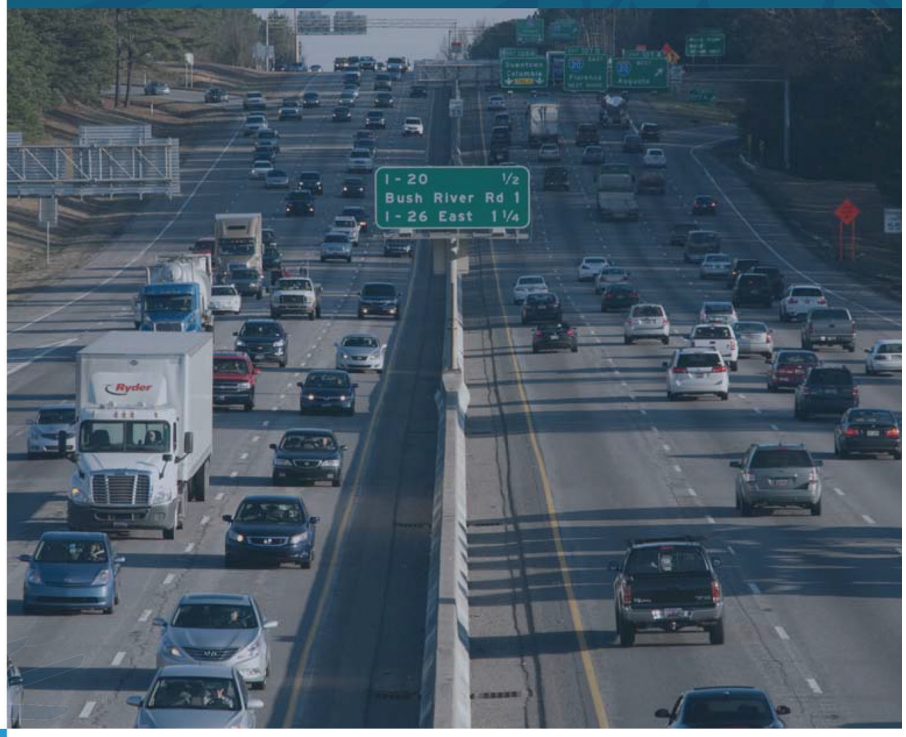
Appendix I—Noise Technical Report

Part 1

CAROLINA
CROSSROADS
I-20/26/126 Corridor Project



Noise Technical Report

Carolina Crossroads
I-20/26/126 Corridor Improvement Project
Lexington and Richland Counties, South Carolina

DEIS July 23, 2018

SCDOT
South Carolina Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

Prepared for South Carolina Department of Transportation
and the Federal Highway Administration

Noise Technical Report

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And the Federal Highway Administration

Prepared by

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1 Introduction—What is a noise study?

Traffic noise is associated with highway traffic, generally in the form of loud and/or persistent noises from vehicles. A noise study is done to determine both the existing and future predicted noise for a highway project like the proposed Carolina Crossroads I-20/26/126 Corridor Improvement Project (Carolina Crossroads). In 2015, a study was completed to assess the existing noise conditions within the project study area for the proposed Carolina Crossroads project in Lexington and Richland Counties, South Carolina.[1] The proposed project consists of roadways and bridges for improvements to the I-20/26/126 corridor in Richland and Lexington counties. To date, the project area has been defined as a mainline corridor including I-20 from the Saluda River to the Broad River, I-26 from US 378 to Broad River Road, and I-126 from Colonial Life Boulevard to I-26. Figure 1.1 presents a map showing the location of the study area.

Figure 1-1 Carolina Crossroads I-20/26/126 Corridor Improvement Project area

In 2017, due to a slightly updated project area, the project team revised the existing noise analysis and conducted analyses on how much noise may be generated by the No-Build Alternative and Reasonable Alternatives (RA) 1 and RA5 Modified. The following sections discuss why the studies were done, the existing noise conditions in the project area, how much noise the new alignments might cause, and what happens when noise impacts occur.

The purpose of this Preliminary Noise Analysis is to compare noise impacts from the two proposed alternatives to noise sensitive land use within the project area of each alternative. The noise assessment for the I-20/I-26/I-126 project was prepared in accordance with 23 CFR §772 and SCDOT Noise Abatement Policy (September 1, 2014). SCDOT's policy states that the preliminary traffic noise analysis shall include the following for each alternative under detailed study:

[1] Noise Data Collection Report. Carolina Crossroads I-20/26/126 Corridor Report, Lexington and Richland Counties, South Carolina. Prepared for South Carolina Department of Transportation and the Federal Highway Administration. Prepared by HDR.

- Identification of existing activities, developed lands, and undeveloped lands for which development is planned, designed and programmed, which may be affected by noise from the highway
- Measurement of existing noise levels
- Model validation
- Noise model analysis of existing and future noise levels.
- Identification of traffic noise impacts
- Consideration of noise abatement

Upon selection of a preferred alternative, a Detailed Noise Analysis will be conducted based on the most current design and traffic information available.

2 How are noise impacts estimated?

The Federal Noise Control Act of 1972 requires that all federal agencies administer their programs in a manner that promotes an environment free from noises that could jeopardize public health or welfare. The federal regulation that the Federal Highway Administration (FHWA) uses to assess noise impacts is 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. The South Carolina Department of Transportation (SCDOT) Traffic Noise Abatement Policy constitutes the official SCDOT noise policy and procedures for the purpose of meeting the requirements of 23 CFR Part 772 and applicable state laws. Noise-abatement criteria (NAC) are used to define the noise levels that are considered an impact (in hourly A-weighted sound-level decibels) for each land-use activity category. If future noise levels approach (within 1 dBA) or exceed the NAC, they are considered noise impacts per SCDOT policy. Noise impacts would also occur if the difference between the existing noise level and the predicted noise level under the build condition is 15 dBA L_{eq} or greater. These types of impacts are typically only found on new alignment projects. Section 4.1 discusses how noise impacts are determined in more detail. The NAC are summarized in Table 2.1.

Table 2.1 Noise-Abatement Criteria

Activity Category	Activity Criteria[1,2]		Evaluation Location	Description of Activity Category
	L_{eq} (h)	L_{10}(h)		
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

Activity Category	Activity Criteria[1,2] L_{eq} (h)	L_{10}(h)	Evaluation Location	Description of Activity Category
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 §772, Procedures for Abatement of Highway Traffic Noise and Construction Noise.

[1]Either the L_{eq}(h) or the L_{10}(h) may be used on a project (but not both)

[2]The L_{eq}(h) and L_{10}(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.

To ensure the model is accurate in calculating noise levels at these sensitive receivers, the model is validated by collecting field measurements with a sound level meter and counting the traffic volumes on the roads during the field data collections. If results from the TNM model are within a 3+/- decibels (dB) tolerance of the measurement collected in the field, the model is considered valid to calculate noise levels for the project. For the I-20/I-26/I-126 project all of the field measurements were within tolerance of the modeled results.

3 What are the existing noise conditions?

On June 29, 2015, the project team measured traffic noise at locations that are representative of nearby noise-sensitive sites throughout the project study area on both sides of the roadway. These locations were reviewed and approved by SCDOT prior to the measurements occurring. Traffic noise measurements were conducted in accordance with the FHWA-PD-96-046 Measurement of Highway Related Noise (May 1996). The average meteorological conditions were reported as shown in Table 3.1 below.

Table 3.1 Meteorological Conditions

Condition	Measure
Temperature	≅ 77-93 ° F
Humidity	≅ 27-76 %
Wind	≅ 5 mph
Conditions	Clear
Barometric pressure	≅ 30.00

3.1 What types of equipment were used?

Noise monitoring was conducted using a Larson Davis 824 Sound Level Meter (SLM) (Figure 3.1). The microphone used was a Larson Davis 2541 microphone and the calibrator was a Larson Davis CAL200.

Table 3.2 summarizes the instruments used to collect the monitoring data for this activity.

Table 3.2 Noise Analysis Instrumentation Summary

Instrument	Make	Serial number	Calibration due date
Sound level meter	Larson Davis 824	2636	5/19/2017
Microphone	Larson Davis 2541	4652	5/19/2017
Calibrator	Larson Davis CAL200	3722	9/25/2015

3.2 What field methods were used?

The SLM was programmed to compute the equivalent sound level (L_{eq}). L_{eq} is the preferred method to describe sound levels that vary over time, resulting in a single decibel value which takes into account the total sound energy over the period of time interest. L_{eq} is measured in A-weighted dBA, which closely approximates the range of frequencies the human ear can hear.

The following procedures were used for noise monitoring:

- The duration of the L_{eq} measurements was fifteen minutes.
- The SLM was calibrated before and after monitoring. No significant drifts were detected during the analysis.
- The microphone was mounted on a tripod five feet above the ground.
- The microphone was covered with a windscreen.
- Traffic was counted manually, classified by vehicle type, and used as input in the validation of the FHWA TNM.
- Vehicle speeds were determined in the field by driving the corridor.

3.3 How loud is loud?

Figure 3.1 Larson Davis 824 sound level meter
Source: CEQ 1970. Typical A-weighted noise levels taken with a sound-level meter and expressed as decibels on the "A" scale. The "A" scale approximates the frequency response of the human ear
Note: photo link: http://www.larsondavis.com/products/sou

Sound-level meters measure the actual pressure fluctuations caused by sound waves and record separate measurements for different sound frequency ranges. The decibel (dB) scale used to describe sound is a logarithmic scale that accounts for the large range of sound pressure levels in the environment. Most sounds consist of a broad range of sound frequencies. Several frequency-weighting schemes have been used to develop composite decibel scales that approximate the way the human ear responds to sound levels. The A-weighted decibel (dBA) scale is most widely used for this purpose. Figure 3.2 presents some common outdoor and indoor noises.

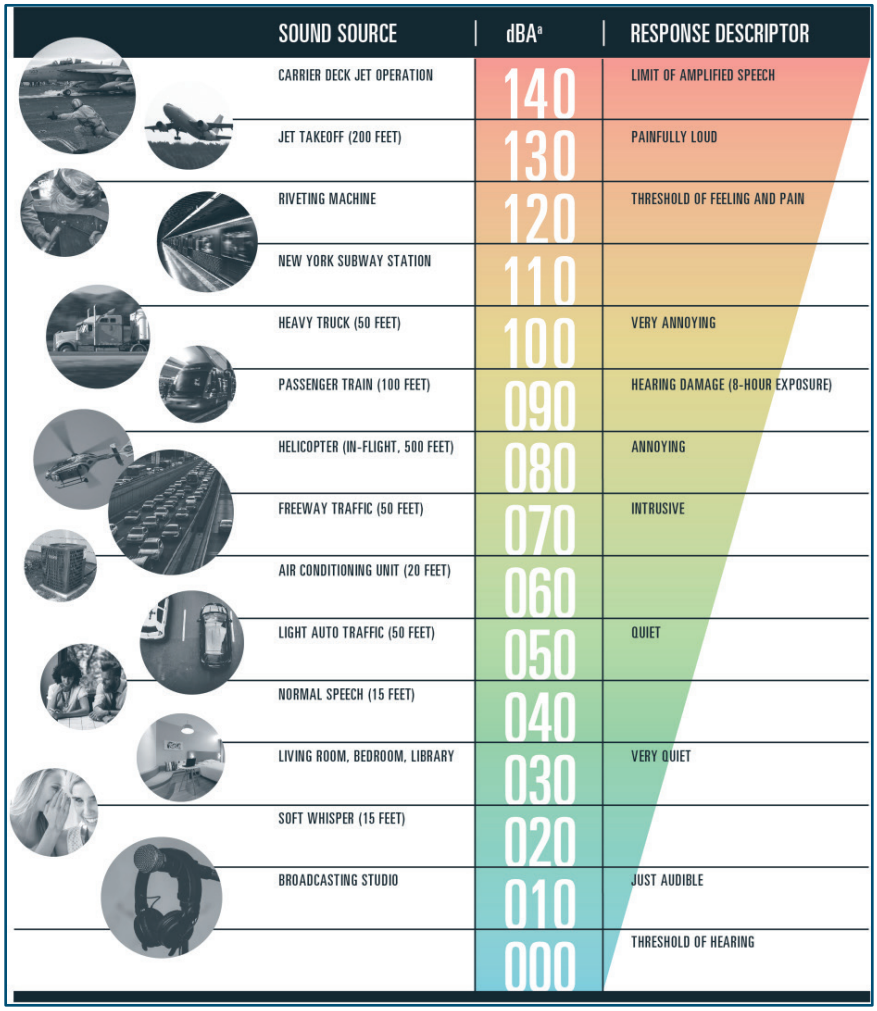


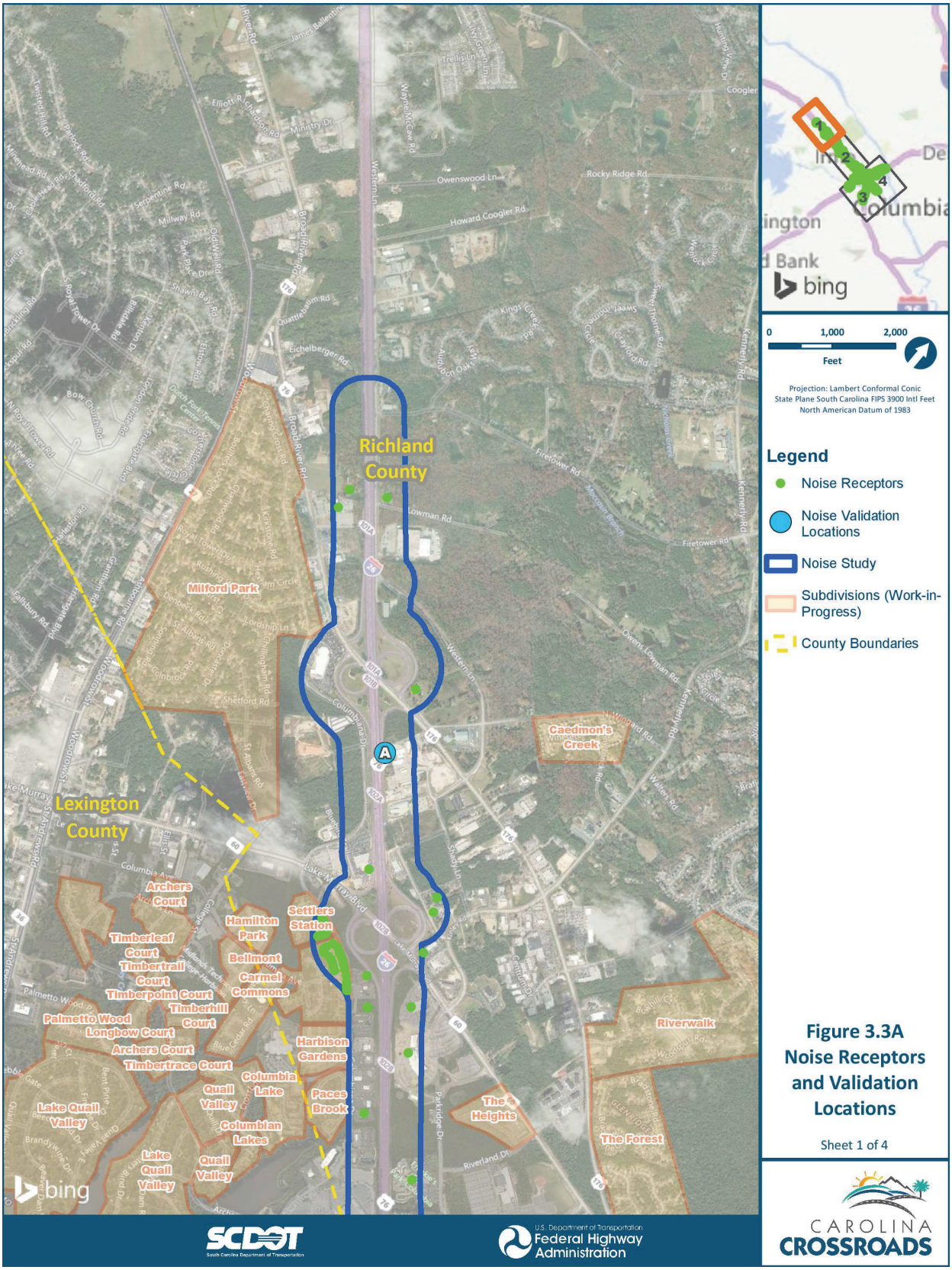
Figure 3.2 Weighted noise levels and human response

3.4 Where were noise measurements taken?

Noise measurements were taken at 11 noise validation locations spread throughout the project area. Table 3.3 describes the locations of each of the noise validation locations. Figures 3.3A - D present a detailed view of the noise validation locations.

