Dillon County
N19
95
96
97
98
99
100
101
Daniels Ct
Reedy Springs Ct
Daniels Ct
S Bethea Rd
N Bethea Rd
Ball Park Pl
Kensel Ct
Bethea Dr
Bingham Rd
S Bethea Rd
SEE SHEET 22
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 21

North Receptors
- Not Impacted
- Impacted
- Measurement Site

Interstate 73
- Bridge
- Edge of Pavement
- Right of Way

Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95

0 500 1,000 2,000 Feet

Sheet 22


SEE SHEET 22
N
Dillon
County
Centerville Rd
Centerville Rd
Reedy Creek Rd
SEE SHEET 24
N20
102
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet

Sheet 23


SEE SHEET 23
N20
102
103
104
Dillon County
Bay Catfish Rd
Catfish Church Rd
N
North Receptors
Not Impacted
Impacted
Measurement Site
Interstate 73
Bridge
Edge of Pavement
Right of Way
Receptor Location
South Carolina
Department of Transportation
Interstate 74 to Interstate 95
0
500
1,000
2,000 Feet
Sheet 24

IV. FEASIBLE AND REASONABLE CONSIDERATION OF ABATEMENT

North Carolina

Approximately 5 miles of the proposed I-73 is located in North Carolina at its northern terminus with I-74. As a result, the NCDOT impact criteria as well as the feasibility and reasonableness criteria was applied to predicted impacted receivers.

NCDOT applies the same absolute NAC approach criteria as SCDOT (66 dBA approach criteria for residential land uses, for example). The NCDOT Substantial Increases Noise Impact Criteria is different than SCDOT's 15 dBA (or greater) criteria over existing conditions, however. NCDOT uses a graduated increase impact scale based on the existing sound levels as shown below. This criteria was applied in Table 4 for NC receivers 1-33.

NCDOT Substantial Increase Noise Impact Criteria	
Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))	
Existing Noise Level[1] ($L_{eq(h)}$)	**Predicted Design Year Noise Level Increase[2] ($L_{eq(h)}$)**
50 or less	15 or more
51	14 or more
52	13 or more
53	12 or more
54	11 or more
55 or more	10 or more

[1] Loudest hourly equivalent noise level from the combination of natural and mechanical sources and human activity usually present in a particular area.

[2] Predicted hourly equivalent Design Year traffic noise level minus existing noise level.

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 Rights-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 project and would not be cost effective, but could be revisited during final design.

D. Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development

Adequate property is not available to create an effective buffer zone between the proposed roadway and the impacted receivers.

E. Noise insulation of public use or nonprofit institutional structures

No public use or nonprofit institutional structures would be impacted by the proposed project.

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. For this study, an earthen berm was ruled out since there is not enough room for proper sloping. Drainage and safety line-of-sight may also be an issue.

Based on the need for a barrier to be continuous and to protect a dense concentration of receivers, it is typically not considered reasonable to provide abatement for single impacted receivers or on non-controlled access facilities where access and safety requirements would impact the barrier placement. The proposed I-73 highway is a controlled facility.

When traffic noise impacts are identified and noise abatement is warranted, noise abatement measures shall be considered and evaluated for feasibility and reasonableness. All of the following conditions must be met in order for noise abatement to be justified and incorporated into project design, as applicable. Failure to achieve any single element of feasibility or reasonableness will result in the noise abatement measure being deemed not feasible or not reasonable, whichever applies.

1. Feasibility:

a. Any receiver that receives a minimum noise level reduction of 5 dBA due to noise abatement measures shall be considered a benefited receiver. Noise reduction of five dB(A) must be achieved for at least one impacted receiver.

b. Engineering feasibility of the noise abatement measure(s) shall consider adverse impacts created by or upon property access, drainage, topography, utilities, safety, and maintenance requirements.

2. Reasonableness:

The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure must include:

a. A noise reduction design goal of at least 7 dBA must be evaluated for all front row receivers. At least one benefited front row receiver must achieve the noise reduction design goal of 7 dBA to indicate the noise abatement measure effectively reduces traffic noise.

b. The maximum allowable base quantity of noise walls and/or earthen berms per benefited receiver shall not exceed 2,500 ft^2 and 7,000 yd^3, respectively. Additionally, an incremental increase of 35 ft^2 for noise walls and 100 yd^3 for earthen berms shall be added to the base quantity per the average increase in dBA between existing and predicted exterior noise levels of all impacted receivers within each noise sensitive area, which is defined as a group of receivers that are exposed to similar noise sources. A base dollar value of $37,500 plus an incremental increase of $525 (as defined above) shall be used to determine reasonableness of buffer zones and noise insulation.

c. Viewpoints of the property owners and residents of all benefited receivers shall be solicited. One owner ballot and one resident ballot shall be solicited for each benefited receiver. Points per ballot shall be distributed in the following weighted manner:

- 3 points/ballot for benefited front row property owners
- 1 point/ballot for all other benefited property owners
- 1 point/ballot vote for all residents

2. Other Considerations:

Prior to CE approval or issuance of a FONSI or ROD, NCDOT shall identify in environmental documents:

a. Noise abatement measures that are feasible and reasonable,

b. Noise impacts for which no abatement appears to be feasible and reasonable;

c. Locations where noise impacts will occur, where noise abatement is feasible and reasonable, and the locations that have no feasible and reasonable abatement.

d. Whether it is "likely" or "unlikely" that noise abatement measures will be installed for each noise sensitive area identified. "Likely" does not mean a firm commitment. The final decision on the installation of the abatement measures shall be made upon completion of the project design, the public involvement process, concurrence with the NCDOT Policy, and FHWA approval.

Barrier 1NC - R20 (NC 38-Louis Breedon Boulevard):

Feasibility:

Acoustic Feasibility: NCDOT noise policy states that any receiver that receives a minimum noise level reduction of 5 dBA due to noise abatement measures shall be considered a benefited receiver. Noise reduction of 5 dBA must be achieved for at least one impacted receiver. This was not achieved for the 1 receiver as the maximum predicted reduction was 2 dBA. This does not meet the NCDOT criteria.

Engineering Feasibility: R20 has direct access to NC 38, a significant traffic noise contributor to the total sound level environment

Reasonableness:

The reasonableness analysis is not applicable since the noise reduction feasibility criteria was not met. No further analysis is required.

Conclusion: Based on the above results, this abatement feature is not feasible.

Barrier 2NC - R23 (Scholl Shankle Rd):

Feasibility:
Acoustic Feasibility: NCDOT noise policy states that any receiver that receives a minimum noise level reduction of 5 dBA due to noise abatement measures shall be considered a benefited receiver. Noise reduction of 5 dBA must be achieved for at least one impacted receiver. This minimum was not achieved and therefore does not meet the NCDOT criteria.

Engineering Feasibility: Since the acoustic feasibility requirement was not met, then the engineering feasibility criteria is not applicable.

Reasonableness:
Noise Reduction Design Goal: Since the feasibility requirement was not met, then the reasonableness criteria is not applicable.

Square-foot Allowance Since the feasibility requirement was not met, then the reasonableness criteria is not applicable.

Public Viewpoints: Since the feasibility requirement was not met, then the reasonableness criteria is not applicable.

Conclusion: Based on the above results, this abatement feature is neither feasible nor reasonable.

Barrier 3NC - R26 (Ghio Road):

Feasibility:
Acoustic Feasibility: NCDOT noise policy states that any receiver that receives a minimum noise level reduction of 5 dBA due to noise abatement measures shall be considered a benefited receiver. Noise reduction of 5 dBA must be achieved for at least one impacted receiver. This minimum was achieved and therefore meets the NCDOT criteria.

Engineering Feasibility: No known issues at this time.

Reasonableness:
Noise Reduction Design Goal: NCDOT noise policy states that at least 7 dBA must be achieved for 1 first-row receiver. This was achieved and meets the NCDOT criteria.

Square-foot Allowance: An optimized sound barrier with a total area of 57,017 square feet is predicted to benefit 1 receiver. The 57,017 square feet per benefit is more than the maximum allowable 3,130 square feet per benefit (2,500 + (35 x 18 dBA average increase)). The analyzed feature does not meet the NCDOT criteria.

Public Viewpoints: The public involvement process is not applicable since the analyzed feature does not meet the NCDOT noise policy criteria.

Conclusion: Based on the above results, this abatement feature is feasible but not reasonable.

Barrier 4NC - R27, 28 (Ghio Road):

Feasibility:
Acoustic Feasibility: NCDOT noise policy states that any receiver that receives a minimum noise level reduction of 5 dBA due to noise abatement measures shall be considered a benefited receiver. Noise reduction of 5 dBA must be achieved for at least one impacted receiver. This minimum was achieved and therefore meets the NCDOT criteria.

Engineering Feasibility: No known issues at this time.

Reasonableness:
Noise Reduction Design Goal: NCDOT noise policy states that at least 7 dBA must be achieved for 1 first-row receiver. This was achieved and meets the NCDOT criteria.

Square-foot Allowance: An optimized sound barrier with a total area of 25,173 square feet is predicted to benefit 2 receivers. The 12,586 square feet per benefit is more than the maximum allowable 3,323 square feet per benefit (2,500 + (35 x 23.5 dBA average increase)). The analyzed feature does not meet the NCDOT criteria.

Public Viewpoints: The public involvement process is not applicable since the analyzed feature does not meet the NCDOT noise policy criteria.

Conclusion: Based on the above results, this abatement feature is feasible but not reasonable.

Barrier 5NC – R30 (Quicktown Road):

Feasibility:
Acoustic Feasibility: NCDOT noise policy states that any receiver that receives a minimum noise level reduction of 5 dBA due to noise abatement measures shall be considered a benefited receiver. Noise reduction of 5 dBA must be achieved for at least one impacted receiver. This minimum was achieved and therefore meets the NCDOT criteria.

Engineering Feasibility: This barrier was modeled traversing under the Quicktown Road overpass. If this barrier were to be carried forward, then it could possibly be constructed into the overpass's retaining wall and/or conceivably be considered as two separate barriers that would likely not meet the feasibility and/or reasonableness requirements. No other known issues at this time.

Reasonableness:
Noise Reduction Design Goal: NCDOT noise policy states that at least 7 dBA must be achieved for 1 first-row receiver. This was achieved and meets the NCDOT criteria.

Square-foot Allowance: An optimized sound barrier with a total area of 9,652 square feet is predicted to benefit 1 receiver. The 9,652 square feet per benefit is more than

the maximum allowable 3,270 square feet per benefit (2,500 + (35 x 22 dBA average increase)). The analyzed feature does not meet the NCDOT criteria.

Public Viewpoints: The public involvement process is not applicable since the analyzed feature does not meet the NCDOT noise policy criteria.