Table 3.3 Noise Validation Location Summary

Measurement location	Description
A	≈ 40 feet east of Broad River Road off-ramp near Southland Log Homes
B	≈ 122 feet east of Harbison Boulevard on-ramp near Love Chevrolet
C	≈ 120 feet west of Piney Grove Road off-ramp near Country Walk Apartments
D	≈ 155 feet west of Piney Grove Road on-ramp near 490 Jamil Road
E	≈ 82 feet east of I-26 near Raintree Apartments
F	≈ 130 feet west of I-26 near Stoney Creek Apartments
G	≈ 100 feet east of I-126 near 164 Morninghill Drive
H	≈ 155 feet northeast of I-126 near Three Rivers Apartments
I	≈ 76 feet west of Sunset Boulevard off-ramp near 198 East Medical Lane
J	≈ 198 feet southwest of Bush River Road off-ramp near Double Tree by Hilton
K	≈ 172 feet north of I-20 near Briargate Condominiums


Richland County
Lexington County
Milford Park
Caedmon's Creek
Archers Court
Hamilton Park
Settlers Station
Timberleaf Court
Timbertrail Court
Timberpoint Court
Timberhill Court
Bellmont
Carmel Commons
Palmetto Wood
Longbow Court
Archers Court
Timbertrace Court
Harbison Gardens
Columbia Lake
Quail Valley
Paces Brook
Lake Quail Valley
Columbian Lakes
The Heights
Riverwalk
The Forest
0
1,000
2,000
Feet
Projection: Lambert Conformal Conic
State Plane South Carolina FIPS 3900 Intl Feet
North American Datum of 1983
Legend
Noise Receptors
Noise Validation Locations
Noise Study
Subdivisions (Work-in-Progress)
County Boundaries
Figure 3.3A
Noise Receptors and Validation Locations
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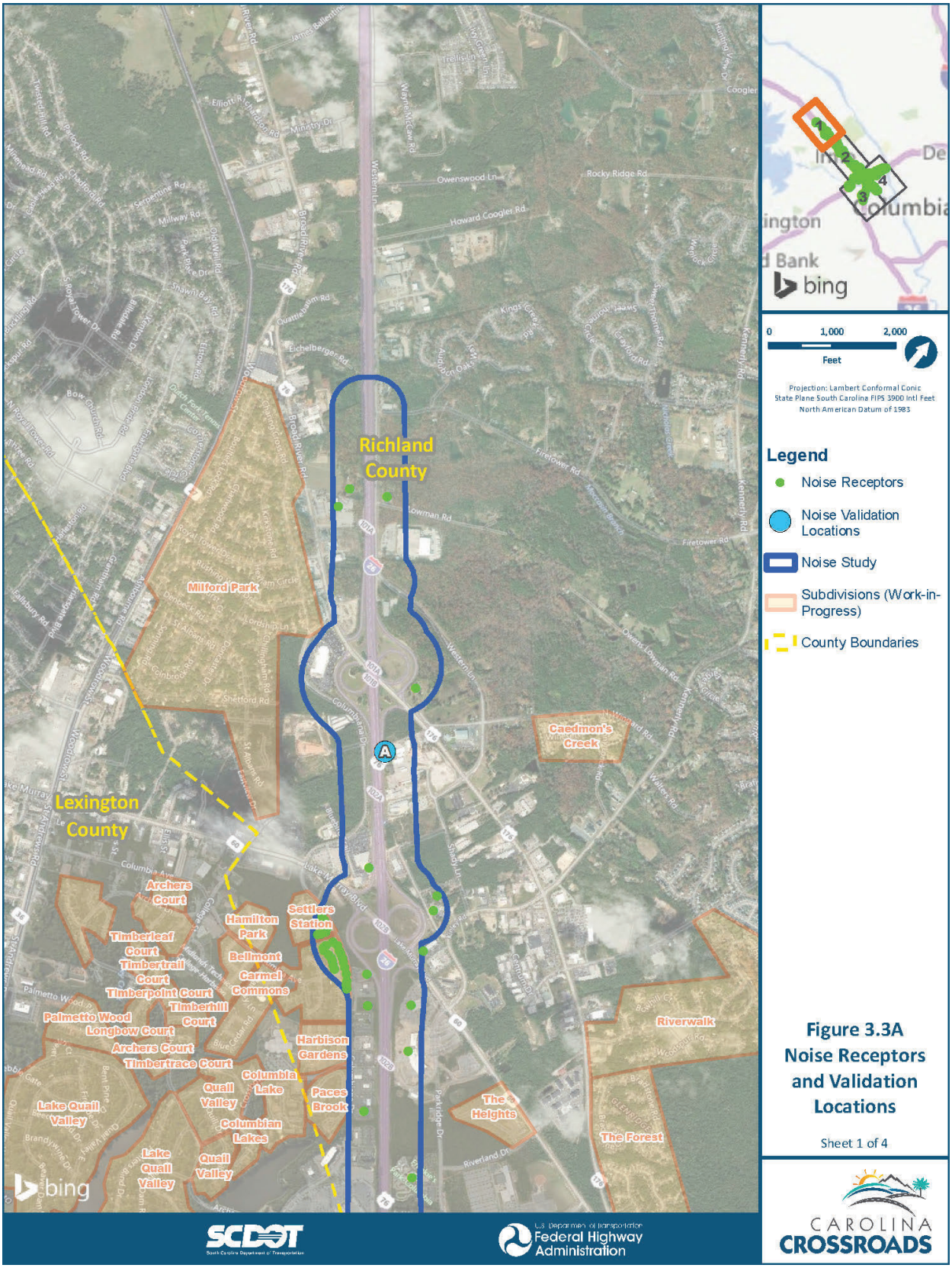
Richland County
Lexington County
Milford Park
Caedmon's Creek
Archers Court
Hamilton Park
Settlers Station
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Timbertrail Court
Timberpoint Court
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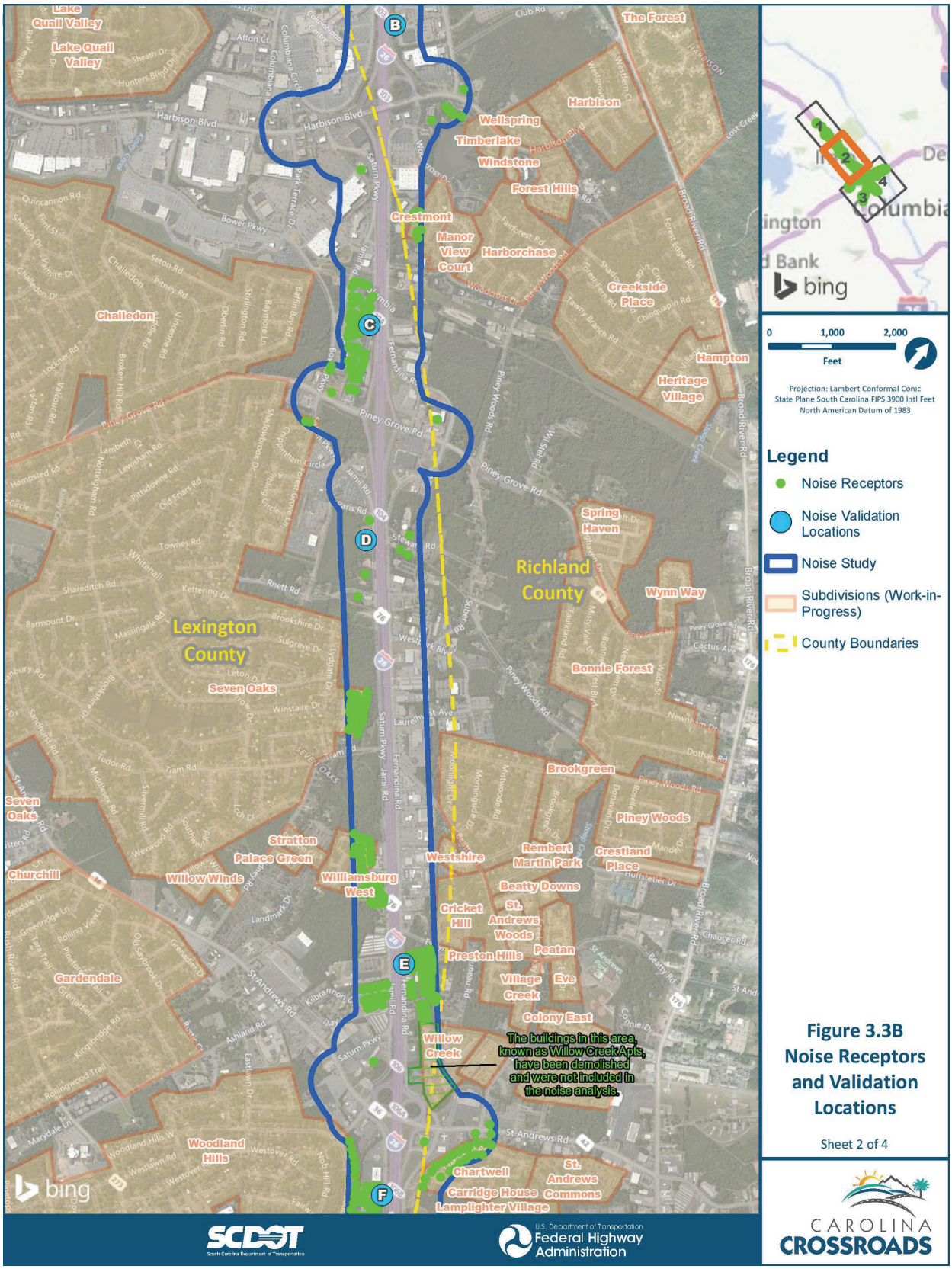
Lake Quail Valley
Lake Quail Valley
Harbison Blvd
Harbison Blvd
Club Rd
The Forest
Harbison
Wellspring
Timberlake
Windstone
Forest Hills
Crestmont
Manor View Court
Harborchase
Creekside Place
Challedon
Hampton
Heritage Village
Piney Grove Rd
Piney Grove Rd
Piney Grove Rd
Spring Haven
Richland County
Wynn Way
Lexington County
Seven Oaks
Bonnie Forest
Brookgreen
Piney Woods
Seven Oaks
Stratton
Palace Green
Churchill
Willow Winds
Williamsburg West
Westshire
Rembert Martin Park
Crestland Place
Beatty Downs
Cricket Hill
St. Andrews Woods
Preston Hills
Peatan
Village Creek
Eve
Gardendale
Colony East
Willow Creek
The buildings in this area, known as Willow Creek Apts, have been demolished and were not included in the noise analysis.
Woodland Hills
St Andrews Rd
Chartwell
St. Andrews Commons
Carridge House
Lamplighter Village
B
C
D
E
F
bing
0
1,000
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Feet
Projection: Lambert Conformal Conic
State Plane South Carolina FIPS 3900 Intl Feet
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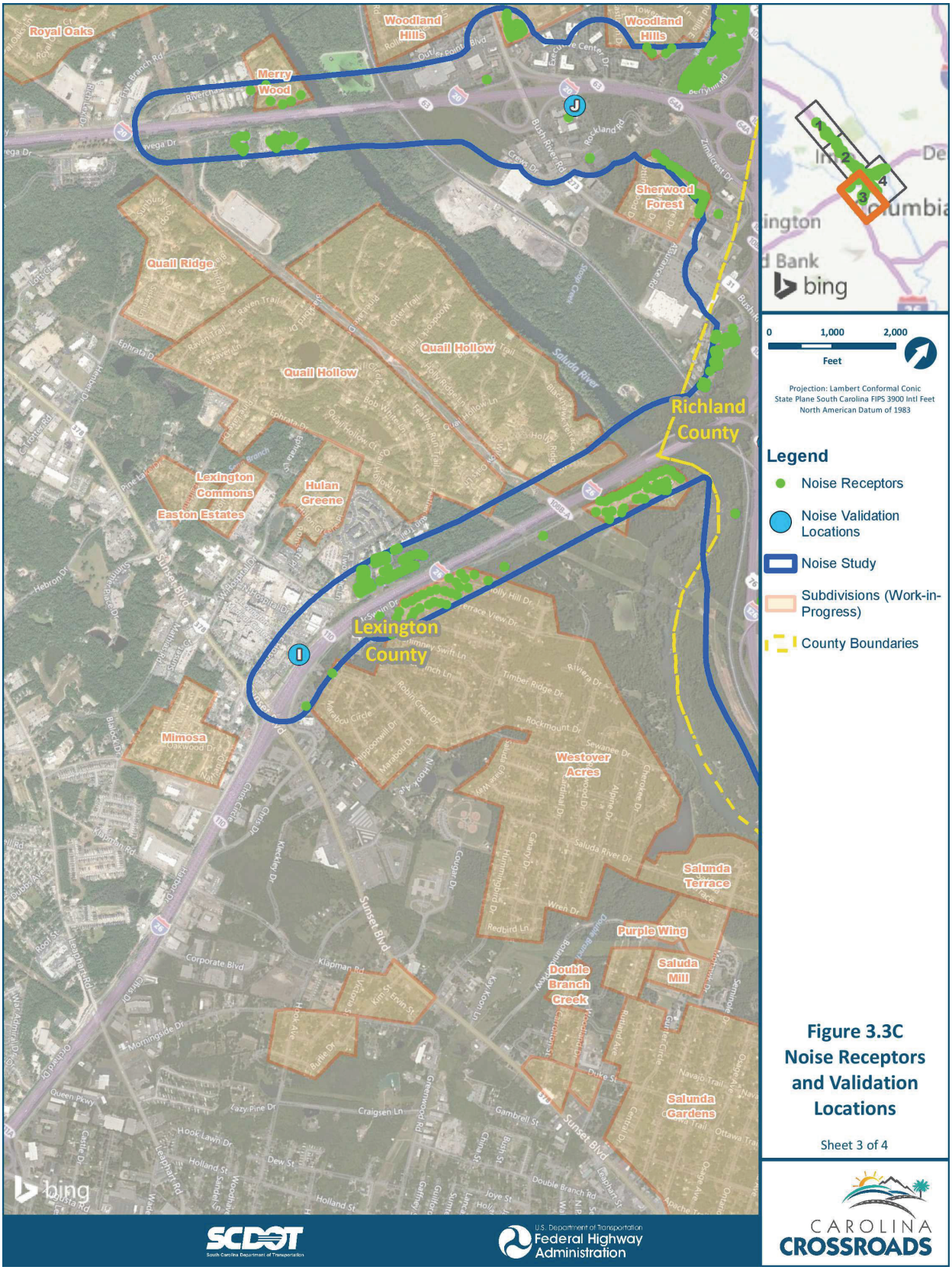
Royal Oaks
Woodland Hills
Woodland Hills
Merry Wood
Sherwood Forest
Quail Ridge
Quail Hollow
Quail Hollow
Saluda River
Richland County
Lexington Commons
Easton Estates
Hulan Greene
Lexington County
Mimosa
Westover Acres
Salunda Terrace
Purple Wing
Saluda Mill
Double Branch Creek
Salunda Gardens
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Figure 3.3D Noise Receptors and Validation Locations

3.5 What were the results of the noise measurements?

23 CFR 772.11(d)(2) requires validation to verify the accuracy of noise models used to predict existing or future noise levels. The model is validated if existing highway traffic noise levels and predicted highway traffic noise levels are within plus or minus three decibels (dBA) of one another. If the measured and predicted highway traffic noise levels are within plus or minus 3 dBA for all the measurements at all the sites, then the model is considered valid and can be used to predict existing and future highway traffic noise levels along the entire project. The measured and predicted noise levels for each of the monitoring sites selected along the corridor are presented in Table 3.4. Each set of predicted and measured data was found to be within the acceptable plus or minus 3 dBA tolerance.