Conclusion: Based on the above results, this abatement feature is feasible but not reasonable.

South Carolina

Since there are receivers that would be impacted by noise from the Design Year Build Alternative in South Carolina, then abatement measures were considered for the proposed project.

When considering noise abatement measures, primary consideration shall be given to exterior areas where frequent human use occurs. Since South Carolina is not part of the FHWA-approved Quiet Pavement Pilot Program, the use of quieter pavements was not considered as an abatement measure for the proposed project. In addition, the planting of vegetation or landscaping was also 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 Rights-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 project and would not be cost effective, but could be revisited during final design.

D. Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development
Adequate property is not available to create an effective buffer zone between the proposed roadway and the impacted receivers.

E. Noise insulation of public use or nonprofit institutional structures
No public use or nonprofit institutional structures would be impacted by the proposed project.

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. For this study, an earthen berm was ruled out since there is not enough room for proper sloping. Drainage and safety line-of-sight may also be an issue.

Based on the need for a barrier to be continuous and to protect a dense concentration of receivers, it is typically not considered reasonable to provide abatement for single impacted receivers or on non-controlled access facilities where access and safety requirements would impact the barrier placement. The proposed I-73 highway is a controlled facility.

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:

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.

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. Completion of a "Feasibility and Reasonableness Worksheet" is required for inclusion in the noise analysis report.

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.

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. This allowable cost will be reanalyzed every 5 years.

During the detailed 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 – 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 method of obtaining the votes shall be determined on a project-by-project basis, but may include flyers, door-to-door surveys, a public meeting, or a mailing. 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. One owner ballot and one resident ballot shall be solicited for each benefited receiver.

Home owner associations or local governments cannot be given authority over the desirability for abatement. The viewpoints of the abatement must be solicited from the property owners and tenants.

Note: Barriers numbered 2SC (R39/40), 4SC (R44), 4ASC (R45), 5 (R47), 6 (R50), 7SC (R51), 8SC (R52/R54), 9SC (R55), 10 (R57), 11 (R60), 12 (R69), 13 (R71), 14 (R82), 15 (R93) and 16SC (R102/103) are not included in the mitigation analysis since the receivers impacted in those locations included isolated receivers with either one or two receivers which were globally addressed (Barrier 1SC or Barrier 3SC analysis discussion, as applicable) and analyzed to reduce the report size by deleting the repetitive analysis and conclusions for isolated one and two receiver sites. The barrier numbers were not renumbered to maintain continuity with the already completed SCDOT Feasible and Reasonable Worksheets.

Barrier 1SC – R33A (Beards Road): this is a single isolated receiver. Typically, a single isolated receiver will likely meet the feasibility requirement, but not the cost reasonableness requirement. In order to avoid numerous single isolated receiver analyses, this barrier was modeled as an example run for other isolated receivers as identified in the Conclusion paragraph of this barrier analysis.

Feasibility:

Acoustic Feasibility: SCDOT noise policy states that a noise reduction of at least 5 dBA must be achieved for 75 percent of the impacted receivers. This was achieved for 1 of the 1 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that at least 8 dBA must be achieved for 80 percent of the benefited receivers. There was 1 of the 1 benefited receiver that achieved the 8 dBA reduction (100%). This meets the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed not to be reasonable as the estimated cost per benefited receiver exceeded the SCDOT allowable cost ($30,000) per benefitted receiver. (~$1,526,120 / 1 benefited receiver = $1,526,120).

Public Viewpoints: The public involvement process is not applicable since the analyzed feature does not meet the SCDOT noise policy criteria.

Conclusion: Based on the above results, this abatement feature is feasible but not reasonable. This analysis is also applicable to single isolated receptors R44, R47, R50, R51, R55, R57, R60, R68, R71, R82 and R93.

Barrier 3SC – R35 (Old Wire Road East): this is an isolated impacted receiver with a nearby non-impacted receiver located farther from the proposed highway. Typically, two isolated receivers may meet the feasibility requirement, but not the cost reasonableness requirement. In order to avoid numerous isolated receiver analyses, this barrier was modeled as an example run for other isolated receivers as will be identified later in this section.

Feasibility:
Acoustic Feasibility: SCDOT noise policy states that a noise reduction of at least 5 dBA must be achieved for 75 percent of the impacted receivers. This was achieved for 2 of the 2 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver.

Engineering Feasibility: No known issues at this time.

Reasonableness:
Noise Reduction Design Goal: SCDOT noise policy states that at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 1 of the 2 benefited receivers that achieved the 8 dBA reduction (50%). This did not meet the SCDOT allowable percentage (80%) of the benefitted receivers, even at the maximum 25 foot SCDOT barrier height.

Cost Effectiveness: The cost effectiveness analysis is not applicable since the noise reduction design goal was not met.

Conclusion: Based on the above results, this abatement feature is feasible but not reasonable. This analysis is also applicable to two isolated receptor conditions (with one or two impacts) near receptors R39/R40, R52/R54, R69/R70 and R102/R103.

Overall, as a result of the mitigation analysis, there were no feasible and reasonable solutions to mitigate for the noise according to the SCDOT noise policy. Therefore, there are no analyzed noise barriers that are proposed to be carried forward to the construction phase. The primary reason for the lack of mitigation to be forwarded to the construction phase is the sparsity of development throughout the entire rural project corridor. Essentially, there were not enough potentially benefited homes to meet the SCDOT noise reduction design goal and/or the SCDOT criteria for cost reasonableness.

Consequently, there are no figures included to show proposed noise barriers to be carried forward and there are no tables showing insertion losses for impacted receivers. Appendix D shows the Feasibility and Reasonableness Worksheets. The TNM models (submitted to SCDOT on CD) include the barrier analyses that were used to determine feasibility and reasonableness.

Overall, as a result of the mitigation analysis, there were no feasible and reasonable solutions to mitigate for the noise according to the NCDOT noise policy. Therefore, there are no analyzed noise barriers that are proposed to be carried forward to the construction phase. The primary reason for the lack of mitigation to be forwarded to the construction phase is the sparsity of development throughout the entire rural project corridor. Essentially, there were not enough potentially benefited homes to meet the NCDOT noise reduction design goal and/or the NCDOT criteria for reasonableness.

Consequently, there are no figures included to show proposed noise barriers to be carried forward and there are no tables showing insertion losses for impacted receivers. Appendix D shows the NCDOT Feasibility and Reasonableness Worksheets. The TNM models (submitted to NCDOT on CD through SCDOT) include the barrier analyses that were used to determine feasibility and reasonableness.

Please note that this analysis was performed with a conceptual design for reevaluation purposes. At this time, there has been no topographic elevation survey. The conceptual design was based off of USGS topo which is only good for 10 foot intervals in most places in South Carolina. The North Carolina section has more detailed contouring and it was applied where applicable. Nonetheless, the cut and fill slopes can change dramatically once the actual elevation data is obtained and may cause some shifts in the final design alignment to avoid impacts. There will also be a value engineering review after the revisions for final design and, subsequently, the design can change again as necessary.

V. FINDINGS AND RECOMMENDATIONS

The modeling results indicated that 26 receivers (all residential) would approach or exceed the NAC criteria and/or meet or exceed the substantial increase criteria for the 2040 design year Build Alternative. (This applies to both SCDOT and NCDOT criteria.) Noise abatement was therefore considered for the proposed project. As a result of the mitigation analysis, there were no feasible and reasonable solutions to mitigate for the noise according to SCDOT or NCDOT noise policy. The primary reason for the lack of mitigation to be forwarded to the construction phase is the sparsity of development throughout the entire rural project corridor. Essentially, there were not enough potentially benefited homes to meet the SCDOT noise reduction design goal and/or the SCDOT criteria for cost reasonableness. In North Carolina, there were also not enough potentially benefited homes to meet the NCDOT noise reduction design goals or the square footage criteria per benefited receiver. As mentioned, Feasibility and Reasonableness Worksheets are included in Appendix D.

Also, please note again that this analysis was performed with a conceptual design for reevaluation purposes. At this time, there has been no topographic elevation survey, the cut and fill slopes can change dramatically and the final design alignment may still be shifted to avoid impacts. There will also be a value engineering review after the revisions for final design and, subsequently, the design can change again as necessary.

VI. CONSTRUCTION NOISE

A. Construction Noise - South Carolina

If the Build Alternative is chosen, 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. The major noise sources from construction would be the heavy equipment operated at the site. However, other construction site noise sources would include hand tools and trucks supplying and removing materials.

Typical noise levels generated by different types of construction equipment are presented in Table 5. Construction operations are typically broken down into several phases including clearing and grubbing, earthwork, erection, paving and finishing. Although these phases can overlap, each has their own noise characteristics and objective.

SCDOT's "2007 Standard Specifications for Highway Construction" includes various references to construction noise, including Sections 107.6-paragraph 3, 606.3.1.6.3-paragraph 1, 607.3.1.6.3-paragraph 1, 607.3.2.6.3-paragraph 1, and 702.4.15-paragraph 3. The SCDOT specifications cited above are generalized for nuisance noise avoidance. Detailed specifications suggested for consideration for inclusion in the proposed project's construction documents may consist of the following:

- Construction equipment powered by an internal combustion engine shall be equipped with a properly maintained muffler.
- Air compressors shall meet current USEPA noise emission exhaust standards.
- Air powered equipment shall be fitted with pneumatic exhaust silencers.
- Stationary equipment powered by an internal combustion engine shall not be operated within 150 feet of noise sensitive areas without portable noise barriers placed between the equipment and noise sensitive sites. Noise sensitive sites include residential buildings, motels, hotels, schools, churches, hospitals, nursing homes, libraries and public recreation areas.
- Portable noise barriers shall be constructed of plywood or tongue and groove boards with a noise absorbent treatment on the interior surface (facing the equipment).
- Powered construction equipment shall not be operated during the traditional evening and/or sleeping hours within 150 feet of a noise sensitive site, to be decided either by local ordinances and/or agreement with the SCDOT.

Table 5 -
Leq Noise Level (dBA) at 50 Feet for Construction Equipment

Equipment	dBA Leq @ 50 feet
Earth Moving:	
Front Loader	79
Back Hoe	85
Dozer	80
Tractor	80
Scraper	88
Grader	85
Truck	91
Paver	89
Materials Handling:	
Concrete Mixer	85
Concrete Pump	82
Crane	83
Derrick	88
Stationary:	
Pump	76
Generator	78
Compressor	81
Impact:	
Pile Driver	100
Jackhammer	88
Rock Drill	98
Other:	
Saw	78
Vibrator	76
SOURCE: Grant, Charles A. and Reagan, Jerry, A., *Highway Construction Noise: Measurement, Prediction and Mitigation.*	

B. Construction Noise - North Carolina

The dominant construction activities associated with this project are expected to be activities associated with construction of the highway, the ramps, overpass bridges and frontage/local roads. Temporary and localized construction noise increases may occur (refer to Table 6). During daytime hours (7:00 a.m. – 8:30 p.m.), the effects of these impacts may be temporary speech interference for passers-by and those working near the project. During evening/nighttime hours (8:30 p.m. – 7:00 a.m.), if applicable, steady-state construction noise emissions may be audible. Sporadic evening and nighttime construction equipment noise emissions such as from backup alarms, lift gate closures (slamming of dump truck gates), etc., may be perceived as distinctly louder than the typical ambient noise environment.

Extremely loud construction noise activities such as usage of pile-drivers and impact-hammers (jack hammer, hoe-ram) will provide sporadic and temporary construction noise impacts in the vicinity of those activities (refer to Table 6). It is the recommendation of this report that construction activities that will produce extremely loud noises be scheduled during times of the day when such noises will create as minimal a disturbance as possible.

Generally, low-cost and easily implemented construction noise control measures should be incorporated into the project plans and specifications. These measures include, but are not limited to: work-hour limits; exhaust muffler requirements; haul-road locations; elimination of tailgate banging; ambient-sensitive backup alarms; construction noise complaint mechanisms; and consistent and transparent community communication.

While discrete construction noise level prediction is difficult for a particular receiver or group of receivers, it can be assessed in a general capacity with respect to distance from known or likely project activities. Although construction noise impact mitigation should not place an undue burden upon the financial cost of the project or the project construction schedule, pursuant to the requirements of 23 CFR 772.19, it is the recommendation of this analysis that:

- Earth removal, grading, hauling, and paving activities should be limited to weekday daytime hours.
- If meeting the project schedule requires that earth removal, grading, hauling and/or paving must occur during evening, nighttime and/or weekend hours, the Contractor shall notify the local governments as soon as possible. In such instance(s), all reasonable attempts shall be made to notify and make appropriate arrangements for the mitigation of the predicted construction noise impacts upon the affected property owners and/or residents.
- If construction noise activities must occur during context-sensitive hours, discrete construction noise abatement measures including, but not limited to portable noise barriers and/or other equipment-quieting devices shall be considered.
- Some construction activities may create extremely noticeable noise increases. It is the recommendation of this analysis that considerations be made to reduce or avoid evening and/or nighttime periods and for all weekend hours in which these construction activities might occur.

For additional information on construction noise, please refer to the FHWA Construction Noise Handbook (FHWA-HEP-06-015) and the “Roadway Construction Noise Model” (RCNM), both available online at: http://www.fhwa.dot.gov/environment/noise/cnstr_ns.htm.

Table 6 – NC Construction Equipment Typical Noise Level Emissions

(Copied from NCDOT noise report)

Construction Equipment Typical Noise Level Emissions[1]	
Equipment	**Noise Level Emissions (dB(A)) at 50 Feet From Equipment[2]**
	70 80 90 100
Pile Driver[3]	
Jack Hammer	
Tractor	
Road Grader	
Backhoe	
Truck	
Paver	
Pneumatic Wrench	
Crane	
Concrete Mixer	
Compressor	
Front-End Loader	
Generator	
Saws	
Roller (Compactor)	

1. Adapted from *Noise Construction Equipment and Operations, Building Equipment, and Home Appliances*. U.S. Environmental Protection Agency. Washington D.C. 1971.
2. Cited noise level ranges are typical for the equipment cited. Noise energy dissipates as a function of distance between the source and the receptor. For example, if the noise level from a pile driver at a distance of 50 feet = 100 decibels (dB(A)), then at 400 feet, it might be 82 decibels (dB(A)) or less.
3. Due to project safety and potential construction noise concerns, pile driving activities are typically limited to daytime hours.

VII. COORDINATION WITH LOCAL OFFICIALS

A. Noise Compatible Land Use – South Carolina

SCDOT has no authority over local land use planning and development. SCDOT can only encourage local officials and developers to consider highway traffic noise in the planning, zoning and development of property near existing and proposed highway corridors. The lack of consideration of highway traffic noise in land use planning at the local level has added to the highway traffic noise problem which will continue to grow as development continues adjacent to major highway long after these highways were proposed and/or constructed.

In order to help local officials and developers consider highway traffic noise in the vicinity of proposed Type I project, SCDOT will inform them of the predicted future noise levels and the required distance from such projects needed to ensure that noise levels remain below the NAC for each type of land use. The contour distances to the 66 and 71 dBA sound levels are shown in Table 7. Please note that the values in the table do not represent predicted levels at every location at a particular distance back from the roadway. Sound levels will vary with changes in terrain and will be affected by the shielding of objects such as buildings and tree zones.

B. Noise Compatible Land Use – North Carolina

One of the most effective means to prevent future traffic noise impacts is noise-sensitive land-use development. The compatibility of highways and neighboring local areas is essential for continued growth, and can be achieved if local governments and developers require and practice noise-sensitive land-use planning.

Although regulation of land use is not within the purview of FHWA or NCDOT, some widely accepted techniques for noise-sensitive land use planning in the vicinity of existing and proposed highway facilities include:

- Locating commercial, industrial, recreational, and other noise-compatible land-uses adjacent to highways
- Incorporating effective traffic noise mitigating features, such as earth berms and solid-mass noise walls, as part of residential developments
- Utilization of noise-sensitive architectural design and site planning, such as the orientation of quiet spaces away from roadways
- Required use of sound insulating building materials and construction methods

As indicated in the July 2011 NCDOT Traffic Noise Abatement Policy, local jurisdictions with zoning control should use the information contained in this report to develop policies and/or ordinances to limit the growth of noise-sensitive land uses located adjacent to roadways. Furthermore, NCDOT encourages the dissemination of this information to all people who may be affected by, or who might influence others affected by, traffic noise.

Table 7 - Contour Distances (dBA) for I-73

NAC Land Use	Impact Contour	Worst-Case Approximate Distances from Nearest Travel Lane Centerline	
Category B & C (Residential, outdoor recreation facilities, churches, schools, hospitals, etc.)	66 dBA	South Carolina	320
		North Carolina	310
Category E (Hotels, motels, offices, restaurants/bars, and other developments/activities not included in the other NAC's.)	71 dBA	South Carolina	185
		North Carolina	180
SOURCE: Michael Baker International, October, 2016.			

APPENDIX A

Traffic Data

TNM Traffic Data – I-73						
DESIGN YEAR BUILD 2040						
	I-74 to Ghio (beginning)		**Ghio to SC 79**		**SC 79 to US 15**	
AADT	27,846		27,141		28,926	
DHV factor	10%		10%		10%	
PEAK	2,785		2,714		2,893	
Speed	70 mph		70 mph		70 mph	
Lane Width	4 lanes @ 12 feet		4 lanes @ 12 feet		4 lanes @ 12 feet	
Directional Split	50/50		50/50		50/50	
	Northbound (per lane)	Southbound (per lane)	Northbound (per lane)	Southbound (per lane)	Northbound (per lane)	Southbound (per lane)
Autos	503	503	487	487	533	533
Medium Trucks	42	42	41	41	40	40
Heavy Trucks	151	151	150	150	150	150

	US 15 to SC 9		**SC 9 to SC 381**	
AADT	28,937		30,713	
DHV factor	10%		10%	
PEAK	2,894		3,071	
Speed	70 mph		70 mph	
Lane Width	4 lanes @ 12 feet		4 lanes @ 12 feet	
Directional Split	50/50		50/50	
	Northbound (per lane)	Southbound (per lane)	Northbound (per lane)	Southbound (per lane)
Autos	541	541	576	576
Medium Trucks	39	39	41	41
Heavy Trucks	144	144	151	151

	SC 384 to SC 34		**SC 34 to I-95 (end)**	
AADT	31,106		30,322	
DHV factor	10%		10%	
PEAK	3,111		3,032	
Speed	70 mph		70 mph	
Lane Width	4 lanes @ 12 feet		4 lanes @ 12 feet	
Directional Split	50/50		50/50	
	Northbound (per lane)	Southbound (per lane)	Northbound (per lane)	Southbound (per lane)
Autos	587	587	570	570
Medium Trucks	41	41	39	39
Heavy Trucks	151	151	149	149

Note1: I-73 is a new alignment highway. As a result, there are no existing and design year build volumes.
Note2: Cross-streets and ramp volumes, as applicable, are provided in the submitted TNM computer model files.

APPENDIX B

Field Measurement Data Sheets

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.2 dB END 94.2 dB

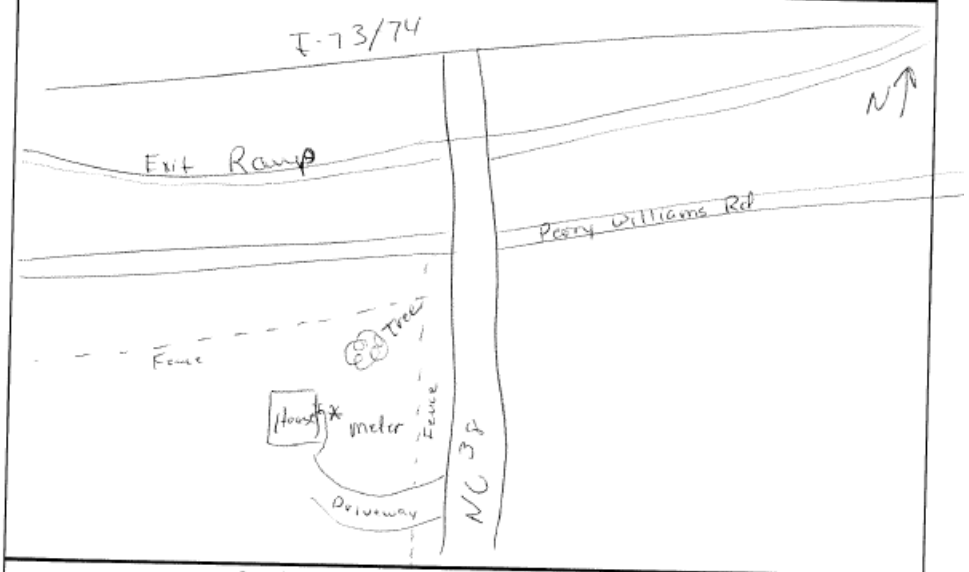
RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: 69° Sunny NNE 2mph

TRAFFIC DATA		
ROAD	NB	SB
AUTOS	67	61
MED TRKS	5	1
HVY TRKS	4	10
DURATION	20	20

DATE: 10/25/16
SITE #: N1
START: 3:46 PM
END: 4:25 PM
LEQ: 61.6
SPEED: 55

SITE SKETCH



BACKGROUND NOISE Birds, Insects
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS Rooster @ 8:45 & 18:18
OTHER NOTES Paused @ 18 min to talk to prop. owner