Table 3.4 Model Validation Results

Measurement location	Leqh (dBA) Measured	Predicted	Difference
A	72.1	73.0	+0.9
B	71.3	72.0	+0.7
C	69.3	72.2	+2.9
D	68.0	69.3	+1.3
E	74.7	71.9	-2.8
F	69.1	72.0	+2.9
G	67.2	69.4	+2.2
H	62.3	64.2	+1.9
I	67.8	70.8	+3.0
J	65.7	68.1	+2.4
K	65.5	68.4	+2.9

4 What are the anticipated noise impacts for the alternatives?

4.1 How did we assess expected noise under the preliminary analysis?

According to 23 CFR §772.5 (g), traffic noise impacts occur when either a) the predicted traffic noise levels approach or exceed the FHWA NAC for the applicable activity category, or b) when the predicted traffic noise levels substantially exceed the existing noise levels. SCDOT considers noise levels within 1 dBA L_{eq} of the FHWA NAC as "approaching" the criteria.[2]

[2] "Traffic Noise Abatement Policy", South Carolina Department of Transportation, September 1, 2014.

A 67 dBA criterion has been established for residences (NAC Category B), as well as active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, institutional, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings (NAC Category C). A 52 dBA (interior) criterion has been established for 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 that do not have an outdoor area of frequent human activity (NAC Category D). A 72 dBA criterion has been established for hotels, motels, offices, restaurants/bars, and other developed lands commercial activities (NAC Category E). Any predicted noise level that approaches or exceeds the applicable NAC is considered an impact (refer to Table 2.1).

SCDOT's Traffic Noise Abatement Policy defines a substantial increase would occur if the difference between the existing noise level and the predicted noise level under the build condition is 15 dBA L_{eq} or greater.

Noise receptors in the project area within approximately 500 feet of the outside lane were identified through field reconnaissance and GIS parcel map information. A total of 2,621 individual noise receptors were identified in the project area. The SCDOT defines a noise receptor as a discrete or representative location of a noise sensitive area. For example, receptors are typically placed on trails based on trail use information per SCDOT policy.

The Saluda Riverwalk Extension is a Section 4(f) resource currently under construction in the project study area adjacent to I-126 and I-26 (refer to Section 3.11 for further information). Typically, a Section 4(f) resource is modeled as a receptor as required by SCDOT's Traffic Noise Abatement Policy. However, a preliminary noise analysis was conducted for the DEIS for the reasonable alternatives, which does not include ground elevations, terrain features, etc. that would affect how noise from the roadway would travel to the resource, in this case the trail. Thus, SCDOT commits to conduct noise modeling for the Saluda Riverwalk Extension as part of the detailed noise analysis. The detailed noise analysis will include elevation data, as well as other features such as ground zones and terrain, which would provide a more accurate depiction of the effects of noise on the trail. Once the detailed noise analysis is completed, the results of the noise analysis for the trail will be available for a 15-day public comment period, as per Section 4(f) requirements. Comments received during the 15-day public comment period on the noise analysis for the 4(f) resource will be addressed in the FEIS/ROD and Section 4(f) documentation.

Traffic noise modeling receptors were also placed at tees and greens on golf courses in the study area. The figures in Appendix A present closer views of these locations, including impacted and relocated receptors. More detailed figures are in Appendix A (Figure 1, Page 1 – 98). The project area was divided up into Noise Sensitive Areas (NSA) to make the noise analysis process more organized and easier to follow by laypersons and decision makers. An NSA is usually defined as a group of receptors that are geographically situated in a single, continuous geographic area, without large gaps and which might reasonably be protected by a single noise barrier. A typical NSA might encompass a residential area with a few dozen homes within a few hundred feet of the highway that extend between two interchanges. It is also common that an NSA will have fairly consistent land use (such as

single family homes), but some NSAs may have mixed use areas. In this sense an NSA may consist of a single isolated noise sensitive structure, or a mile long stretch of closely spaced, uninterrupted homes alongside the project highway.

The Federal Highway Administration (FHWA) Traffic Noise Model (TNM version 2.5) was used to calculate existing noise levels and predict future design year noise levels. Inputs to this model include noise sensitive receiver locations, existing and future roadway alignments, and traffic volumes and posted speeds. The following was assumed:

- Where required, multiple travel lanes were included in the TNM model.
- Peak hour traffic volumes and truck percentages were provided by STV Inc.
- Ground elevations for all inputs to the model, including roadways, receptors, and barriers in the barrier analyses were assumed to be 0 feet per the preliminary noise analysis requirements in Section 3.5 of SCDOT's Traffic Noise Abatement Policy.
- A land use survey was conducted for the project area. The corresponding Noise Abatement Criteria (NAC) category from the SCDOT Traffic Noise Abatement Policy was used.

4.2 Existing condition

The existing land use consists of primarily single-family and multi-family residences (Category B) as well as some places of worship, apartment pools, golf courses, trails (Category C), interiors of medical facilities, places of worship (Category D – interior[3]) and restaurant patios (Category E). For the Carolina Crossroads project, noise sensitive receivers were assigned a NAC category B, C, D, E, or F. Based on this preliminary noise analysis for the existing condition, noise levels would approach or exceed the NAC established in the *SCDOT Traffic Noise Abatement Policy* for 1,605 receivers. The majority of the impacts are to NAC Category B (residences). Noise levels for the existing condition ranged from 38 to 76 dBA. Table 4.1 presents a summary of impacts by alternative. More detailed figures are in Appendix A (Figure A1, Page 1 – 20).

Table 4.1 Summary of Impacts by Alternative

Activity category	Existing	Future no-build	Reasonable alternatives	
			RA1	RA5 Modified
A	0	0	0	0
B	1590	1596	1864	1827
C	12	14	24	25
D	0	0	0	0
E	3	3	4	6
Total	1605	1613	1892	1858

[3] Receivers representing places of worship and medical facilities were only considered as Category D if no exterior area of frequent human activity was identified.

4.3 No-Build Alternative

Based on this preliminary noise analysis for the No-Build alternative, noise levels would approach or exceed the NAC established in the *SCDOT Traffic Noise Abatement Policy* for 1,613 receivers. Noise levels for the No-build Alternative ranged from 38 to 76 dBA. More detailed figures are in Appendix A (Figure A2, Page 1 – 20).

4.4 RA1

For RA1, 2040 noise levels would approach or exceed the NAC established in the *SCDOT Traffic Noise Abatement Policy* for 1,892 receivers. Additionally, relocated receivers are not included in the impact count; refer to Appendix H for additional information on relocated properties. The majority of the impacts would be to NAC Category B (residences). Noise levels for the RA1 ranged from 41 to 77 dBA and are predicted to increase over existing noise levels from 0 to 6 dBA. There were no substantial increase impacts. Figures 4.1 and 4.1A-D presents the RA1 noise receptors and highlights those receptors that are predicted to approach or exceed the NAC. More detailed figures are in Appendix A (Figure A3, Page 1 – 20).

Table 4.2 shows the results of the evaluation of Activity Category D receivers for potential traffic noise impacts.

Table 4.2 Activity Category D Assessment Results RA1

Receptor ID	Use	Exterior areas of human activity	Impact as Class C?
D3	Church	The playground is an area of frequent human outdoor activity, and is physically shielded by church building. Therefore SCDOT policy says Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	No
F1	Hospital	There is no outdoor area of frequent human activity. Therefore SCDOT policy says Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	N/A
F2	Hospital	There is no outdoor area of frequent human activity. Therefore SCDOT policy says Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	N/A
J305	Church	There is no outdoor area of frequent human activity. Therefore SCDOT policy says Land Use Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	N/A
S197	Church	There is no outdoor area of frequent human activity. Therefore SCDOT policy says Land Use Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	N/A

4.5 RA5 Modified

For RA5 Modified, 2040 noise levels would approach or exceed the NAC established in the *SCDOT Traffic Noise Abatement Policy* for 1,858 receivers. Additionally, relocated receivers are not included in the impact count; refer to Appendix H for additional information on relocated properties. The majority of the impacts are to NAC Category B (residences). Noise levels for RA5 Modified ranged from 41 to 77 dBA and are predicted to increase over existing noise levels from 0 to 6 dBA. There were no substantial increase impacts. Figures 4.2 and 4.2A-D presents the RA5 Modified noise receptors and highlights those receptors that are predicted to approach or exceed the NAC. More detailed figures are in Appendix A (Figure A4, Page 1 – 20).

Table 4.3 shows the results of the evaluation of Activity Category D receivers for potential traffic noise impacts.

Table 4.3 Activity Category D Assessment Results RA5 Modified

Receptor ID	Use	Exterior areas of human activity	Impact as Class C?
D3	Church	The playground is an area of frequent human outdoor activity, and is physically shielded by church building. Therefore SCDOT policy says Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	No
F1	Hospital	There is no outdoor area of frequent human activity. Therefore SCDOT policy says Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	N/A
F2	Hospital	There is no outdoor area of frequent human activity. Therefore SCDOT policy says Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	N/A
J305	Church	There is no outdoor area of frequent human activity. Therefore SCDOT policy says Land Use Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	N/A
S197	Church	There is no outdoor area of frequent human activity. Therefore SCDOT policy says Land Use Activity Category D NAC should be applied. There is no impact under Land Use Activity Category D, therefore no additional consideration is necessary.	N/A

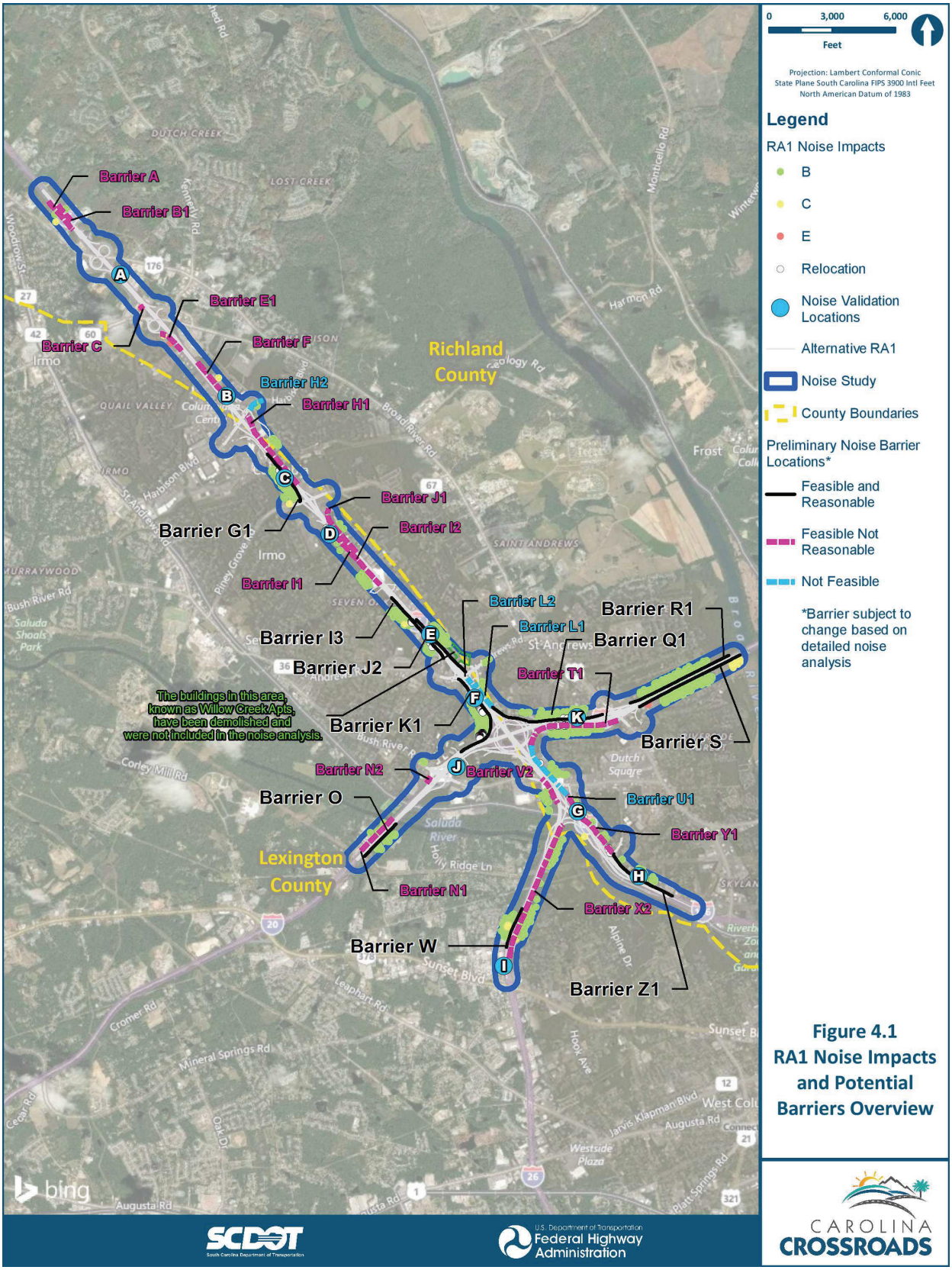
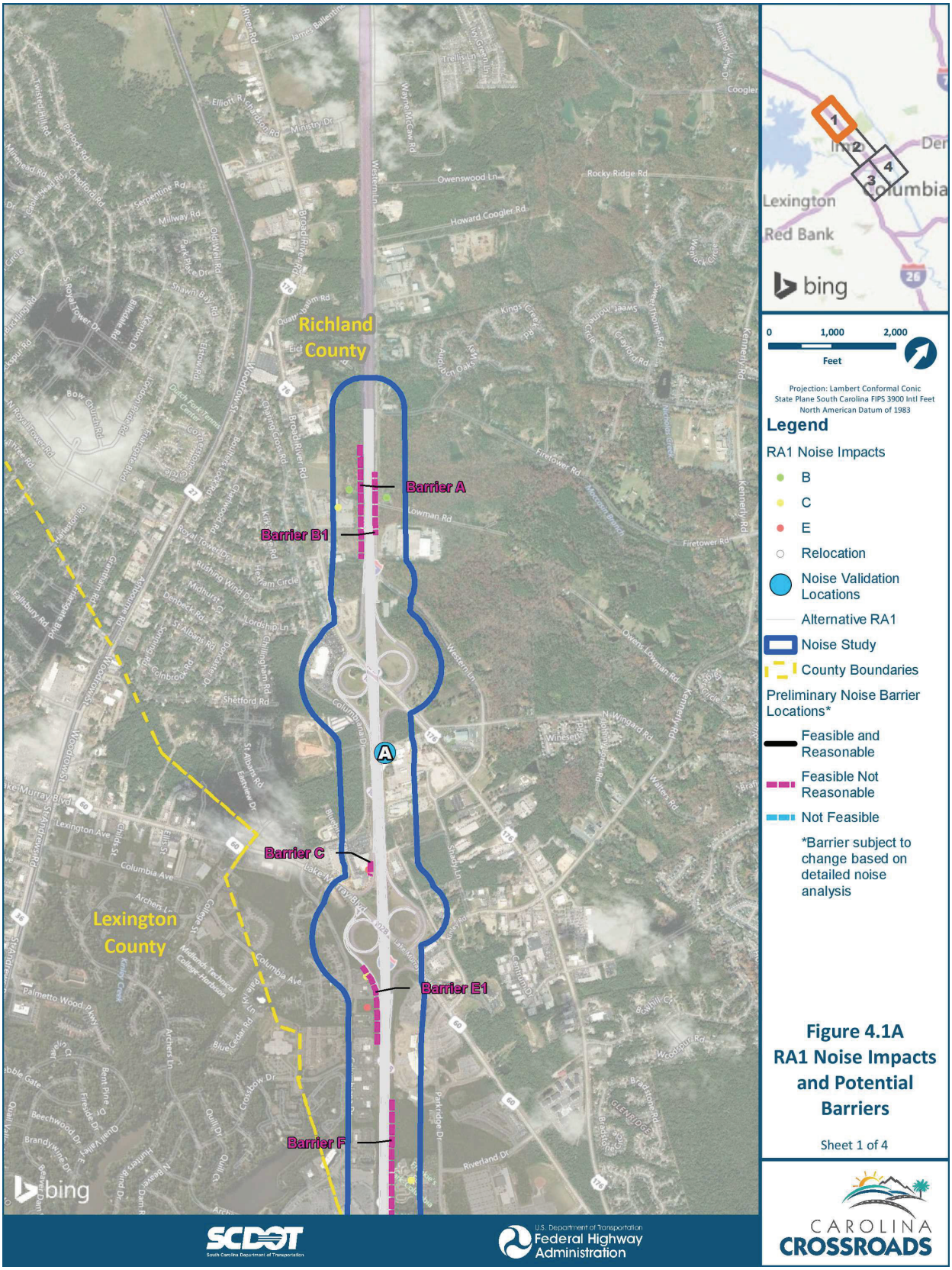