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.2 dB END 94.2 dB

RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

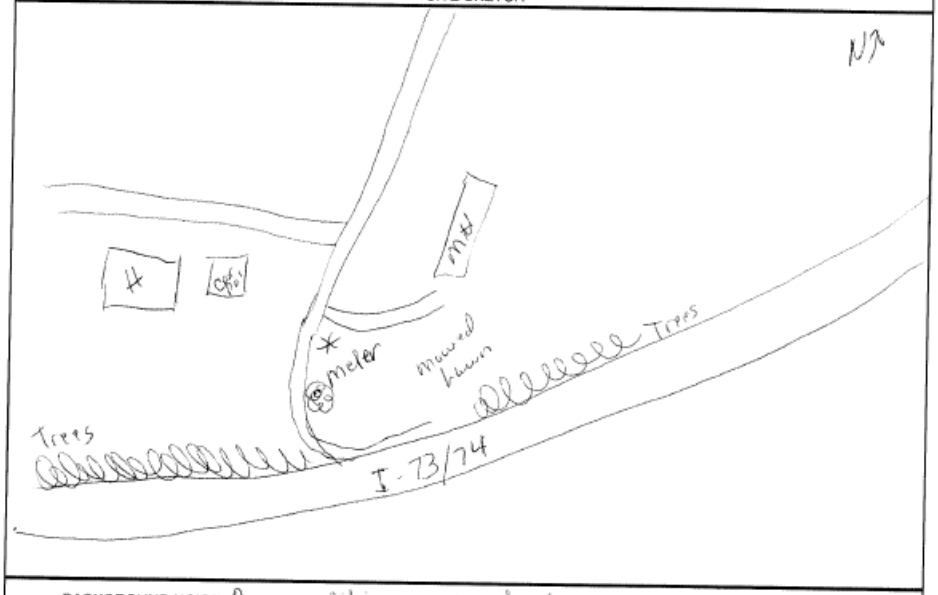
WEATHER DATA: 68° Sunny N 3mph

TRAFFIC DATA		
ROAD		
AUTOS		
MED TRKS		
HVY TRKS		
DURATION		

DATE: 10/25/16
SITE #: N3
START: 4:32 PM
END: 4:52 PM
LEQ: 51.5
SPEED: 70mph

No counts; roadway not visible

SITE SKETCH



BACKGROUND NOISE Air conditioner; Dog barking; birds
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS
OTHER NOTES

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.2 dB END 94.2 dB

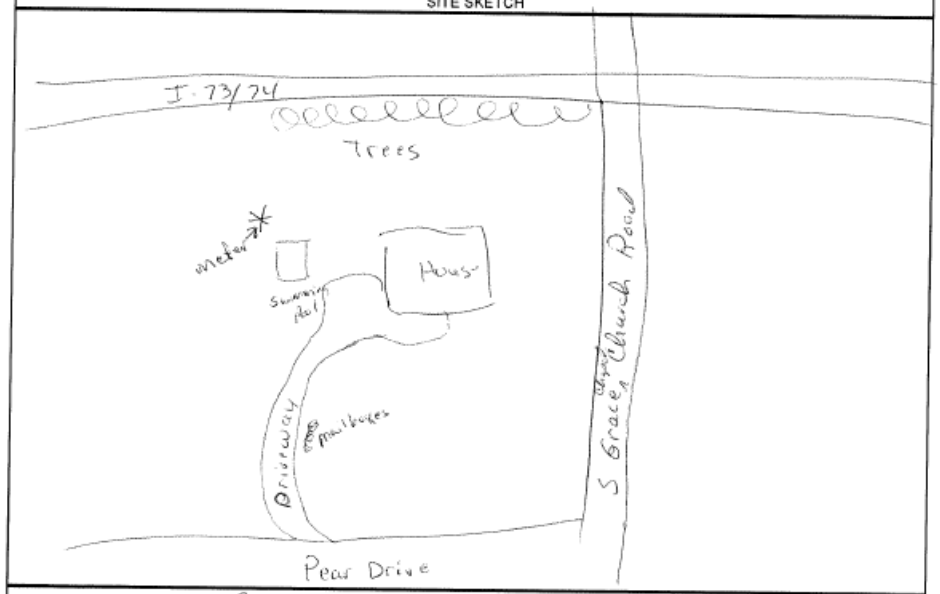
RESPONSE: FAST _____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: 71° Sunny E 10 mph

TRAFFIC DATA			
ROAD	I 73/74 WB	I 73/74 EB	SG CC 28
AUTOS	96	108	9
MED TRKS	2	7	
HVY TRKS	15	15	
DURATION	20	20	

DATE: 10/25/16
SITE #: 13
START: 5:06
END: 5:25
LEQ: 56.9
SPEED: 70 / 55

SITE SKETCH



BACKGROUND NOISE Birds, Insects.
MAJOR SOURCES Vehicles on I-73/74
UNUSUAL EVENTS _____
OTHER NOTES _____

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.2 dB END 94.2 dB

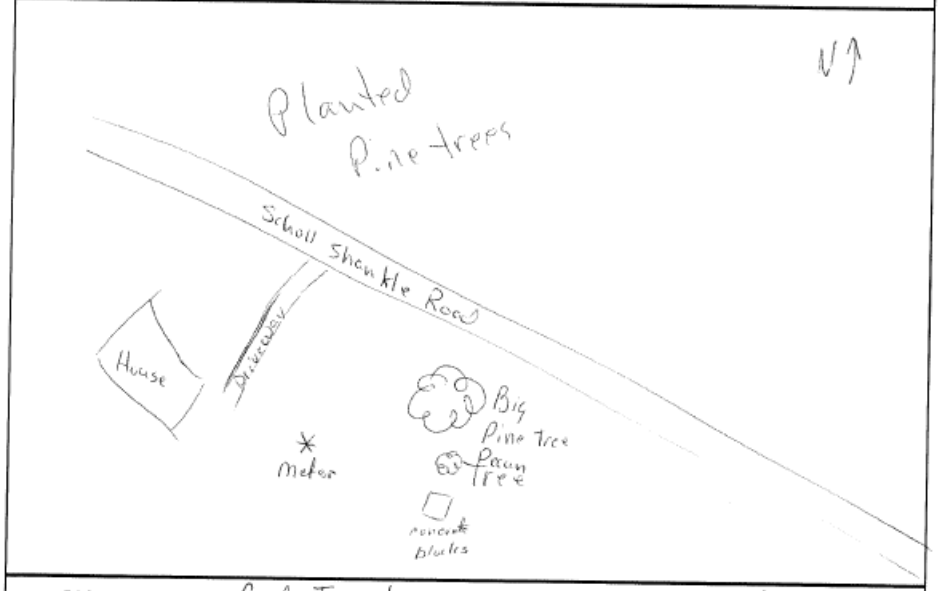
RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: 70° Sunny E 9 mph

TRAFFIC DATA		
ROAD	NWB	SEB
AUTOS	0	1
MED TRKS	6	0
HVY TRKS	0	0
DURATION	20	20

DATE: 10/25/16
SITE #: N4
START: 5:48 PM
END: 6:07 PM
LEQ: 50.7
SPEED: 55

SITE SKETCH



BACKGROUND NOISE Birds, Insects; Train horn; Woodpecker; dog barking
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS Dog dragging chain @ 5:07, Air conditioner @ 9:30
OTHER NOTES Paused @ 6:34 to talk to property owner
airplane @ 10:43

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.2 dB END 94.2 dB

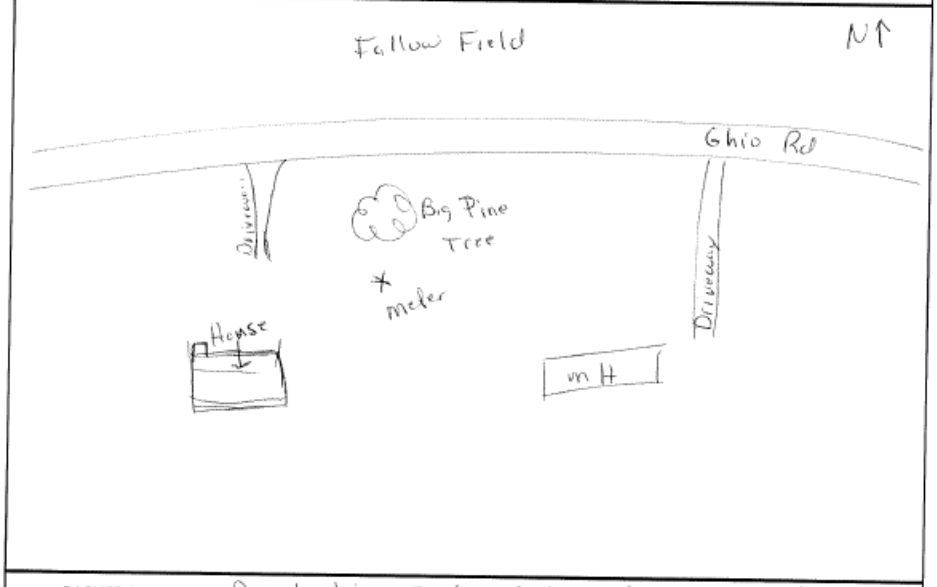
RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: 65° Sunny E 1 mph

TRAFFIC DATA		
ROAD	WB	EB
AUTOS	1	5
MED TRKS	0	0
HVY TRKS	0	0
DURATION	20	20

DATE: 10/25/16
SITE #: N5
START: 6:15 pm
END: 6:35 PM
LEQ: 46.4
SPEED: 55

SITE SKETCH



BACKGROUND NOISE Dogs barking; Insects; Vehicles on other roadway; Jet overhead radio
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS
OTHER NOTES

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.2 dB END 94.2 dB

RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

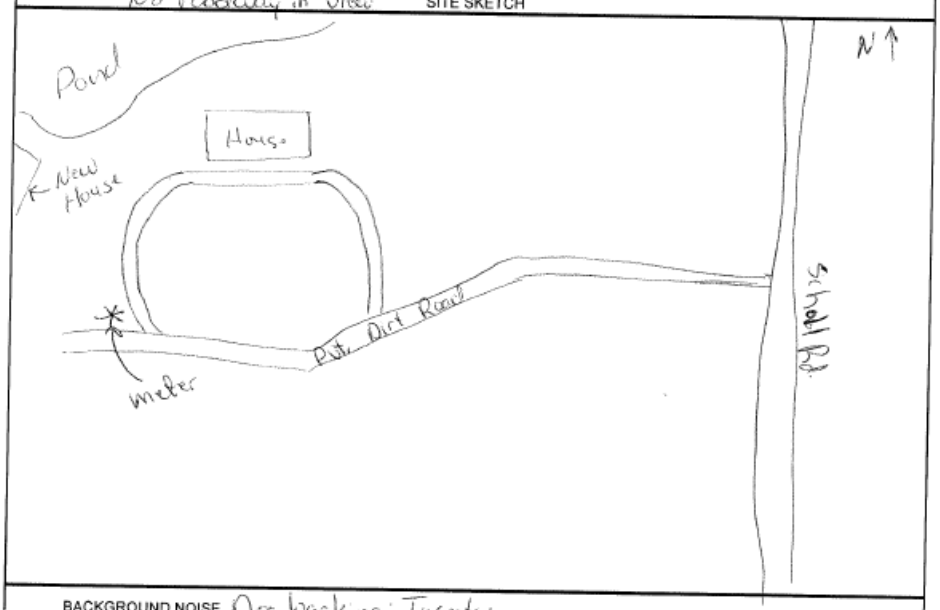
WEATHER DATA: ____

TRAFFIC DATA		
ROAD		
AUTOS		
MED TRKS		
HVY TRKS		
DURATION		

DATE: 10/25/16
SITE #: N6
START: 6:50
END: 7:10
LEQ: 51.4
SPEED: —

No Counts
No roadway in view

SITE SKETCH



BACKGROUND NOISE Dog barking; Insects;
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS Car door @ 0:30
OTHER NOTES ____

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.2 dB END 94.2 dB

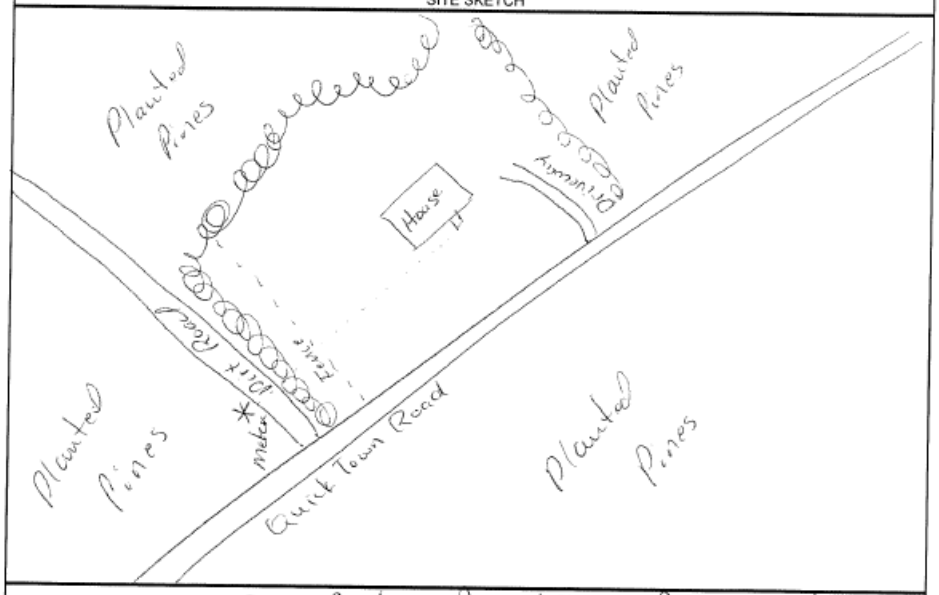
RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: 57° Clear Calm

TRAFFIC DATA		
ROAD	EB	WB
AUTOS	3	3
MED TRKS	0	0
HVY TRKS	0	0
DURATION	20	20

DATE: 10/25/16
SITE #: N7
START: 7:25 PM
END: 7.45 PM
LEQ: 64.2
SPEED: 55

SITE SKETCH



BACKGROUND NOISE Dog Barking, People talking, Plane overhead
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS dog barking non stop
OTHER NOTES Meter even with front steps

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.1 dB END 94.1 dB

RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

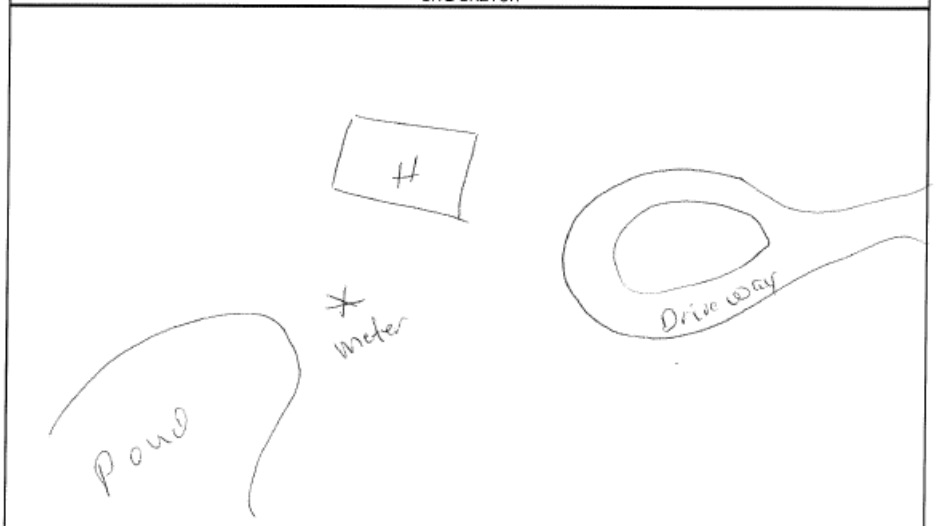
WEATHER DATA: Partly Cloudy 69° 3mph

TRAFFIC DATA		
ROAD		
AUTOS		
MED TRKS		
HVY TRKS		
DURATION		

DATE: 9/27/2016
SITE #: N8
START: 8:53
END: 9:08
LEQ: 44.9
SPEED: n/a

No counts; No roadway in view

SITE SKETCH



BACKGROUND NOISE Crows, crickets, air conditioner, dog barking

MAJOR SOURCES

UNUSUAL EVENTS

OTHER NOTES

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.1 dB END 94.1 dB

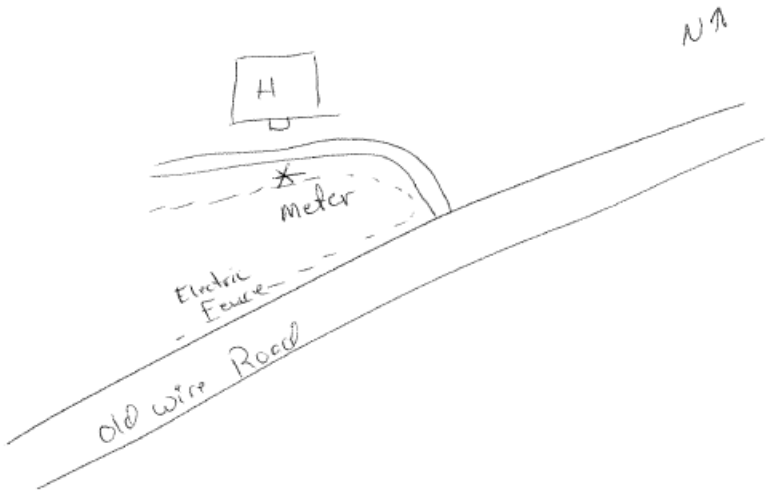
RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: Partly Cloudy 69° 3mph

TRAFFIC DATA		
ROAD	NE	SW
AUTOS	5	0
MED TRKS	0	0
HVY TRKS	0	0
DURATION	15'	15'

DATE: 9/27/2016
SITE #: N9
START: 8:21 Am
END: 8:36 Am
LEQ: 45.0
SPEED: 55

SITE SKETCH



BACKGROUND NOISE Birds, crickets, airplane overhead, Dog barking across on other roads
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS 5:28 Bluejay
OTHER NOTES

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.1 dB END 94.1 dB

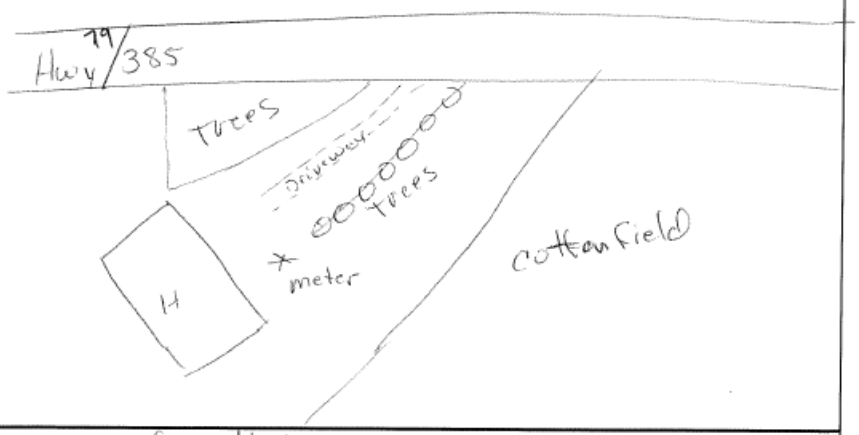
RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: Partly Cloudy, 68°; 2 mph

TRAFFIC DATA		
ROAD	NB	SB
AUTOS	3	9
MED TRKS	0	0
HVY TRKS	0	2
DURATION	15'	15'

DATE: 9/27/2016
SITE #: N10
START: 7:49
END: 8:04
LEQ: 53.4
SPEED: 55 mph

SITE SKETCH



BACKGROUND NOISE Geese Honking, Birds, Crows; Dog barking; Train
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS 10:48 Train 11:05 Train horn 13:53 Train horn
OTHER NOTES ____

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.1 dB END 94.1 dB

RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: Partly Cloudy 69° 2mph

Family Farm Road

TRAFFIC DATA		
ROAD	EB	WB
AUTOS	1	11
MED TRKS	0	0
HVY TRKS	0	0
DURATION	15'	15'