Figure 4.1
RA1 Noise Impacts and Potential Barriers Overview


Richland County
Lexington County
Barrier A
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Projection: Lambert Conformal Conic
State Plane South Carolina FIPS 3900 Intl Feet
North American Datum of 1983
Legend
RA1 Noise Impacts
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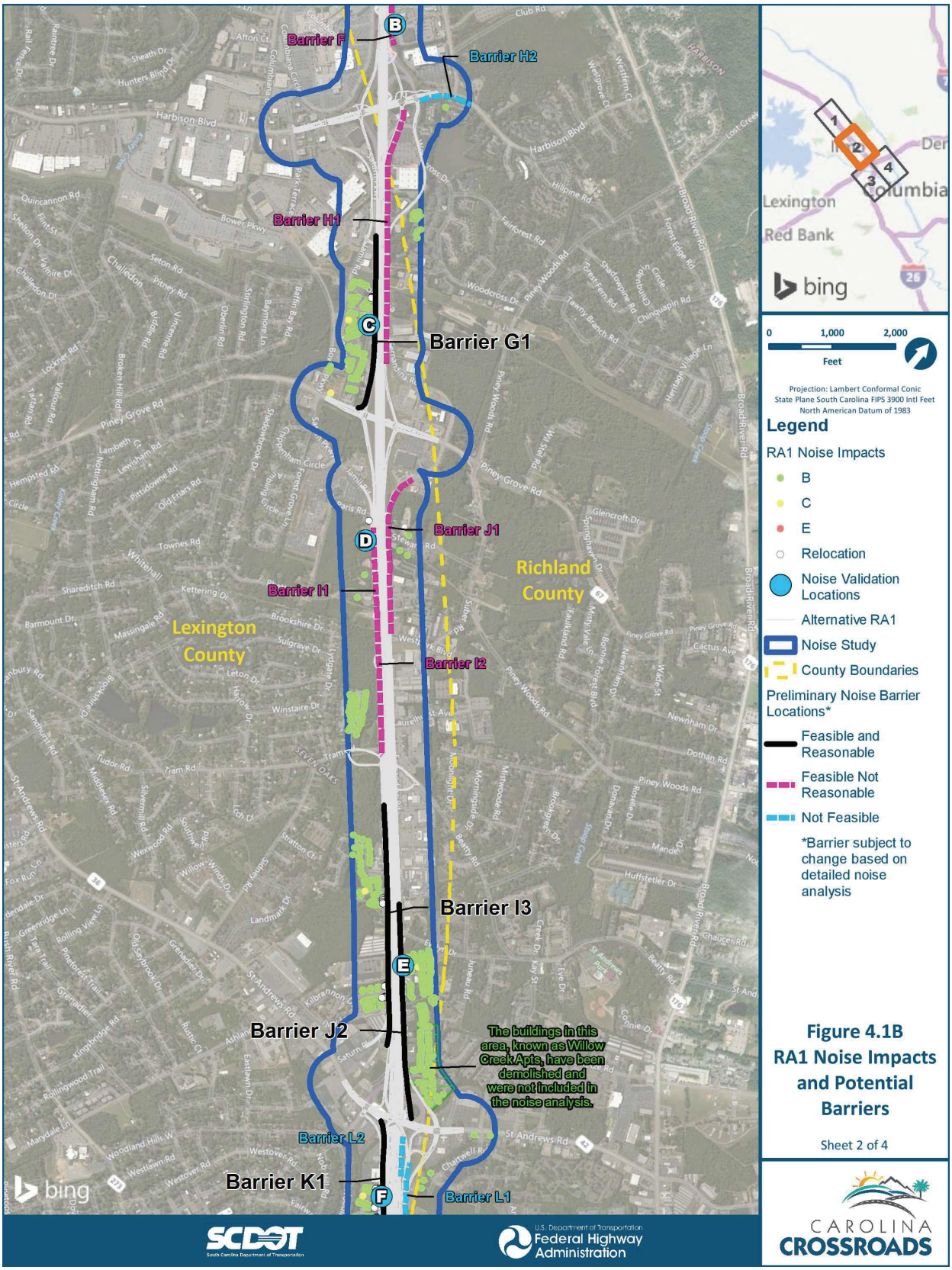
Relocation
Noise Validation Locations
Alternative RA1
Noise Study
County Boundaries
Preliminary Noise Barrier Locations*
Feasible and Reasonable
Feasible Not Reasonable
Not Feasible
*Barrier subject to change based on detailed noise analysis
Figure 4.1A
RA1 Noise Impacts and Potential Barriers
Sheet 1 of 4
SCDOT
South Carolina Department of Transportation
U.S. Department of Transportation
Federal Highway Administration
CAROLINA CROSSROADS


Barrier F
Barrier H2
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Barrier G1
Barrier J1
Barrier I1
Barrier I2
Barrier I3
Barrier J2
Barrier L2
Barrier K1
Barrier L1
Richland County
Lexington County
The buildings in this area, known as Willow Creek Apts, have been demolished and were not included in the noise analysis.
Lexington
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State Plane South Carolina FIPS 3900 Intl Feet
North American Datum of 1983
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Noise Validation Locations
Alternative RA1
Noise Study
County Boundaries
Preliminary Noise Barrier Locations*
Feasible and Reasonable
Feasible Not Reasonable
Not Feasible
*Barrier subject to change based on detailed noise analysis
Figure 4.1B
RA1 Noise Impacts and Potential Barriers
Sheet 2 of 4
CAROLINA CROSSROADS
SCDOT
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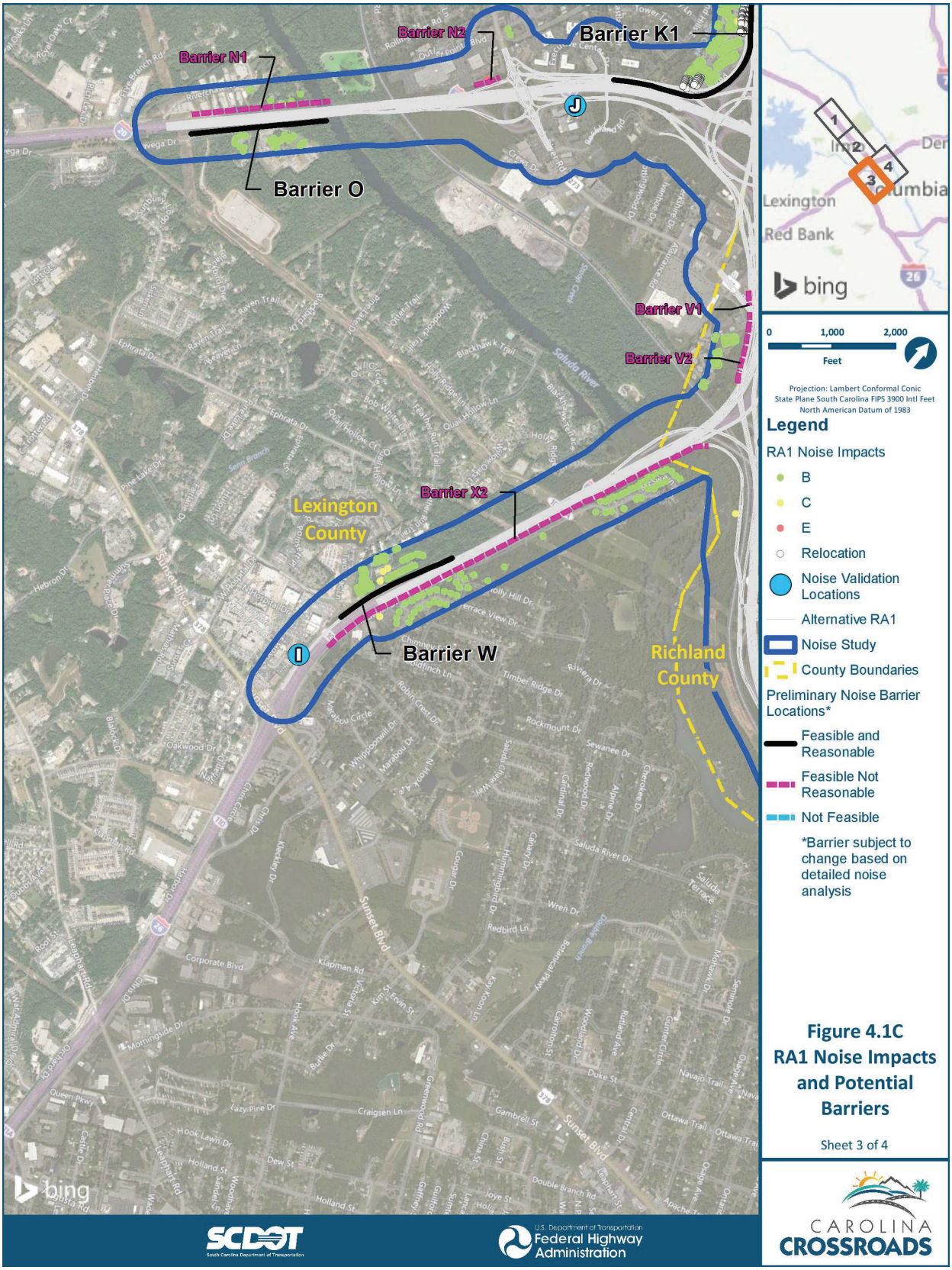
Federal Highway Administration


Barrier N1
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State Plane South Carolina FIPS 3900 Intl Feet
North American Datum of 1983
Legend
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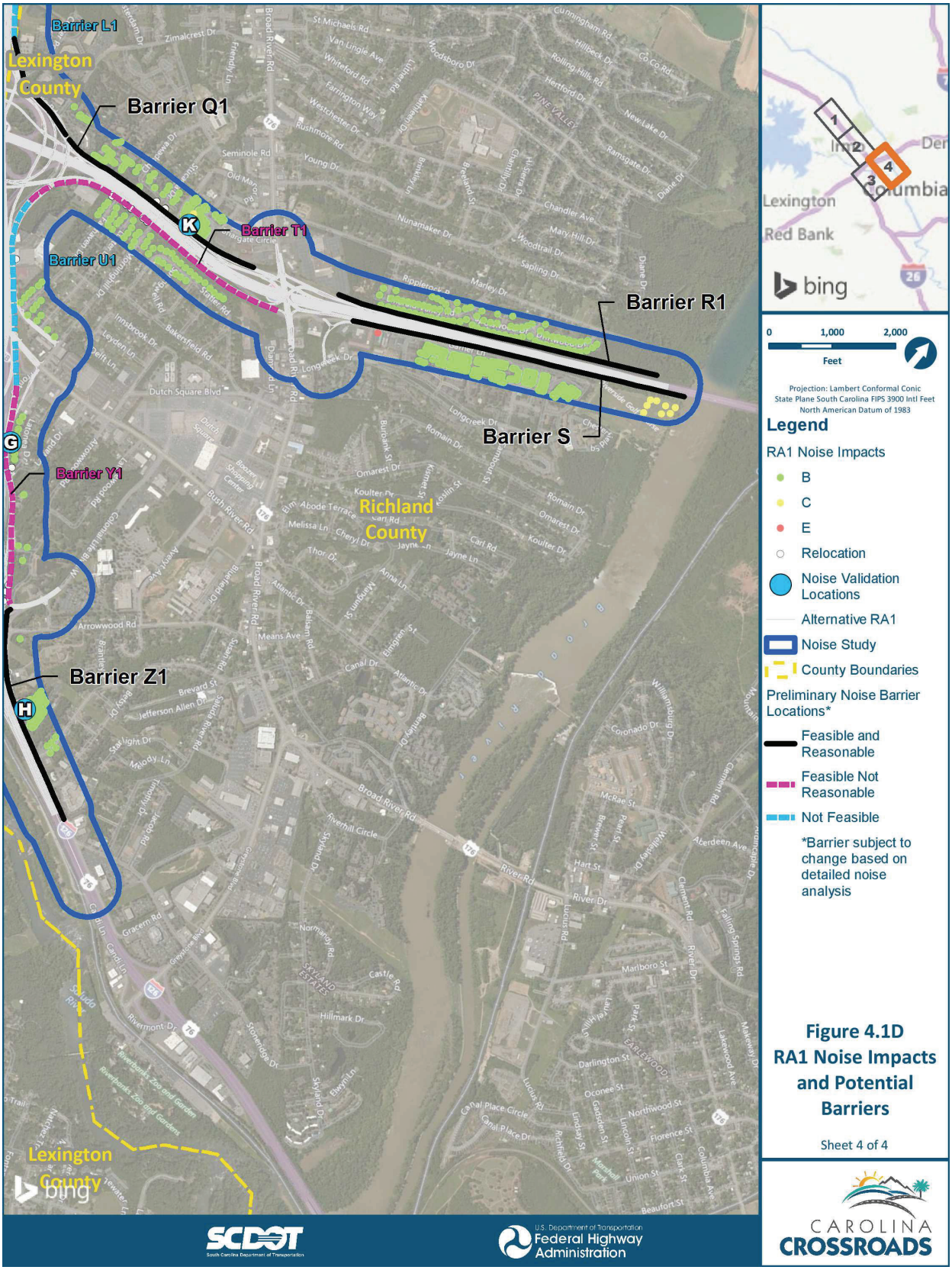
Relocation
Noise Validation Locations
Alternative RA1
Noise Study
County Boundaries
Preliminary Noise Barrier Locations*
Feasible and Reasonable
Feasible Not Reasonable
Not Feasible
*Barrier subject to change based on detailed noise analysis
Figure 4.1C
RA1 Noise Impacts and Potential Barriers
Sheet 3 of 4
SCDOT
South Carolina Department of Transportation
U.S. Department of Transportation
Federal Highway Administration
CAROLINA CROSSROADS


Barrier L1
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Noise Study
County Boundaries
Preliminary Noise Barrier Locations*
Feasible and Reasonable
Feasible Not Reasonable
Not Feasible
*Barrier subject to change based on detailed noise analysis
Figure 4.1D
RA1 Noise Impacts and Potential Barriers
Sheet 4 of 4
SCDOT
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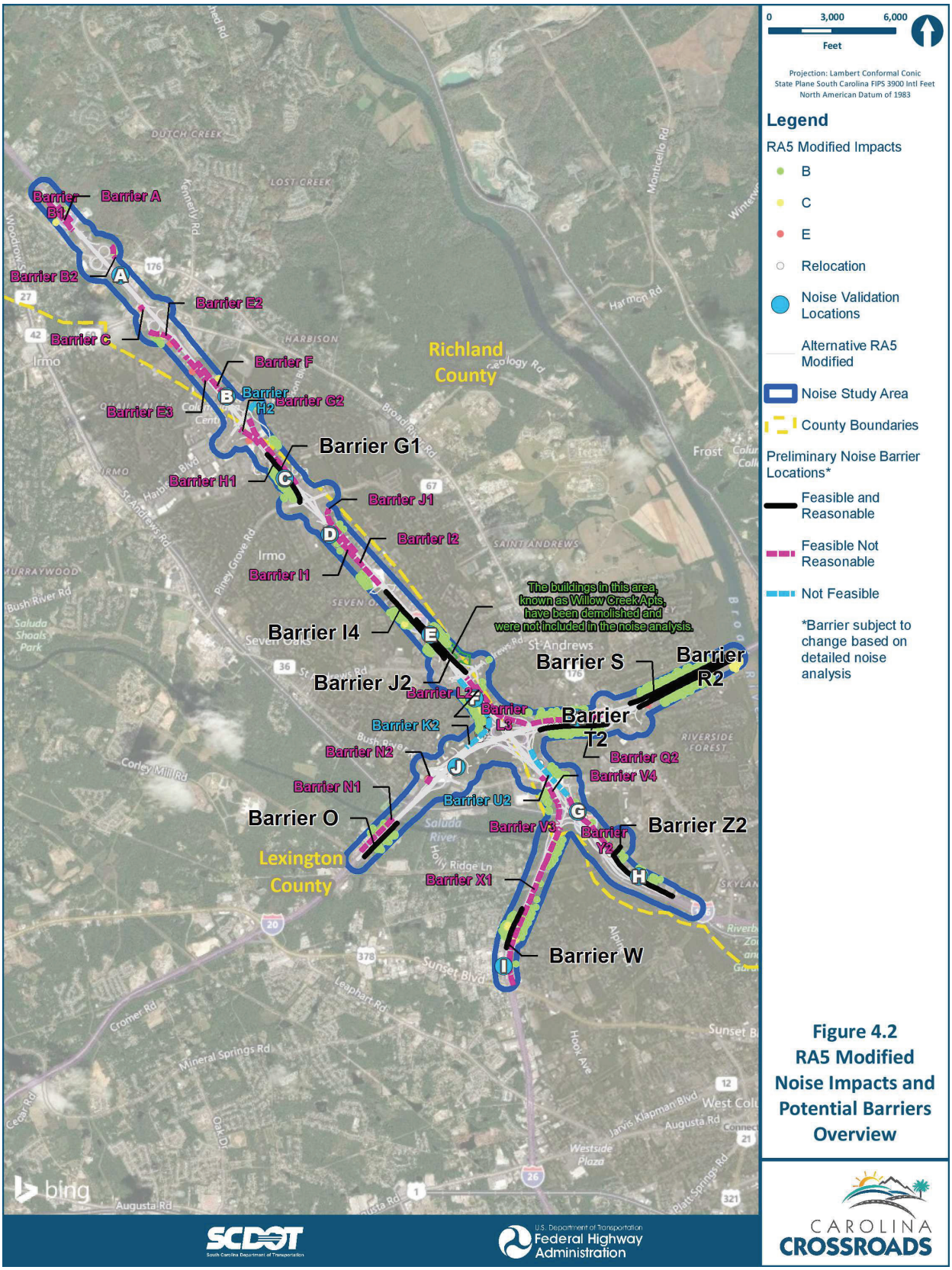
U.S. Department of Transportation
Federal Highway Administration
CAROLINA CROSSROADS


Barrier B1
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Richland County
Barrier G1
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Barrier J1
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Barrier I2
Barrier I1
The buildings in this area, known as Willow Creek Apts, have been demolished and were not included in the noise analysis.
Barrier I4
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Barrier S
Barrier R2
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Barrier K2
Barrier N2
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Barrier Q2
Barrier V4
Barrier N1
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Barrier Y2
Barrier Z2
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Noise Validation Locations
Alternative RA5 Modified
Noise Study Area
County Boundaries
Preliminary Noise Barrier Locations*
Feasible and Reasonable
Feasible Not Reasonable
Not Feasible
*Barrier subject to change based on detailed noise analysis
Figure 4.2
RA5 Modified Noise Impacts and Potential Barriers Overview
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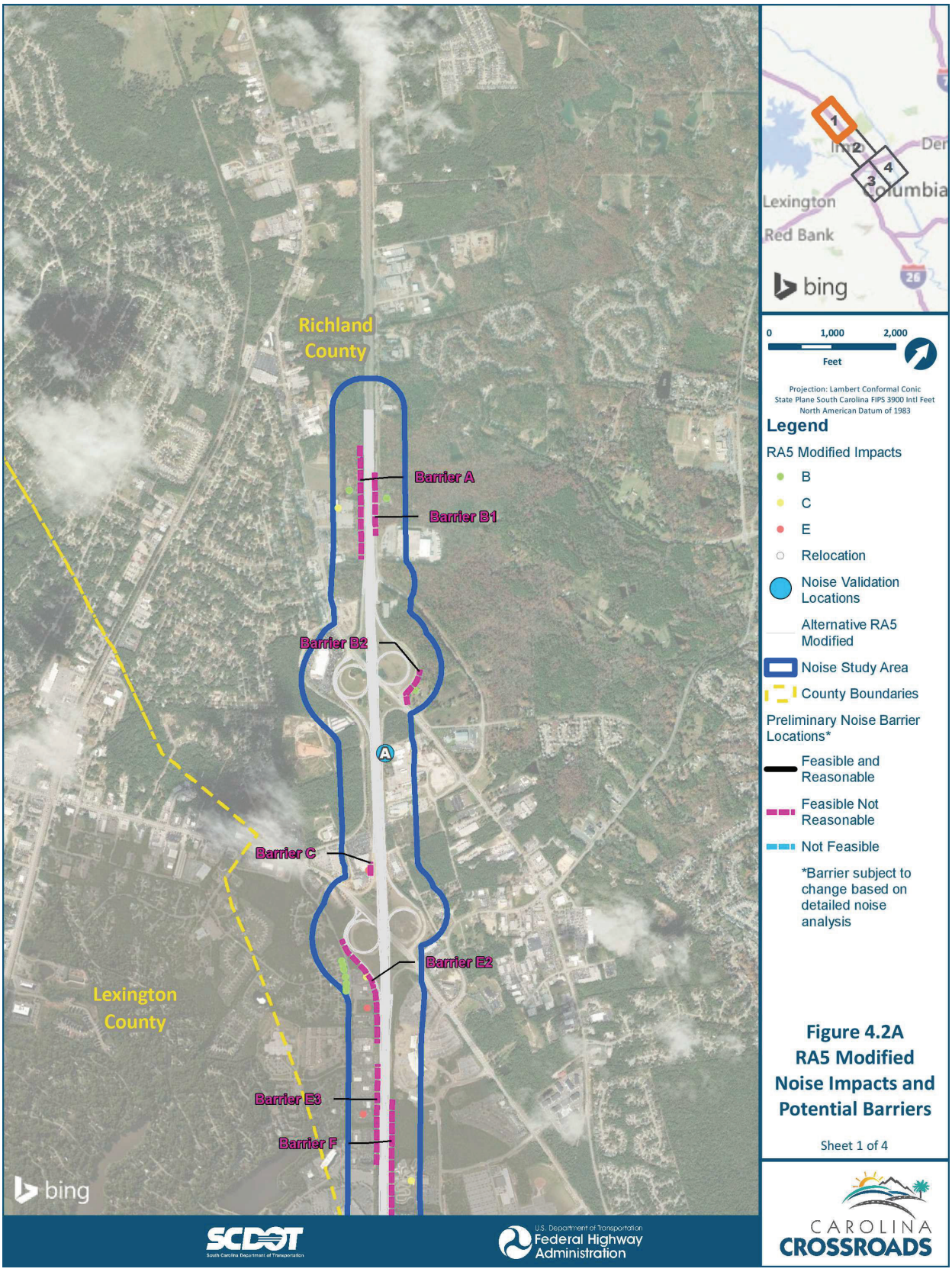
SCDOT
South Carolina Department of Transportation
U.S. Department of Transportation
Federal Highway Administration
CAROLINA CROSSROADS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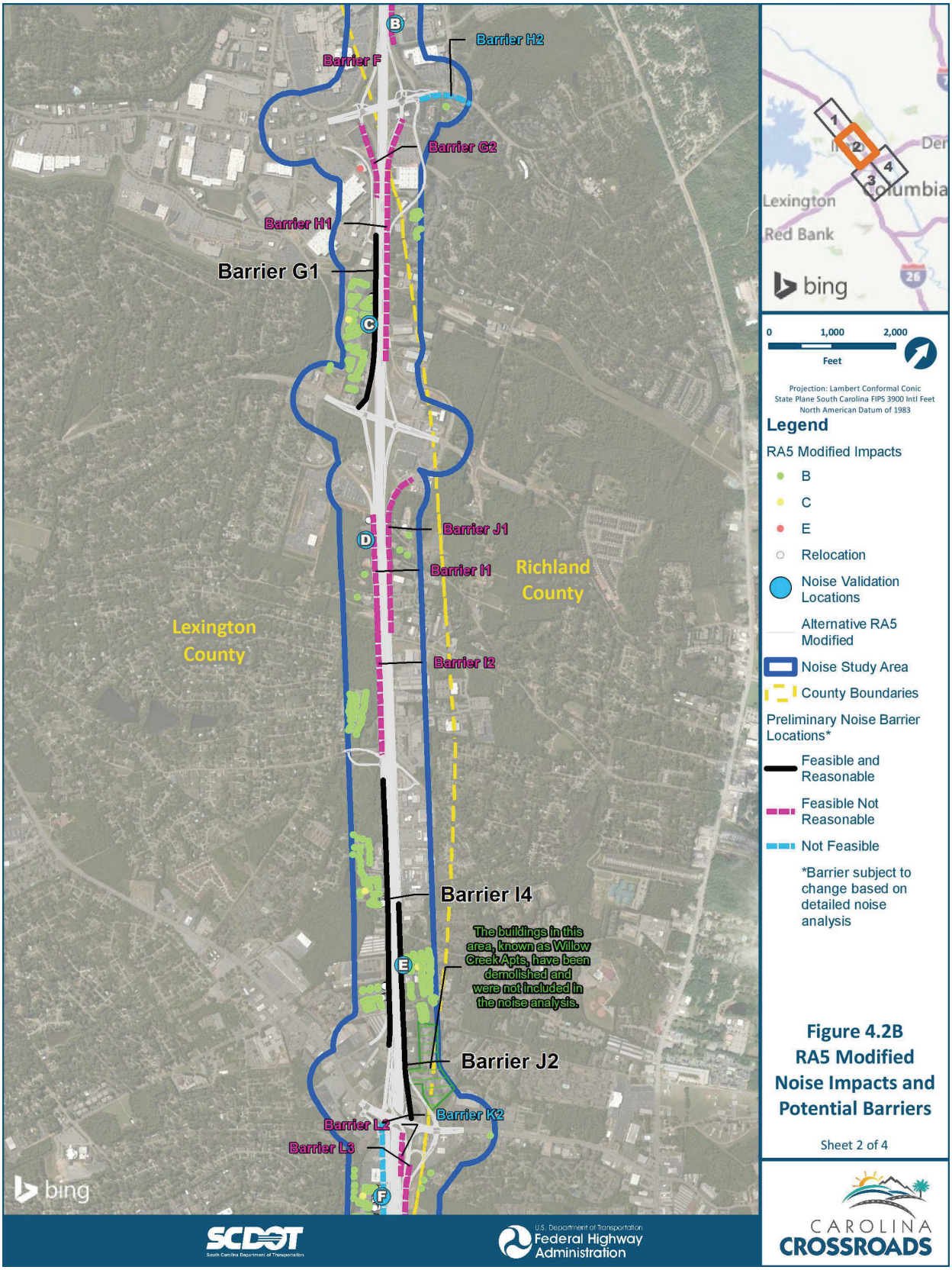
County Boundaries
Preliminary Noise Barrier Locations*
Feasible and Reasonable
Feasible Not Reasonable
Not Feasible
*Barrier subject to change based on detailed noise analysis
Figure 4.2A
RA5 Modified Noise Impacts and Potential Barriers
Sheet 1 of 4
SCDOT
South Carolina Department of Transportation
U.S. Department of Transportation
Federal Highway Administration
CAROLINA CROSSROADS