DATE: 9/27/2016

SITE #: N 1

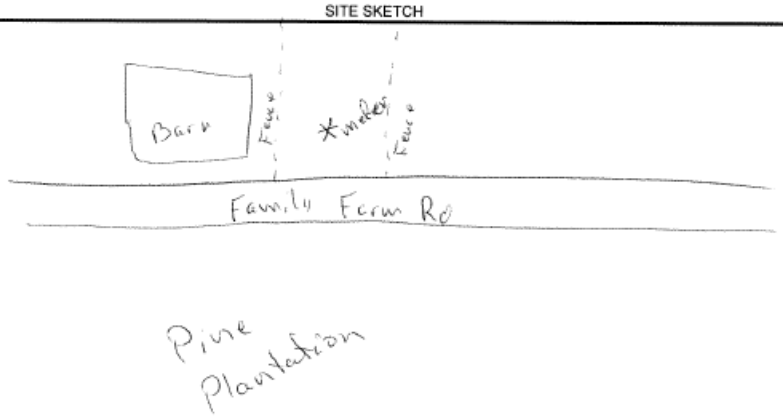
START: 7:18 AM

END: ____

LEQ: 46.1

SPEED: 55

SITE SKETCH



BACKGROUND NOISE Crickets; vehicles on other roadway; birds; car horn

MAJOR SOURCES vehicles on roadway

UNUSUAL EVENTS 5:54 schoolbus

OTHER NOTES ____

Michael Baker Jr., Inc. 2005

Skipped N-12
no one home

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.1 dB END 94.1 dB

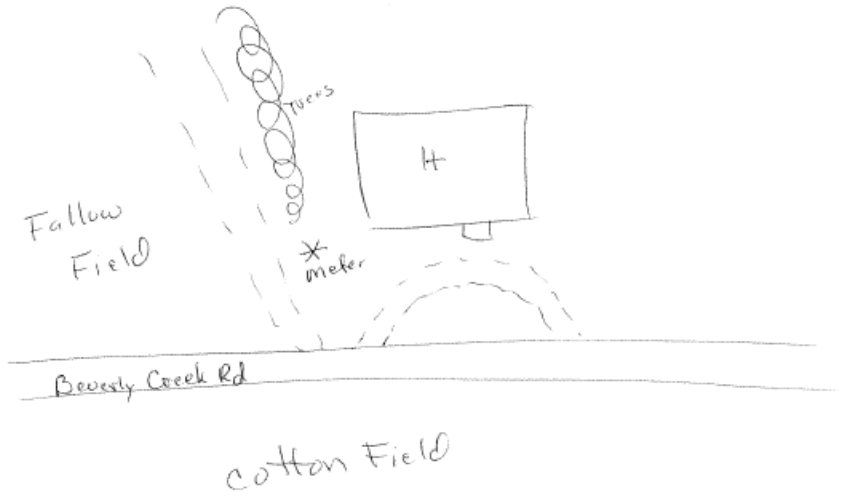
RESPONSE: FAST _____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: Partly Cloudy 78° 3 mph

TRAFFIC DATA		
ROAD	EB	WB
AUTOS	0	6
MED TRKS	0	0
HVY TRKS	0	0
DURATION	15'	15'

DATE: 9/27/2016
SITE #: ~~N12~~ N13
START: 10:21 Am
END: 10:36 AM
LEQ: 53.2
SPEED: 55mph?

SITE SKETCH



BACKGROUND NOISE crickets, Birds, cars on other roadway, Airplane overhead
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS 7:00 Dog Barking, 9:50 Man talking
OTHER NOTES 14:44 airplane

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 93.4 dB END 93.4 dB

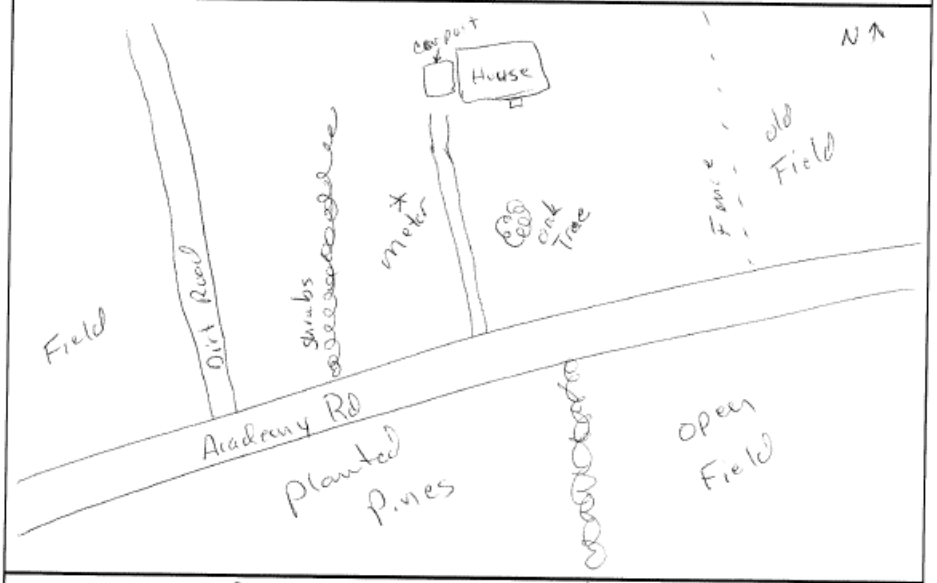
RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: 52° Sunny 2 mph

TRAFFIC DATA		
ROAD	EB	WB
AUTOS	6	10
MED TRKS	0	0
HVY TRKS	0	0
DURATION	15	15

DATE: 10/26/16
SITE #: N14
START: 9:35 Am
END: 9:45 Am
LEQ: 49.7
SPEED: 55?

SITE SKETCH



BACKGROUND NOISE Birds, vehicles on other road
MAJOR SOURCES Vehicles on road
UNUSUAL EVENTS Bluejay @ 10:30
OTHER NOTES

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.1 dB END 94.1 dB

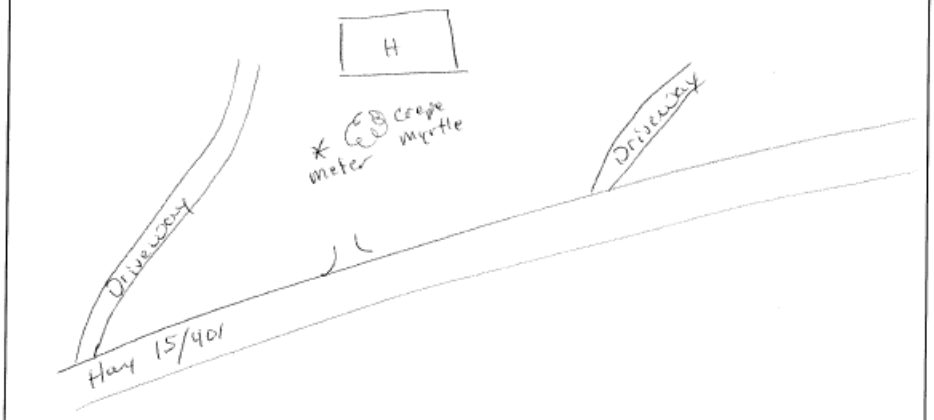
RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: Partly Cloudy 87° 4 mph

TRAFFIC DATA		
ROAD	NB	SB
AUTOS	56	43
MED TRKS	2	0
HVY TRKS	4	4
DURATION	15'	15'

DATE: 9/27/2016
SITE #: N15
START: 4:10 PM
END: 4:25 PM
LEQ: 56.5
SPEED: 55 mph

SITE SKETCH



BACKGROUND NOISE Birds; Wind; Plane overhead; vehicles on other road
MAJOR SOURCES Vehicles on roadway
UNUSUAL EVENTS ____
OTHER NOTES ____

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.1 dB END 94.1 dB

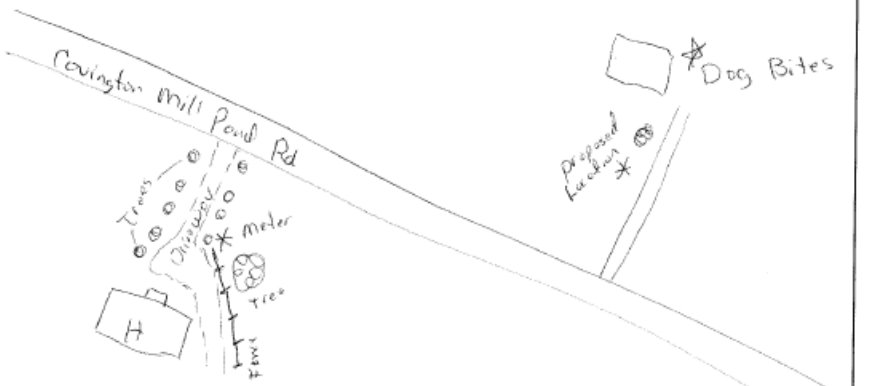
RESPONSE: FAST _____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: Sunny 85° 5mph

TRAFFIC DATA		
ROAD	SE	NW
AUTOS	1	0
MED TRKS	0	0
HVY TRKS	0	0
DURATION	15'	15'

DATE: 9/27/2016
SITE #: N16
START: 4:46 PM
END: 5:01 PM
LEQ: 42.3
SPEED: 55

SITE SKETCH



BACKGROUND NOISE Birds, Squirrels, insects, airplane over head, air condition over
MAJOR SOURCES _____
UNUSUAL EVENTS 10:10 Blue jay
OTHER NOTES moved from east side due to biting dog

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 93.4 dB END 93.4 dB

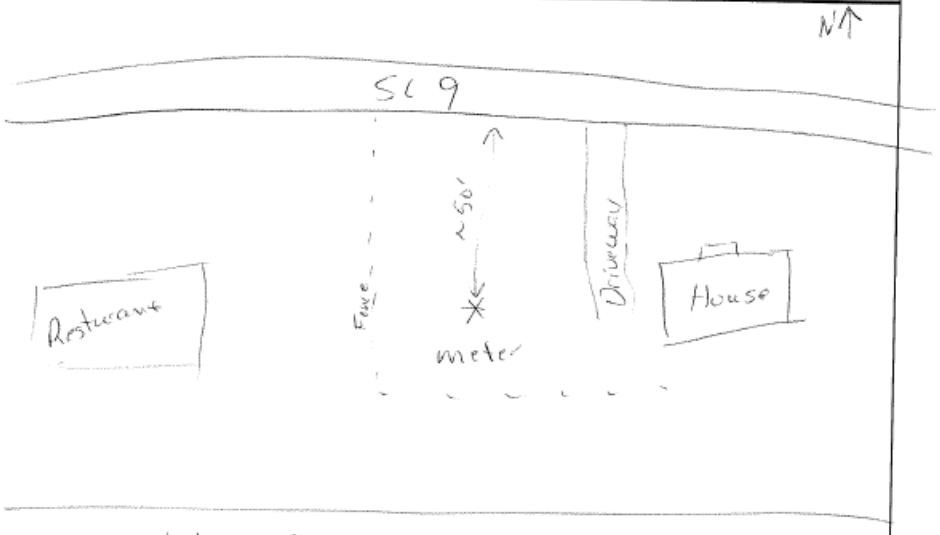
RESPONSE: FAST _____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: 47° Sunny 1mph

TRAFFIC DATA			
ROAD	WB	EB	HDRd
AUTOS	18	15	3
MED TRKS	0	6	0
HVY TRKS	3	0	0
DURATION	15	15	15

DATE: 10/26/16
SITE #: N17
START: ~~8:~~8:50AM
END: 9:08
LEQ: 62.8
SPEED: 55

SITE SKETCH



BACKGROUND NOISE Dog barking; Birds; Cow mooing

MAJOR SOURCES Vehicles on Road

UNUSUAL EVENTS _____

OTHER NOTES Site moved to east side of alignment btween House & Restaurant

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.1 dB END 94.1 dB

RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: Fair; 84° 4 mph

TRAFFIC DATA		
ROAD	SB	NB
AUTOS	8	6
MED TRKS	1	0
HVY TRKS	0	0
DURATION	15'	15'

DATE: 9/27/2016

SITE #: N18

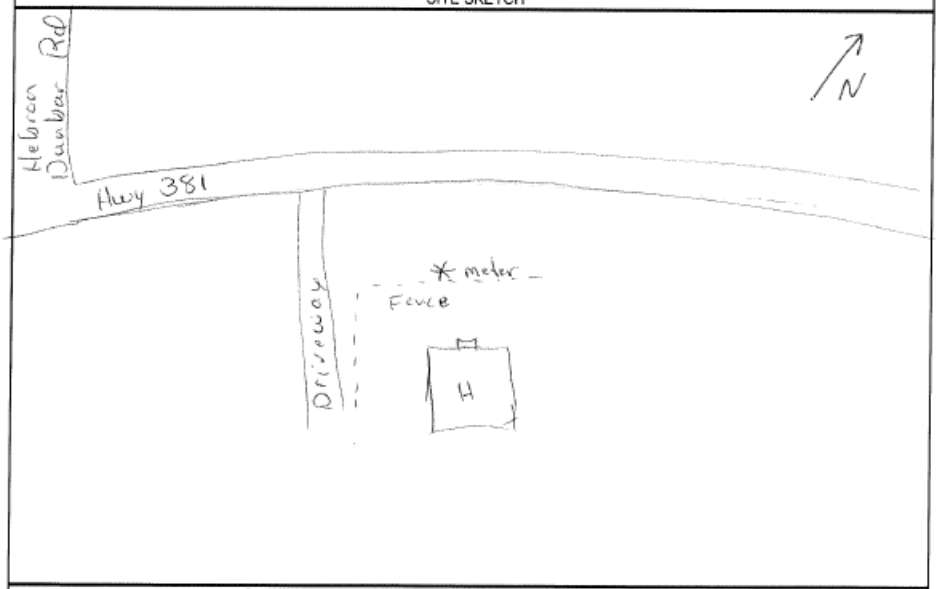
START: 5:46 PM

END: 6:01 PM

LEQ: 56.5

SPEED: 55 mph

SITE SKETCH



BACKGROUND NOISE Birds; tractor; dog barking; vehicles on other road

MAJOR SOURCES Vehicles on roadway

UNUSUAL EVENTS 7:18 Airplane 8:22 jet 9:05 jet

OTHER NOTES Site moved due to no one home

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.1 dB END 94.1 dB

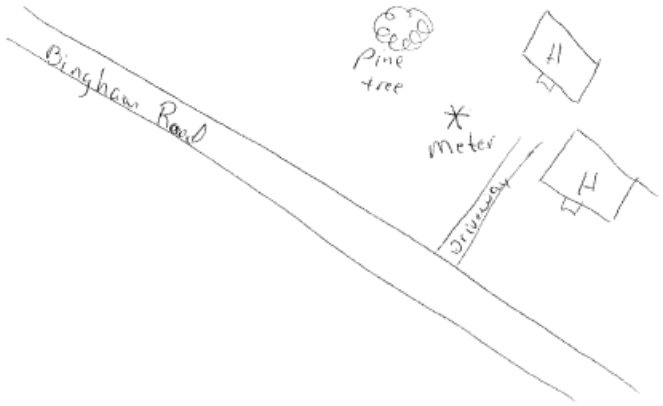
RESPONSE: FAST ____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: Partly Cloudy 82° 1 mph

TRAFFIC DATA		
ROAD	SB	NB
AUTOS	3	0
MED TRKS	0	0
HVY TRKS	0	0
DURATION	15'	15'

DATE: 9/27/2016
SITE #: N19
START: 6:46 PM
END: 7:01 PM
LEQ: 45.7
SPEED: 45? mph

SITE SKETCH



BACKGROUND NOISE Birds, lawn mower, cars on other road, insects; Dogs howlin
MAJOR SOURCES
UNUSUAL EVENTS Jet overhead
OTHER NOTES Site moved because house un-occupied people talking

Michael Baker Jr., Inc. 2005

NOISE SURVEY SHEET

EQUIPMENT: METER Norsonics 132 CALIBRATOR EXTECH 407744

CALIBRATION: START 94.3 dB END 94.3 dB

RESPONSE: FAST _____ SLOW X A-WEIGHTING X BATTERY CHECK X

WEATHER DATA: Sunny 69° 3 mph

TRAFFIC DATA		
ROAD	SB	NB
AUTOS	2	0
MED TRKS	0	0
HVY TRKS	0	0
DURATION	15'	15'

DATE: 9/28/2016

SITE #: N20

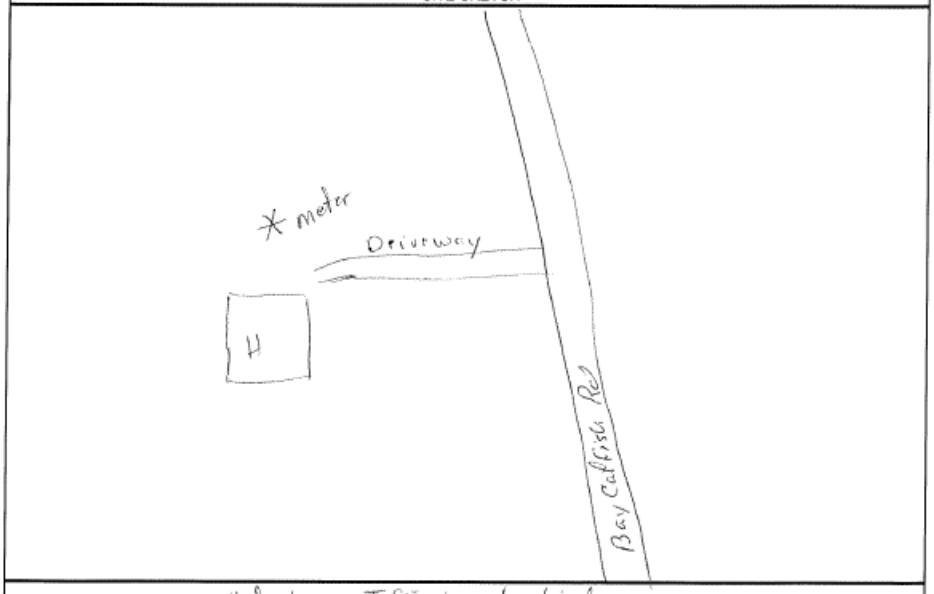
START: 7:08

END: 7:23

LEQ: ~~48.7~~ 45.6

SPEED: 55

SITE SKETCH



BACKGROUND NOISE Vehicles on I-95, insects, birds

MAJOR SOURCES Vehicles on roadway

UNUSUAL EVENTS 5:40 telephone

OTHER NOTES _____

Michael Baker Jr., Inc. 2005

APPENDIX C

TNM Data Files

(Provided on CD to SCDOT/NCDOT)

APPENDIX D

Feasible and Reasonable Worksheets

(SCDOT, followed by NCDOT)

SCDOT Feasibility and Reasonableness Worksheet

Date: February 16, 2017

Project Name I-73: I-95 in Dillon County to SC 22 in Horry County

Highway Traffic Noise Abatement Measure Barrier 1SC - R33A

Feasibility

Number of Impacted Receivers	1	Number of Benefited Receivers	1
Percentage of Impacted Receivers that would achieve a 5 dBA reduction from the proposed noise abatement measure	100		

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.

Detailed Description:

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	1	Number of Benefited Receivers that achieve at least an 8 dBA reduction	1

Percentage of Benefited Receivers 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 must achieve at least a 8 dBA reduction for it to be reasonable. 100

I 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	$1,526,120
Estimated cost per Benefited Receiver	$1,526,120		

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

Based on the above results, this abatement feature is feasible but not reasonable. Additionally, this single isolated receiver calculation was used as the sample mitigation model run for other similar conditions. These results also apply to R44, R47, R50, R51, R55, R57, R60, R68, R71, R82 and R93.

SCDOT Feasibility and Reasonableness Worksheet

Date: February 16, 2017

Project Name I-73: I-95 in Dillon County to SC 22 in Horry County

Highway Traffic Noise Abatement Measure Barrier 3SC - R36

Feasibility

Number of Impacted Receivers: 2

Number of Benefited Receivers: 2

Percentage of Impacted Receivers that would achieve a 5 dBA reduction from the proposed noise abatement measure: 100

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.

Detailed Description:

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	2	Number of Benefited Receivers that achieve at least an 8 dBA reduction	1

Percentage of Benefited Receivers 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 must achieve at least a 8 dBA reduction for it to be reasonable. 50

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	
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

Based on the above results, this abatement feature is feasible but not reasonable. Additionally, this calculation was used as the sample mitigation model run for other similar conditions. These results also apply to two isolated receptor conditions (with one or two impacts) near impacted receptor groups R39/R40, R69/R70, R52/R54 and R102/R103.