Barrier H2
Barrier F
Barrier G2
Barrier H1
Barrier G1
Barrier J1
Barrier I1
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Barrier I2
Barrier I4
The buildings in this area, known as Willow Creek Apts, have been demolished and were not included in the noise analysis.
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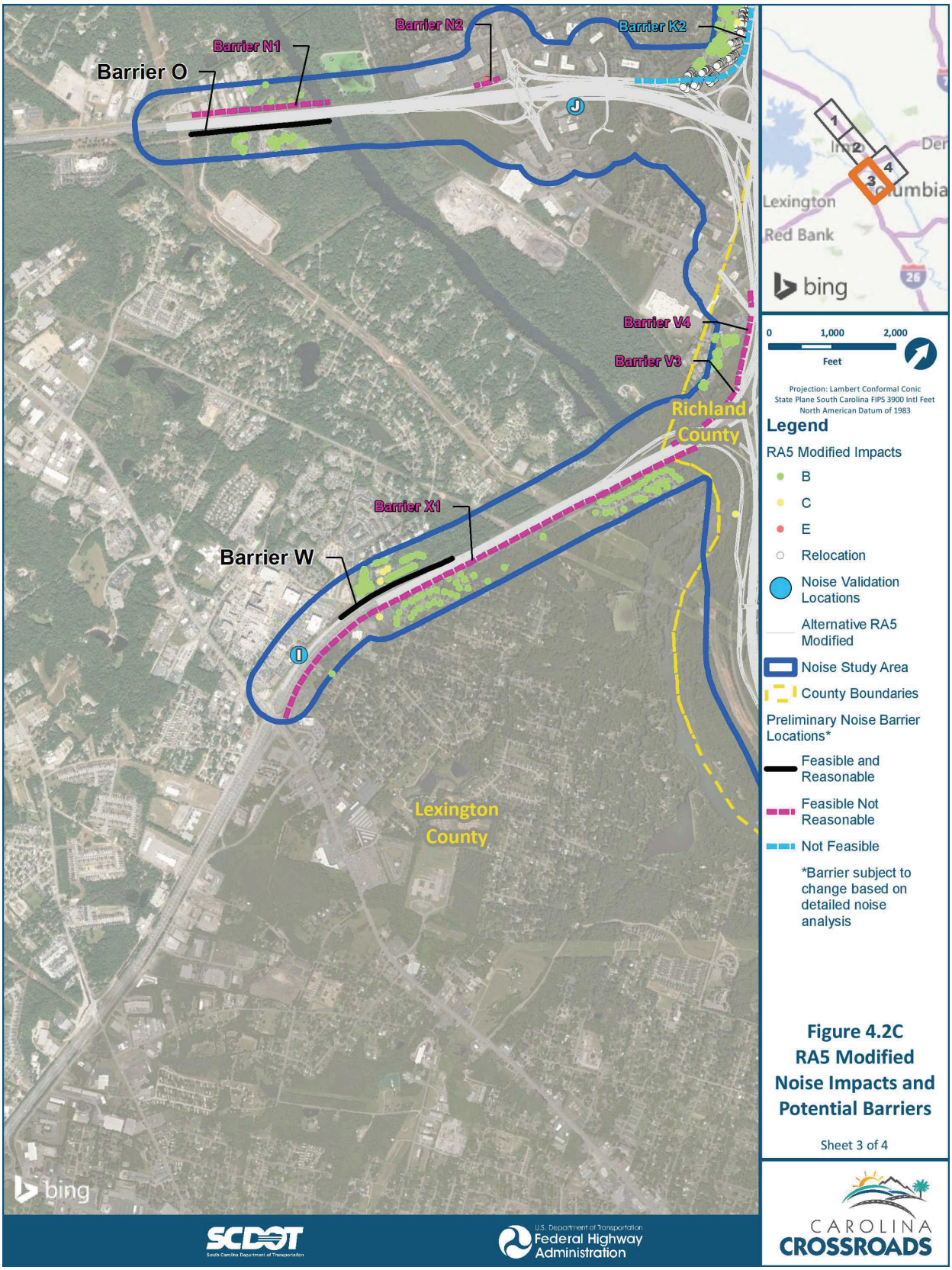
Noise Validation Locations
Alternative RA5 Modified
Noise Study Area
County Boundaries
Preliminary Noise Barrier Locations*
Feasible and Reasonable
Feasible Not Reasonable
Not Feasible
*Barrier subject to change based on detailed noise analysis
Figure 4.2B
RA5 Modified Noise Impacts and Potential Barriers
Sheet 2 of 4
SCDOT
South Carolina Department of Transportation
U.S. Department of Transportation
Federal Highway Administration
CAROLINA CROSSROADS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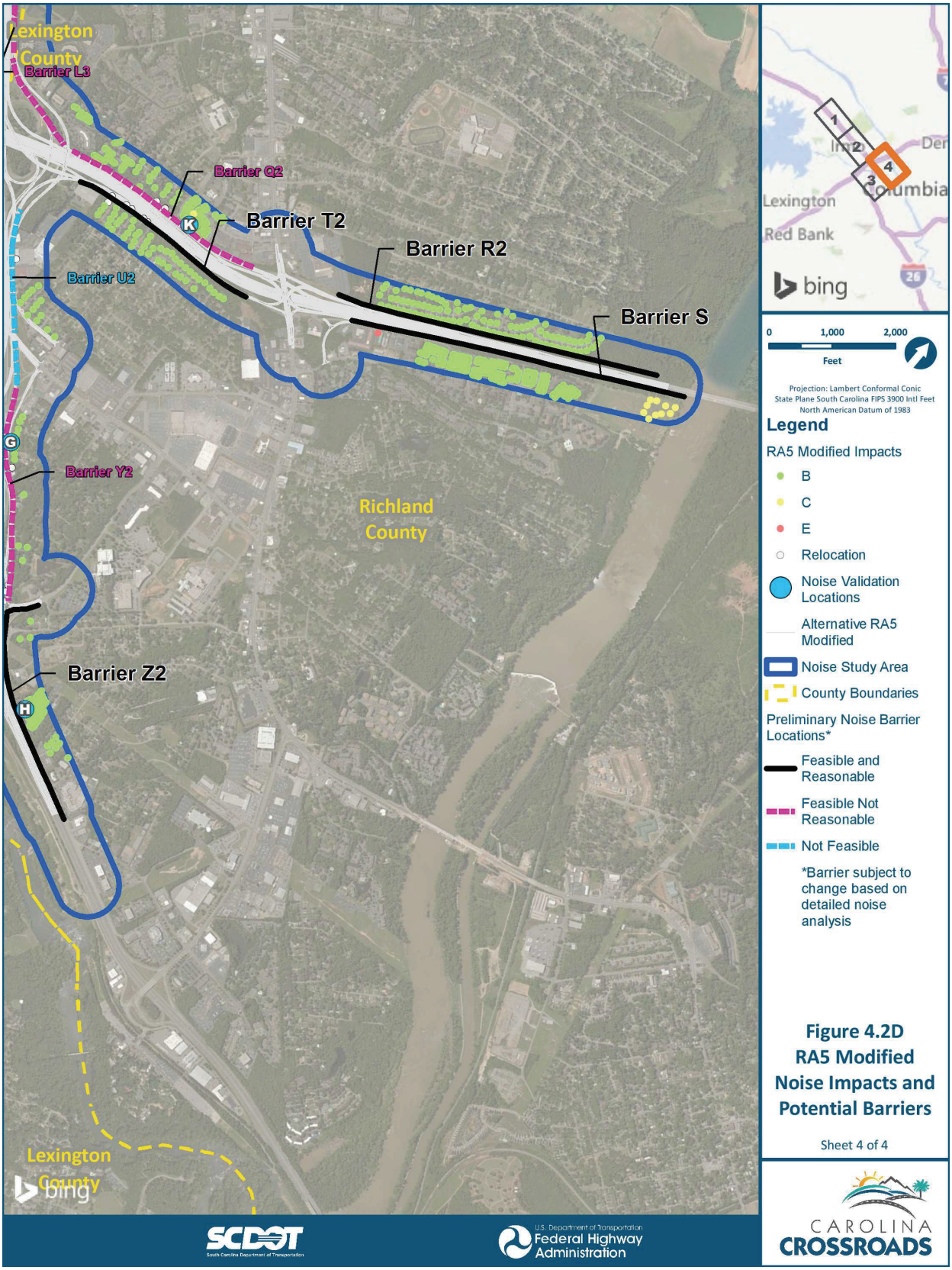
Feasible and Reasonable
Feasible Not Reasonable
Not Feasible
*Barrier subject to change based on detailed noise analysis
Figure 4.2C
RA5 Modified Noise Impacts and Potential Barriers
Sheet 3 of 4
CAROLINA CROSSROADS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Noise Study Area
County Boundaries
Preliminary Noise Barrier Locations*
Feasible and Reasonable
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*Barrier subject to change based on detailed noise analysis
Figure 4.2D
RA5 Modified Noise Impacts and Potential Barriers
Sheet 4 of 4
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5 What happens when noise impacts occur?

Noise abatement measures must be considered for impacted receivers under Build alternatives RA1 and RA5 Modified.

5.1 What noise abatement measures were considered for the Reasonable Alternatives?

In accordance with 23 CFR §772.13 (c) and SCDOT's Noise Abatement Policy, noise abatement measures must be considered for reducing or eliminating noise levels to impacted receivers.[4]

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. The following measures were considered and evaluated as a means to reduce or eliminate the traffic noise impacts:

- Traffic management;
- Alteration of horizontal and vertical alignments;
- Acquisition of real property or interests therein (predominantly unimproved property) to serve as a buffer zone to preempt development;
- Noise insulation of public use or nonprofit institutional structures; and,
- Noise barriers.

Table 5.1 outlines the different types of noise abatement measures considered and whether they were eliminated from consideration or carried forward. Of the possible noise abatement measures considered for the proposed project, only noise barriers were carried forward for consideration due to the constraints listed in Table 5.1 for the other options, primarily because the preliminary design was modified to minimize impacts to the greatest extent to the natural and human environment. The acquisition of additional right-of-way to alter the alignment or create a buffer zone would result in an increase in impacts.

[4] "Traffic Noise Abatement Policy", South Carolina Department of Transportation, September 1, 2014.

Table 5.1 Mitigation Types Considered for Noise Impacts

Mitigation type	Status
Traffic management	Eliminated. 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.
Alteration of horizontal and vertical alignments	Eliminated. Alignment modifications as a means of noise abatement may result in disruptive relocations for this project and may affect other natural resources.
Acquisition of real property or interests therein (predominantly unimproved property)	Eliminated. The taking of adequate property to create an effective buffer zone would most likely involve taking the impacted receivers and would require purchasing additional right-of-way. Additionally, receivers that are farther from the road are likely not impacted.
Noise insulation of public use or nonprofit institutional structures	Eliminated. No public use or nonprofit institutional structures would be impacted by the proposed project.
Noise barriers	Carried forward for further consideration.

5.2 How were noise barriers assessed for mitigation?

The use of structural barriers (freestanding walls) was considered for impacted receivers. There are feasibility and reasonableness criteria that must be met for construction of noise walls. Noise walls are assessed under the feasibility criteria first, and if all conditions are met are then considered for reasonableness. There are two feasibility criteria. Per SCDOT policy acoustic feasibility means that a noise reduction of at least 5 dBA must be achieved for 75% of impacted receivers. There are also seven engineering and design considerations that must be achieved to meet the engineering feasibility criteria. These considerations include topography, safety, drainage, utilities, maintenance, access, and wall height.

Based on the location and concentration of impacted receivers in the build condition, 16 locations for RA1 and 31 locations for RA5 Modified within the project area were considered for noise walls and assessed for adherence to feasibility criteria. Of these, a total of 10 barriers under Alternative RA1 and 9 barriers under Alternative 5A Modified met both the acoustic and engineering feasibility requirements and were assessed for reasonableness. As with feasibility, there are several reasonableness criteria that must be met. These include:

- 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.

- Cost Effectiveness – The allowable cost of the abatement is based on $35.00 per square foot. This allowable cost is based on the cost effectiveness criteria found in SCDOT's Traffic Noise Abatement Policy. This construction cost will be divided by the number of benefited receptors. If the cost per benefited receptor is less than $30,000 then the barrier is determined to be cost effective.
- Property Owners and Residents – SCDOT will solicit the viewpoints of all of the benefited receivers and document a decision on either desiring or not desiring the noise abatement measure. A noise wall will be constructed unless a majority (greater than 50% of the benefited receptors) of votes not desiring noise abatement is received (p.24 of policy). This third criterion is only considered if the noise wall meets the first two criteria.

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 each barrier evaluated (refer to Appendix B and C). Figure 5.1 summarizes the reasonability and feasibility criteria used to assess traffic noise mitigation measures.

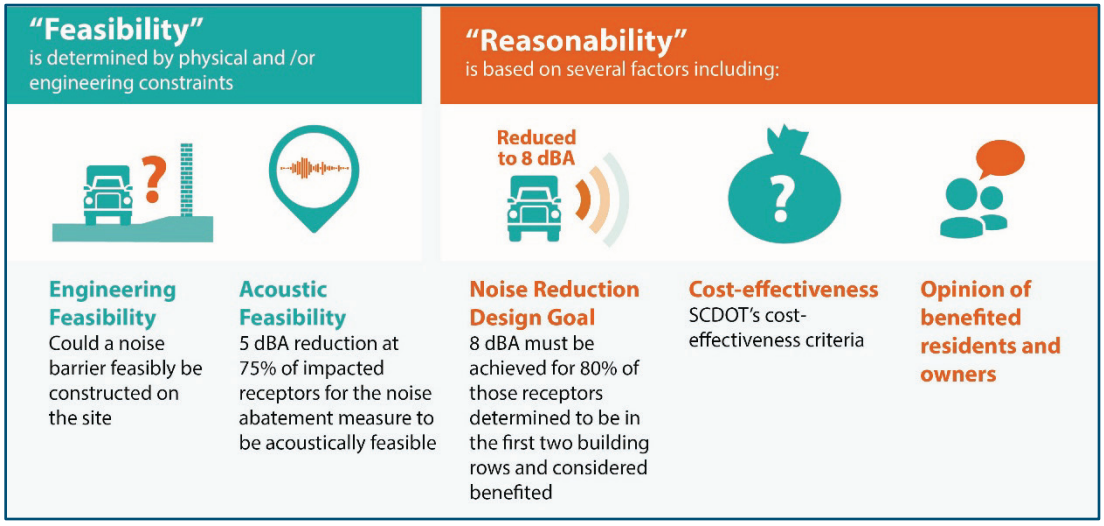

Figure 5-1 Reasonability and Feasibility Criteria

5.2.1 WHAT WERE THE RESULTS OF THE FEASIBILITY AND REASONABLENESS CONSIDERATIONS?

5.2.1.1 Alternative RA1

This section discusses the evaluations of feasibility and reasonableness performed on the barriers that could potentially mitigate projected traffic noise impacts on RA1. Numerous barriers were evaluated as described below. In some instances (i.e. a single impacted receiver behind a proposed barrier), one barrier was evaluated and the results were considered representative of other barriers that only shield one impacted receiver. In some instances, the barrier analysis for Alternative RA5 Modified was applied to RA1 because the project design is the

same and RA5 Modified yielded the worst-case traffic volumes and impacts between the two alternatives. Following are the results of the evaluation of feasibility and reasonableness for barriers identified under Alternative 1.

5.2.1.1.1 Barrier A – Impacted Receivers A1 and A2

Refer to the RA5 Modified evaluation.

5.2.1.1.2 Barrier C – Impacted Receiver C1.

Barrier C is a 229 feet long noise wall whose height is 10 feet. This analysis will also apply to barriers B1, F, and N2, which also only address impacts at one receiver.

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 the one impacted receiver (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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There was one benefited receiver in the first two rows that achieved the 8 dBA reduction (100%). This meets the SCDOT allowable percentage (80%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed not to be reasonable, because the estimated cost per benefited receiver was more than the SCDOT allowable cost ($30,000) per benefitted receiver ($80,150 / one benefited receiver = $80,150).

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

5.2.1.1.3 Barrier E1 – Impacted Receivers E1, E29

Barrier E1 is a 1,312 feet long noise wall whose height is 15 feet.

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 two of the two impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of three receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were two of the three benefited receivers in the first two rows that achieved the 8 dBA reduction (67%). This does not meet the SCDOT allowable percentage (80%) of the benefited receivers.

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

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

5.2.1.1.4 Barrier G1 – Impacted Receivers G2-G48, G53-G176

Barrier G1 is a 2,604 feet long noise wall whose height is 20 feet.

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 166 of the 171 impacted receivers (97%). 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 155 of the 166 benefited receivers in the first two rows that achieved the 8 dBA reduction (93%). This meets the SCDOT allowable percentage (80%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,823,395 / 166 benefited receivers = $10,984).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.1.5 Barrier H1 – Impacted Receivers H5-H8, H70-H73, H94-H97; H270-H293

Barrier H1 is a 4,085 feet long noise wall whose height is 20 feet.

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 36 of the 36 impacted receivers (100%). This meets

the SCDOT allowable percentage (75%) per impacted receiver. A total of 36 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 36 of the 36 benefited receivers in the first two rows that achieved the 8 dBA reduction (100%). This meets the SCDOT allowable percentage (80%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed not to be reasonable, as the estimated cost per benefited receiver was more than the SCDOT allowable cost ($30,000) per benefitted receiver ($2,859,500 / 36 benefited receivers = $79,431).