PROJECT -	I-73: I-74/Richmond Co., NC to I-95/Dillon Co., SC					TIP # -	R-3421					
LOCATION -	Barrier 1NC - R20					COUNTY(IES) -	Richmond					
# IMPACTS -	1	# BENEFITS -	1	NAC:	A	**B**	C	(CIRCLE ALL THAT APPLY) D	E	F	G	
A.	**FEASIBILITY:**											
1	Can a 5-dB(A) reduction in traffic noise levels be achieved for at least one impacted receptor?							YES		X	NO	
2	Does topography negatively affect the proposed abatement measure?							YES		X	NO	
3	Does the abatement measure negatively affect property access, drainage, safety and maintenance requirements?							YES		X	NO	
4	Is there control of access in the vicinity of the proposed abatement measure?							YES		X	NO	
B.	**REASONABLENESS:**											
1	Can a 7-dB(A) reduction in traffic noise levels be achieved for at least one impacted front row receptor?							YES		X	NO	
2	Is the design criteria per benefited receptor of _____ **sq.ft.** less than the maximum allowable design criteria per benefited receptor of _____ **sq.ft.**							YES		N/A	NO	
C.	**NOISE ABATEMENT DECISION:**											
1	Is the noise mitigation feasible?							YES		X	NO	
2	Is the noise mitigation reasonable?							YES		X	NO	
3	Is the noise mitigation likely?							YES		X	NO	
4	Have the owners' and residents' viewpoints been solicited?							YES		X	NO	
5	Is the noise mitigation recommended for construction?							YES		X	NO	
D.	**OPTIONAL REASONABLENESS CONSIDERATION:**											
1	Was optional averaging noise abatement allowance within a common noise environment used for consideration of barrier reasonableness?							YES		X	NO	
2	If the answer to D.1 is YES, the design criteria per benefited receptor for each individual barrier within the common noise environment before averaging are:											
	Bar No.			(CIRCLE ONE) sq.ft./cu.yd		Bar No.					(CIRCLE ONE) sq.ft./cu.yd	
	Bar No.			sq.ft./cu.yd		Bar No.					sq.ft./cu.yd	
3	If the answer to D.1 is YES, is the design criteria per benefited receptor for each individual barrier less than or equal to twice the maximum allowable design criteria per benefited receptor of _____					(CIRCLE ONE) sq.ft./cu.yd		YES			NO	
	Form Completed By:	APK; MICHAEL BAKER INTL				Date:					11/18/2016	
	In Consultation With:	NCDOT				Date:						

PROJECT -	I-73: I-74/Richmond Co., NC to I-95/Dillon Co., SC					TIP # -	R-3421				
LOCATION -	Barrier 2NC - R24					COUNTY(IES) -	Richmond				
							(CIRCLE ALL THAT APPLY)				
# IMPACTS -	1	# BENEFITS -	0	NAC:	A	**B**	C	D	E	F	G
A.	**FEASIBILITY:**										
1	Can a 5-dB(A) reduction in traffic noise levels be achieved for at least one impacted receptor?							YES		X	NO
2	Does topography negatively affect the proposed abatement measure?							YES		N/A	NO
3	Does the abatement measure negatively affect property access, drainage, safety and maintenance requirements?							YES		N/A	NO
4	Is there control of access in the vicinity of the proposed abatement measure?							YES		N/A	NO
B.	**REASONABLENESS:**										
1	Can a 7-dB(A) reduction in traffic noise levels be achieved for at least one impacted front row receptor?							YES		N/A	NO
2	Is the design criteria per benefited receptor of	N/A	**sq.ft.**								
	less than the maximum allowable design criteria per benefited receptor of							YES			NO
	N/A **sq.ft.**										
C.	**NOISE ABATEMENT DECISION:**										
1	Is the noise mitigation feasible?							YES		X	NO
2	Is the noise mitigation reasonable?							YES		N/A	NO
3	Is the noise mitigation likely?							YES		N/A	NO
4	Have the owners' and residents' viewpoints been solicited?							YES		N/A	NO
5	Is the noise mitigation recommended for construction?							YES		N/A	NO
D.	**OPTIONAL REASONABLENESS CONSIDERATION:**										
1	Was optional averaging noise abatement allowance within a common noise environment used for consideration of barrier reasonableness?							YES		X	NO
2	If the answer to D.1 is YES, the design criteria per benefited receptor for each individual barrier within the common noise environment before averaging are:										
				(CIRCLE ONE)							(CIRCLE ONE)
	Bar No.			sq.ft./cu.yd		Bar No.					sq.ft./cu.yd
	Bar No.			sq.ft./cu.yd		Bar No.					sq.ft./cu.yd
3	If the answer to D.1 is YES, is the design criteria per benefited receptor for each individual barrier less than or equal to twice the maximum allowable										
	design criteria per benefited receptor of				**sq.ft.**			YES			NO
	Form Completed By:	APK; MICHAEL BAKER INTL				Date:					2/15/2017
	In Consultation With:					Date:					

PROJECT -	I-73: I-74/Richmond Co., NC to I-95/Dillon Co., SC					TIP # -	R-3421				
LOCATION -	Barrier 3NC - R26					COUNTY(IES) -	Richmond				
							(CIRCLE ALL THAT APPLY)				
# IMPACTS -	1	# BENEFITS -	1	NAC:	A	**B**	C	D	E	F	G
A.	**FEASIBILITY:**										
1	Can a 5-dB(A) reduction in traffic noise levels be achieved for at least one impacted receptor?						X	YES			NO
2	Does topography negatively affect the proposed abatement measure?							YES		X	NO
3	Does the abatement measure negatively affect property access, drainage, safety and maintenance requirements?							YES		X	NO
4	Is there control of access in the vicinity of the proposed abatement measure?						X	YES			NO
B.	**REASONABLENESS:**										
1	Can a 7-dB(A) reduction in traffic noise levels be achieved for at least one impacted front row receptor?						X	YES			NO
2	Is the design criteria per benefited receptor of	57,017	**sq.ft.**								
	less than the maximum allowable design criteria per benefited receptor of							YES		X	NO
	3,130 **sq.ft.**										
C.	**NOISE ABATEMENT DECISION:**										
1	Is the noise mitigation feasible?						X	YES			NO
2	Is the noise mitigation reasonable?							YES		X	NO
3	Is the noise mitigation likely?							YES		X	NO
4	Have the owners' and residents' viewpoints been solicited?							YES		X	NO
5	Is the noise mitigation recommended for construction?							YES		X	NO
D.	**OPTIONAL REASONABLENESS CONSIDERATION:**										
1	Was optional averaging noise abatement allowance within a common noise environment used for consideration of barrier reasonableness?							YES		X	NO
2	If the answer to D.1 is YES, the design criteria per benefited receptor for each individual barrier within the common noise environment before averaging are:										
				(CIRCLE ONE)							(CIRCLE ONE)
	Bar No.			sq.ft./cu.yd		Bar No.					sq.ft./cu.yd
	Bar No.			sq.ft./cu.yd		Bar No.					sq.ft./cu.yd
3	If the answer to D.1 is YES, is the design criteria per benefited receptor for each individual barrier less than or equal to twice the maximum allowable										
	design criteria per benefited receptor of	6,260	**sq.ft.**					YES			NO
	Form Completed By:	APK; MICHAEL BAKER INTL				Date:					11/18/2016
	In Consultation With:	NCDOT				Date:					

PROJECT -	I-73: I-74/Richmond Co., NC to I-95/Dillon Co., SC					TIP # -	R-3421				
LOCATION -	Barrier 4NC - R27, 28					COUNTY(IES) -	Richmond				
							(CIRCLE ALL THAT APPLY)				
# IMPACTS -	2	# BENEFITS -	2	NAC:	A	**B**	C	D	E	F	G
A.	**FEASIBILITY:**										
1	Can a 5-dB(A) reduction in traffic noise levels be achieved for at least one impacted receptor?						X	YES			NO
2	Does topography negatively affect the proposed abatement measure?							YES		X	NO
3	Does the abatement measure negatively affect property access, drainage, safety and maintenance requirements?							YES		X	NO
4	Is there control of access in the vicinity of the proposed abatement measure?						X	YES			NO
B.	**REASONABLENESS:**										
1	Can a 7-dB(A) reduction in traffic noise levels be achieved for at least one impacted front row receptor?						X	YES			NO
2	Is the design criteria per benefited receptor of 12,586 **sq.ft.** less than the maximum allowable design criteria per benefited receptor of 3,323 **sq.ft.**							YES		X	NO
C.	**NOISE ABATEMENT DECISION:**										
1	Is the noise mitigation feasible?						X	YES			NO
2	Is the noise mitigation reasonable?							YES		X	NO
3	Is the noise mitigation likely?							YES		X	NO
4	Have the owners' and residents' viewpoints been solicited?							YES		X	NO
5	Is the noise mitigation recommended for construction?							YES		X	NO
D.	**OPTIONAL REASONABLENESS CONSIDERATION:**										
1	Was optional averaging noise abatement allowance within a common noise environment used for consideration of barrier reasonableness?							YES		X	NO
2	If the answer to D.1 is YES, the design criteria per benefited receptor for each individual barrier within the common noise environment before averaging are:										
				(CIRCLE ONE)							(CIRCLE ONE)
	Bar No.			sq.ft./cu.yd		Bar No.					sq.ft./cu.yd
	Bar No.			sq.ft./cu.yd		Bar No.					sq.ft./cu.yd
3	If the answer to D.1 is YES, is the design criteria per benefited receptor for each individual barrier less than or equal to twice the maximum allowable design criteria per benefited receptor of 6,646 **sq.ft.**							YES			NO
	Form Completed By:	APK; MICHAEL BAKER INTL				Date:					11/18/2016
	In Consultation With:	NCDOT				Date:					

PROJECT -	I-73: I-74/Richmond Co., NC to I-95/Dillon Co., SC					TIP # -	R-3421				
LOCATION -	Barrier 5NC - R30					COUNTY(IES) -	Richmond				
							(CIRCLE ALL THAT APPLY)				
# IMPACTS -	1	# BENEFITS -	1	NAC:	A	**B**	C	D	E	F	G
A.	**FEASIBILITY:**										
1	Can a 5-dB(A) reduction in traffic noise levels be achieved for at least one impacted receptor?						X	YES			NO
2	Does topography negatively affect the proposed abatement measure?							YES		X	NO
3	Does the abatement measure negatively affect property access, drainage, safety and maintenance requirements?							YES		X	NO
4	Is there control of access in the vicinity of the proposed abatement measure?						X	YES			NO
B.	**REASONABLENESS:**										
1	Can a 7-dB(A) reduction in traffic noise levels be achieved for at least one impacted front row receptor?						X	YES			NO
2	Is the design criteria per benefited receptor of 9,652 **sq.ft.** less than the maximum allowable design criteria per benefited receptor of 3,270 **sq.ft.**							YES		X	NO
C.	**NOISE ABATEMENT DECISION:**										
1	Is the noise mitigation feasible?						X	YES			NO
2	Is the noise mitigation reasonable?							YES		X	NO
3	Is the noise mitigation likely?							YES		X	NO
4	Have the owners' and residents' viewpoints been solicited?							YES		X	NO
5	Is the noise mitigation recommended for construction?							YES		X	NO
D.	**OPTIONAL REASONABLENESS CONSIDERATION:**										
1	Was optional averaging noise abatement allowance within a common noise environment used for consideration of barrier reasonableness?							YES		X	NO
2	If the answer to D.1 is YES, the design criteria per benefited receptor for each individual barrier within the common noise environment before averaging are:										
				(CIRCLE ONE)							(CIRCLE ONE)
	Bar No.			sq.ft./cu.yd		Bar No.					sq.ft./cu.yd
	Bar No.			sq.ft./cu.yd		Bar No.					sq.ft./cu.yd
3	If the answer to D.1 is YES, is the design criteria per benefited receptor for each individual barrier less than or equal to twice the maximum allowable design criteria per benefited receptor of **sq.ft.**							YES			NO
	Form Completed By:	APK; MICHAEL BAKER INTL				Date:					2/15/2017
	In Consultation With:					Date:					