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

5.2.1.1.6 Barrier H2 – Impacted Receiver H215

Barrier H2 is a 845 feet long noise wall whose height is 25 feet.

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 not achieved for the one impacted receiver (0%). This does not meet the SCDOT allowable percentage (75%) per impacted receiver.

Engineering Feasibility: No known issues at this time.

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is not feasible. Per SCDOT Policy, the reasonableness analysis is not applicable since the feasibility criteria were not met.

5.2.1.1.7 Barrier I1 – Impacted Receivers I16-I18

Barrier I1 is a 2,006 feet long noise wall whose height is 20 feet.

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 three of the three impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of three receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were three of the three benefited receivers in the first two rows that achieved the 8 dBA reduction (100%). This meets the SCDOT allowable percentage (80%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed to be not reasonable, because the estimated cost per benefited receiver was more than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,403,465/3 benefited receivers = $ 467,822).

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

5.2.1.1.8 Barrier I2 – Impacted Receivers I1-I11, I19-I43

Barrier I2 is a 2,404 feet long noise wall whose height is 25 feet.

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 36 of the 36 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 in the first two building rows. There were 17 of the 28 benefited receivers in the first two rows that achieved the 8 dBA reduction (61%). This does not meet the SCDOT allowable percentage (80%) of the benefited receivers.

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

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

5.2.1.1.9 Barrier I3 – Impacted Receivers I12-I14; I44-I107; I109; I112; I116-I143; I145; I149-I163; I168-I169

Barrier I3 is a 4,003 feet long noise wall whose height is 20 feet.

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 115 of the 115 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 81 of the 92 benefited receivers in the first two rows that achieved the 8 dBA reduction (88%). This meets the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($2,801,015 / 115 benefited receivers = $24,357).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.1.10 Barrier J1 – Refer to the RA5 Modified evaluation.

5.2.1.1.11 Barrier J2 – Impacted Receivers J1-J9, J15-J20; J23-J28, J34-J299, J300-J301, J302-J304

Barrier J2 is a 3,210 feet long noise wall whose height is 15 feet.

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 251 the 292 impacted receivers (86%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 254 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 136 of the 148 benefited receivers in the first two rows that achieved the 8 dBA reduction (100%). This meets the SCDOT allowable percentage (92%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,685,600 / 254 benefited receivers = $6,636).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.1.12 Barrier K1 – Impacted Receivers K24-K49, K51, K53, K55, K57, K59, K61, K63, K65, K67, K70-K73, K75, K77, K79, K81, K83, K85, K87, K89, K91, K93, K95, K97, K99, K101, K103, K105, K107, K109, K111, K113, K115, K117, K119, K121, K123, K125-K143, K145, K147, K153, K155-K157, K159-K160, K163, K166, K176-K179, K186, K189-K191, K193-K195, K197-K209, K213, K215-K218, K221, K223-K226, K228, K230, K233, K238, K241, K243, K246, K248-K251, K253, K256-K258, K264, K268, K276, K278, K284-K285, K288, K290-K291, K294-K295, K297, K302, K304-K305, K310-K311, K314-K316, K318, K320-K324, K326-K328, K330-K332, K334, K337-K338, K342, K344-K402

Barrier K1 is a 4,742 feet long noise wall whose height is 25 feet.

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 234 of the 234 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 292 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 227 of the 273 benefited receivers in the first two rows that achieved the 8 dBA reduction (83%). This meets the SCDOT allowable percentage (80%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver is less than the SCDOT allowable cost ($30,000) per benefitted receiver ($4,146,170 / 234 benefited receivers = $14,199).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.1.13 Barrier L1/L2 – Impacted Receivers L53-L55, L60, L70

Barrier L1/L2 is a 2,054 feet long noise wall whose height is 25 feet.

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 three of the five impacted receivers (60%). This does not meet the SCDOT allowable percentage (75%) per impacted receiver. A total of four receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is not feasible. Per SCDOT Policy, the reasonableness analysis is not applicable since the feasibility criteria were not met.

5.2.1.1.14 Barrier N1 – Refer to the RA5 Modified evaluation.

5.2.1.1.15 Barrier O – Refer to the RA5 Modified evaluation.

5.2.1.1.16 Barrier Q1 – Impacted Receivers Q1, Q3, Q5, Q7, Q9, Q11, Q13, Q15, Q17, Q19, Q21, Q23, Q25, Q27, Q29, Q43, Q45, Q51, Q53, Q55, Q57, Q61, Q63-Q194, L26, L28, L40, L48, L50

Barrier Q1 is a 5,327 feet long noise wall whose height is 20 feet.

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 157 of the 157 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 213 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that at a noise reduction of least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 158 of the 198 benefited receivers in the first two rows that achieved the 8 dBA reduction (80%). This meets the SCDOT allowable percentage (80%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver is less than the SCDOT allowable cost ($30,000) per benefitted receiver ($3,731,665 / 213 benefited receivers = $17,520).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.1.17 Barrier R1 – Refer to the RA5 Modified evaluation for Barrier R2.

5.2.1.1.18 Barrier S – Refer to the RA5 Modified evaluation.

5.2.1.1.19 Barrier T1 – Impacted Receivers T1-T3, T5, T16-T22, T24-T26, T28-T30, T32, T34-T55, T57, T60-T61, T63-T64

Barrier T1 is a 4,569 feet long noise wall whose height is 25 feet.

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 44 of the 45 impacted receivers (98%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 59 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 39 of the 41 benefited receivers in the first two rows that achieved the 8 dBA reduction (95%). This meets the SCDOT allowable percentage (80%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed to be not reasonable, because the estimated cost per benefited receiver is more than the SCDOT allowable cost ($30,000) per benefitted receiver ($3,998,225 / 59 benefited receivers = $67,767).

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

5.2.1.1.20 Barrier U1 – Impacted Receivers U16-U25, U28-U29, U31, U34

Barrier U1 is a 2,833 feet long noise wall whose height is 25 feet.

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 10 of the 14 impacted receivers (71%). This does not meet the SCDOT allowable percentage (75%) per impacted receiver. A total of 15 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is not feasible. Per SCDOT Policy, the reasonableness analysis is not applicable since the feasibility criteria were not met.

5.2.1.1.21 Barrier V1/V2 – Impacted Receivers V2, V5-V7, V9, V11, V13-V15, V17, V19, V22, V24, V26, V28-V29, V31-V46

Barrier V1/V2 is a 2,916 feet long noise wall whose height is 25 feet.

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 32 of the 32 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 46 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 30 of the 46 benefited receivers in the first two rows that achieved the 8 dBA reduction (65%). This does not meet the SCDOT allowable percentage (80%) of the benefited receivers.

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

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

5.2.1.1.22 Barrier W – Refer to the RA5 MODIFIED evaluation.

5.2.1.1.23 Barrier X2 – Impacted Receivers X1, X8-X14, X17-X51, X53-X57, X59-X65, X67-X71, X73, X77

Barrier X2 is a 6,851 feet long noise wall whose height is 20 feet.

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 62 of the 62 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 71 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 63 of the 63

benefited receivers in the first two rows that achieved the 8 dBA reduction (100%). This meets the SCDOT allowable percentage (80%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed not to be reasonable, because the estimated cost per benefited receiver is more than the SCDOT allowable cost ($30,000) per benefitted receiver ($4,795,280 / 71 benefited receivers = $67,539).

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

5.2.1.1.24 Barrier Y1 – Impacted Receivers Y1-Y4, Y6, Y8, Y11, Y13, Y20, Y22, Y24-Y25

Barrier Y1 is a 3,508 feet long noise wall whose height is 25 feet.

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 12 of the 12 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 22 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that at a noise reduction of least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 15 of the 21 benefited receivers in the first two rows that achieved the 8 dBA reduction (71%). This does not meet the SCDOT allowable percentage (80%) of the benefited receivers.

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

5.2.1.1.25 Barrier Z1 – Impacted Receivers Z2, Z12-Z20, Z22-Z24, Z26, Z28-Z32, Z34, Z36-Z55, Z58, Z60, Z62-Z63, Z65-Z67, Z69-Z74, Z76-Z97, Z99-Z119, Z121-Z122, Z124, Z126-Z182, Z184-Z185

Barrier Z1 is a 3,535 feet long noise wall whose height is 20 feet.

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 147 of the 147 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 158 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers in the first two building rows. There were 151 of the 153 benefited receivers in the first two rows that achieved the 8 dBA reduction (99%). This meets the SCDOT allowable percentage (80%) of the benefited receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver is less than the SCDOT allowable cost ($30,000) per benefitted receiver ($2,474,395 / 158 benefited receivers = $15,661).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.1.26 RA1 (Preferred) Mitigation Summary

Based on the preliminary noise analysis, under this alternative fifteen barriers were determined to be feasible but not reasonable; ten barriers were determined to be reasonable and feasible; and three barriers were determined to not be feasible (and therefore no reasonableness assessment occurred). Appendix B contains the worksheets for these determinations. Please refer to the RA5 MODIFIED worksheets (in Appendix C) for barriers that apply to RA1 as analyzed under the RA5 Modified alternative. A summary of the barrier analysis is presented in Table 5.2. The location of the proposed noise walls is shown on Figure A3 in Appendix A. Following the public hearing, a detailed noise analysis will be completed to verify these results. The detailed noise analysis may modify where barriers are located, as well as if barriers are warranted in certain locations. If a barrier is feasible and reasonable in the preliminary analysis and it is determined not feasible and reasonable in the detailed analysis, SCDOT will notify the benefited receptors of that barrier that the barrier is no longer warranted per the SCDOT Noise Policy requirements. If a barrier that is determined not to be feasible and reasonable in the preliminary analysis, but is determined to be feasible and reasonable in the detailed analysis per the requirements in the SCDOT noise policy, the benefited receptors of the barrier will be notified by SCDOT.

Table 5.2 Summary of Preliminary Noise Mitigation Analysis, RA1 (Preferred)

Alternative RA1 (Preferred)					
Barrier	**Dimensions (length x height, feet)**	**Cost[5]**	**Feasible**	**Reasonable**	**Proposed**
A	1,800x25	$1,575,035	Yes	No	No
B1	See C				
C	229x10	$80,150	Yes	No	No
E1	1,312x15	N/A	Yes	No	No
F	See C				

[5] Note: Instances where the noise wall cost does not exactly equal to the wall area multiplied by $35/sq ft. are due to rounding that occurs during barrier dimension calculations performed by TNM

Alternative RA1 (Preferred) Barrier	Dimensions (length x height, feet)	Cost[5]	Feasible	Reasonable	Proposed
G1	2,604x20	$1,823,395	Yes	Yes	Yes
H1	4,085x20	$2,859,500	Yes	No	No
H2	845x25	N/A	No	N/A	No
I1	2,006x20	$1,403,465	Yes	No	No
I2	2,404x25	N/A	Yes	No	No
I3	4,003x20	$2,801,015	Yes	Yes	Yes
J1	2,600x15	$1,365,245	Yes	No	No
J2	3,210x15	$1,685,600	Yes	Yes	Yes
K1	4,742x25	$4,146,170	Yes	Yes	Yes
L1/L2	2,054x25	N/A	No	N/A	No
N1	2,200x15	$1,155,014	Yes	No	No
N2	See C				
O	2,200x15	$1,154,930	Yes	Yes	Yes
Q1	5,327x20	$3,731,665	Yes	Yes	Yes
R1	5,200x15	$2,729,860	Yes	Yes	Yes
S	5,400x25	$4,725,035	Yes	Yes	Yes
T1	4,569x25	$3,998,225	Yes	No	No
U1	2,833x25	N/A	No	N/A	No
V1/V2	2,916x25	N/A	Yes	No	No
W	2,000x25	$1,749,650	Yes	Yes	Yes
X2	6,851x20	$4,795,280	Yes	No	No
Y1	3,508x25	N/A	Yes	No	No
Z1	3,535x20	$2,474,395	Yes	Yes	Yes

5.2.1.2 Alternative RA5 Modified

This section discusses the evaluations of feasibility and reasonableness performed on the barriers that could potentially mitigate projected traffic noise impacts on Alternative RA5 Modified. Numerous barriers were evaluated as described below. In some instances (i.e. a single impacted receiver behind a proposed barrier), one barrier was evaluated and the results were considered representative of other barriers that only shield one impacted receiver. Following are the results of the evaluation of feasibility and reasonableness for barriers identified under Alternative RA5 Modified.

5.2.1.2.1 Barrier A – Impacted Receivers A1, A2

Barrier A is a 1,800 feet long noise wall whose height is 25 feet.

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 both 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 a noise reduction of least 8 dBA must be achieved for 80 percent of the benefited receivers. Both of the two benefited receivers in the first two rows 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 to be not reasonable, because the estimated cost per benefited receiver was greater than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,575,035 / 2 benefited receivers = $787,518).

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

5.2.1.2.2 Barrier B1 – Impacted Receiver B1

This analysis will also apply to the other barriers that only address impacts at one receiver (Barriers B2, C, E3, F, G2, and N2). Barrier B is a 1,000 feet long noise wall whose height is 25 feet. These same dimensions are assumed to apply at other locations where a wall would be modeled to shield a single impacted receptor.

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 the one impacted receiver (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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There was one benefited receiver in the first two rows 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 to be not reasonable, because the estimated cost per benefited receiver was greater than the SCDOT allowable cost ($30,000) per benefitted receiver ($875,049 / 1 benefited receiver = $875,049).

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

5.2.1.2.3 Barrier E2 – Impacted Receivers E1, E21, E23-E29

Barrier E2 is an 1,820 feet long noise wall whose height is 25 feet.

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 9 of the 9 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 16 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 9 of the 16 benefited receivers in the first two rows that achieved the 8 dBA reduction (56%). This does not meet the SCDOT allowable percentage (80%) of the benefitted receivers.

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

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

5.2.1.2.4 Barrier G1 – Impacted Receivers G2-G48; G53-G98, G100-G142; G144-G176

Barrier G1 is a 2,780 feet long noise wall whose height is 20 feet.

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 166 of the 169 impacted receivers (98%). 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 162 of the 166 benefited receivers in the first two rows that achieved the 8 dBA reduction (98%). This meets the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,945,650 / 166 benefited receivers = $11,721).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.2.5 Barrier H1 – Impacted Receivers H5-H8; H70-H73; H94-H97; H270-H293

Barrier H1 is a 3,492 feet long noise wall whose height is 20 feet.

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 36 of the 36 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 a noise reduction of least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 36 of the 36 benefited receivers in the first two rows 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, because the estimated cost per benefited receiver was more than the SCDOT allowable cost ($30,000) per benefitted receiver ($2,444,575 / 36 benefited receivers = $67,905).

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

5.2.1.2.6 Barrier H2 – Impacted Receivers H215, H218

Barrier H2 is an 844 feet long noise wall whose height is 25 feet.

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 0 of the 2 impacted receivers (0%). This does not meet the SCDOT allowable percentage (75%) per impacted receiver.

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is not feasible. Per SCDOT Policy, the reasonableness analysis is not applicable since the feasibility criteria were not met.

5.2.1.2.7 Barrier I1 – Impacted Receivers I16-I18

Barrier I1 is an 2,000 feet long noise wall whose height is 20 feet.

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 3 of the 3 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 3 of the 3 benefited receivers in the first two rows 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, because the estimated cost per benefited receiver was greater than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,399,930 / 3 benefited receivers = $466,643).

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

5.2.1.2.8 Barrier I2 – Impacted Receivers I1-I11; I19-I43

Barrier I2 is a 2,400 feet long noise wall whose height is 25 feet.

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 36 of the 36 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 18 of the 28 benefited receivers in the first two rows that achieved the 8 dBA reduction (64%). This does not meet the SCDOT allowable percentage (80%) of the benefitted receivers.

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

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

5.2.1.2.9 Barrier I4 – Impacted Receivers I12-I14; I44-I107; I109; I112; I116-I143; I145; I149-I163; I168-I169

Barrier I4 is a 4,200 feet long noise wall whose height is 25 feet.

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 115 of the 115 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 85 of the 92 benefited receivers in the first two rows that achieved the 8 dBA reduction (92%). This does not meet the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($2,939,755 / 115 benefited receivers = $25,563).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.2.10 Barrier J1 – Impacted Receivers J31-J33

Barrier J1 is a 2,600 feet long noise wall whose height is 15 feet.

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 3 of the 3 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 3 of the 3 benefited receivers in the first

two rows 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 to be not reasonable, because the estimated cost per benefited receiver was greater than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,365,245 / 3 benefited receivers = $455,082).

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

5.2.1.2.11 Barrier J2 – Impacted Receivers J1-J12; J15-J20; J23-J28; J31-J304

Barrier J2 is a 3,400 feet long noise wall whose height is 15 feet.

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 295 of the 295 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 187 of the 189 benefited receivers in the first two rows that achieved the 8 dBA reduction (99%). This meets the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, as the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,785,000 / 295 benefited receivers = $6,051).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.2.12 Barrier K2 – Impacted Receivers K5-K9, K24-K61, K63-K65, K67-K68, K70-K83, K85, K87, K89, K91, K93, K95, K97, K99, K101, K111, K113, K115-K117, K119, K121, K123, K125-K143, K145, K147, K153, K155-K157, K159-K160, K163, K166, K176-K179, K186, K189-K191, K193-K195, K197-K201, K205, K207-K209, K213, K215-K217, K226, K228, K230, K233, K238, K246, K251, K256-K257, K290-K291, K294-K295, K297, K302, K304-K305, K311, K315, K321, K327-K328, K331, K334, K338

Barrier K2 is a 4,177 feet long noise wall whose height is 25 feet.

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 0 of the 157 impacted receivers (0%). This does not meet the SCDOT allowable percentage (75%) per impacted receiver.

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is not feasible. Per SCDOT Policy, the reasonableness analysis is not applicable since the feasibility criteria were not met.

5.2.1.2.13 Barrier L2/L3 – Impacted Receivers L53-L55, L70

Barrier L2/L3 is a 2,330 feet long noise wall whose height is 25 feet.

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 3 of the 4 impacted receivers (75%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 8 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There was 1 of the 8 benefited receivers in the first two rows that achieved the 8 dBA reduction (13%). This does not meet the SCDOT allowable percentage (80%) of the benefitted receivers.

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

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

5.2.1.2.14 Barrier N1 – Impacted Receivers N1-N6

Barrier N1 is a 2,200 feet long noise wall whose height is 15 feet.

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 6 of the 6 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 6 of the 6 benefited receivers in the first two rows 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 to be not reasonable, because the estimated cost per benefited receiver was greater than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,155,014 / 6 benefited receivers = $192,502).

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

5.2.1.2.15 Barrier O – Impacted Receivers O1-O50

Barrier O is a 2,200 feet long noise wall whose height is 15 feet.

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 50 of the 50 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 43 of the 50 benefited receivers in the first two rows that achieved the 8 dBA reduction (86%). This meets the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,154,930 / 50 benefited receivers = $23,099).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.2.16 Barrier Q2 – Impacted Receivers Q1-Q5, Q7, Q9, Q11, Q13, Q15, Q17, Q19, Q21, Q23, Q25, Q27, Q29, Q43, Q45, Q48-Q51, Q53, Q55, Q57, Q61, Q63-Q194, L8, L16, L24, L26, L28, L38, L40, L42, L44, L46, L48, L50

Barrier Q2 is a 5,047 feet long noise wall whose height is 25 feet.

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 169 of the 169 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 231 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 160 of the 216 benefited receivers in the first two rows that achieved the 8 dBA reduction (74%). This does not meet the SCDOT allowable percentage (80%) of the benefitted receivers.

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

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

5.2.1.2.17 Barrier R2 – Impacted Receivers R1-R93

Barrier R2 is a 5,200 feet long noise wall whose height is 15 feet.

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 93 of the 93 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 76 of the 76 benefited receivers in the first two rows 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 to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($2,729,860 / 93 benefited receivers = $29,353).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.2.18 Barrier S – Impacted Receivers S196, S198-S498

Barrier S is a 5,400 feet long noise wall whose height is 25 feet.

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 302 of the 302 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 315 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 259 of the 262 benefited receivers in the first two rows that achieved the 8 dBA reduction (99%). This meets the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($4,725,035 / 315 benefited receivers = $15,000).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.2.19 Barrier T2 – Impacted Receivers T1-T5; T16-T17; T19-T22; T24-T57; T60-T61; T63-T64

Barrier T2 is a 3,201 feet long noise wall whose height varies between 10 and 15 feet.

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 45 of the 46 impacted receivers (98%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 55 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 31 of the 37 benefited receivers in the first

two rows that achieved the 8 dBA reduction (84%). This meets the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,645,735 / 55 benefited receivers = $29,922).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.2.20 Barrier U2 – Impacted Receivers U16-U20; U22-U25; U28-U29; U31; U34

Barrier U2 is a 2,669 feet long noise wall whose height is 25 feet.

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 0 of the 13 impacted receivers (0%). This does not meet the SCDOT allowable percentage (75%) per impacted receiver.

Engineering Feasibility: No known issues at this time.

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is not feasible. Per SCDOT Policy, the reasonableness analysis is not applicable since the feasibility criteria were not met.

5.2.1.2.21 Barrier V3-V4 – Impacted Receivers V2; V4-V7; V9; V11-V17; V19; V22; V24; V26; V28-V29; V31-V46

Barrier V3-V4 is a 2,406 feet long noise wall whose height is 25 feet.

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 35 of the 35 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 44 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 13 of the 43 benefited receivers in the first two rows that achieved the 8 dBA reduction (30%). This does not meet the SCDOT allowable percentage (80%) of the benefitted receivers.

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

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

5.2.1.2.22 Barrier W – Impacted Receivers W4, W6, W8, W18, W20, W25-W26, W28, W30, W32, W34-W92

Barrier W is a 2,000 feet long noise wall whose height is 25 feet.

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 69 of the 69 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 55 of the 62 benefited receivers in the first two rows that achieved the 8 dBA reduction (89%). This meets the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, because the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($1,749,650 / 69 benefited receivers = $25,357).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.2.23 Barrier X – Impacted Receivers X1-X3; X8-X14; X17-X21; X23-X32; X34-X51; X53-X57; X59-X74; X77-X78

Barrier X is a 7,998 feet long noise wall whose height is 20 feet.

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 65 of the 66 impacted receivers (98%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 74 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 64 of the 66 benefited receivers in the first two rows that achieved the 8 dBA reduction (97%). This meets the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be not reasonable, because the estimated cost per benefited receiver was greater than the SCDOT allowable cost ($30,000) per benefitted receiver ($5,597,795 / 74 benefited receivers = $75,646).

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

5.2.1.2.24 Barrier Y2 – Impacted Receivers Y1-Y4, Y6, Y8, Y11, Y13, Y20, Y22, Y24-Y25

Barrier Y2 is a 3.399 feet long noise wall whose height is 25 feet.

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 11 of the 12 impacted receivers (92%). A total of 15 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction. 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 a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 8 of the 15 benefited receivers in the first two rows that achieved the 8 dBA reduction (53%). This did not meet the SCDOT allowable percentage (80%) of the benefitted receivers.

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

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

5.2.1.2.25 Barrier Z2 – Impacted Receivers Z1-Z2; Z5; Z12-Z20; Z28-Z53; Z62; Z66-Z67; Z69-Z119; Z122-Z186

Barrier Z2 is a 3,985 feet long noise wall whose height is 25 feet.

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 157 of the 157 impacted receivers (100%). This meets the SCDOT allowable percentage (75%) per impacted receiver. A total of 161 receivers (including impacted and non-impacted) achieved 5 dBA of noise reduction.

Engineering Feasibility: No known issues at this time.

Reasonableness:

Noise Reduction Design Goal: SCDOT noise policy states that a noise reduction of at least 8 dBA must be achieved for 80 percent of the benefited receivers. There were 155 of the 156 benefited receivers in the first two rows that achieved the 8 dBA reduction (99%). This met the SCDOT allowable percentage (80%) of the benefitted receivers.

Cost Effectiveness: The analyzed feature was deemed to be reasonable, as the estimated cost per benefited receiver was less than the SCDOT allowable cost ($30,000) per benefitted receiver ($3,486,455 / 161 benefited receivers = $21,655).

Conclusion: Based on the above results of the preliminary analysis, this abatement feature is feasible and reasonable.

5.2.1.2.26 RA5 Modified Mitigation Summary

Based on the preliminary noise analysis, under this alternative nineteen barriers were determined to be feasible but not reasonable; nine barriers were determined to be reasonable and feasible; and three barriers were determined to not be feasible (and therefore no reasonableness assessment occurred). Appendix C contains the worksheets for these determinations. A summary of the barrier analysis is presented in Table 5.3. The location of the proposed noise walls is shown on Figure A4 in Appendix A. Following the public hearing, a detailed noise analysis will be completed to verify these results. The detailed noise analysis may modify where barriers are located, as well as if barriers are warranted in certain locations. If a barrier is feasible and reasonable in the preliminary analysis and it is determined not to be feasible and reasonable in the detailed analysis, SCDOT will notify the benefited receptors of that barrier that the barrier is no longer warranted per the SCDOT Noise Policy requirements. If a barrier that is determined not to be feasible and reasonable in the preliminary analysis, but is determined to be feasible and reasonable in the detailed analysis per the requirements in the SCDOT noise policy, the benefited receptors of the barrier will be notified by SCDOT.

Table 5.3 Summary of Preliminary Noise Mitigation Analysis for RA5 Modified

Alternative RA5 Modified Barrier	Dimensions (length x height, feet)	Cost[6]	Feasible	Reasonable	Proposed
A	1,800x25	$1,575,035	Yes	No	No
B1	1,000x25	$875,049	Yes	No	No
B2	See B1				
C	See B1				
E2	1,820x25	N/A	Yes	No	No
E3	See B1				
F	See B1				
G1	2,780x20	$1,945,650	Yes	Yes	Yes
G2	See B1				
H1	3,492x20	$2,444,575	Yes	No	No
H2	844x25	N/A	No	N/A	No
I1	2,000x20	$1,399,930	Yes	No	No
I2	2,400x25	N/A	Yes	No	No
I4	4,200x20	$2,939,755	Yes	Yes	Yes
J1	2,600x15	$1,365,245	Yes	No	No
J2	3,400x15	$1,785,000	Yes	Yes	Yes
K2	4,177x25	N/A	No	N/A	No
L2/L3	2,330x25	N/A	Yes	No	No
N1	2,200x15	$1,155,014	Yes	No	No
N2	See B1				
O	2,200x15	$1,154,930	Yes	Yes	Yes
Q2	5,047x25	N/A	Yes	No	No
R2	5,200x15	$2,729,860	Yes	Yes	Yes
S	5,400x25	$4,725,035	Yes	Yes	Yes
T2	3,201x15	$1,645,735	Yes	Yes	Yes
U2	2,669x25	N/A	No	N/A	No
V3/V4	2,406x25	N/A	Yes	No	No
W	2,000x25	$1,749,650	Yes	Yes	Yes
X1	7,998x20	$5,597,795	Yes	No	No
Y2	3,399x25	N/A	Yes	No	No
Z2	3,985x25	$3,486,455	Yes	Yes	Yes

Note: Instances where the noise wall cost does not exactly equal to the wall area multiplied by $35/sq ft. are due to rounding that occurs during barrier dimension calculations performed by TNM.

[6] Note: Instances where the noise wall cost does not exactly equal to the wall area multiplied by $35/sq ft. are due to rounding that occurs during barrier dimension calculations performed by TNM

Appendix E contains a summary of the predicted traffic noise levels for each receptor analyzed.

6 Will there be noise during construction?

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 Appendix D. 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 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.

7 Coordination with local officials

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 highways 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 a 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 in accordance with 23 CFR §772.17. The contour distances to the 66 and 71 dBA sound levels are shown in Table 7.1. 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. These locations were chosen in areas where there is potential for future development. SCDOT will provide this information to Richland and Lexington counties, as well as the Towns and Cities with jurisdiction over planning and development adjacent to the project.

Table 7.1 Contour Distances (dBA) for Land Use Planning

Project area (build alternative – RA1/RA5) (noise sensitive area – NSA)	Worst-case approximate distance from edge of pavement (feet) Category B & C (residential, outdoor recreation facilities, churches, schools, hospitals, etc.)	Category E (hotels, motels, offices, restaurants/bars, and other developments/activities not included in the other NAC's)
	66 dBA	71 dBA
RA1 – NSA B	430	210
RA1 – NSA C	500	220
RA1 – NSA F	520	250
RA1 – NSA I	520	210
RA1 – NSA O	420	150
RA1 – NSA P	340	140
RA1 – NSA R	410	210
RA1 – NSA V	330	110
RA1 – NSA W	490	220
RA1 – NSA X	470	220
RA5 – NSA B	480	230
RA5 – NSA C	550	260
RA5 – NSA F	560	270
RA5 – NSA I	600	250
RA5 – NSA O	460	180
RA5 – NSA P	300	80
RA5 – NSA R	530	250
RA5 – NSA V	350	130
RA5 – NSA W	400	180
RA5 – NSA X	450	210

Source: HDR Engineering, May 2018

8 Was the public involved?

Through a call for volunteers at project information and public input meetings, the project team identified neighborhood contacts to serve on a Noise Advisory Board (NAB). The purpose of the NAB is to involve representatives from each subdivision/community within the project study area. NAB members, who represented a variety of non-governmental and civic organizations, were invited to participate in meetings designed to provide the project team with specific feedback related to noise concerns. NAB representatives were requested to share information with the community at-large.

At the onset of the project, it was determined that members of the NAB were volunteers from subdivisions and neighborhoods that fall within the noise study area boundary. This boundary is a 500-foot buffer outside of the project study area boundary and consists of 49 identified subdivisions and neighborhoods. During the Community Kickoff and Public Input meetings, a station was set up to explain the NAB and its purpose. If a person was interested in serving on the NAB, he or she could express their interest by leaving their name and contact information on the sign-in sheet that was located at the station. Between the two meetings, 17 individuals expressed an interest in being part of this advisory board. Of the 17 individuals, nine live within, or just outside of, the noise study area boundary. Those nine individuals are primarily located near to the I-20/26 interchange.

In order to identify additional potential board members for greater geographic coverage within the noise study area, information was drawn from the public involvement database to determine active participants in the project. Active participants were identified as having attended the Community Kickoff Meeting, Public Input Meeting, and/or submitted a comment via online, email, in-person comment form, or hotline voicemail. Approximately 230 individuals were identified, with an approximately 54 of them being located within or just outside of the noise study area boundary.

Following the identification of potential members, a letter/postcard was distributed with information regarding the NAB, the anticipated commitment, and a request for an alternative candidate if they were uninterested. Social media outlets were used to solicit participation as well. Content was posted on Facebook, Twitter and Instagram requesting that interested parties contact the project hotline or project email with their information and interest in volunteering on the NAB.

An initial NAB meeting was held on March 15, 2016 to review the proposed project, the goals and objectives of the NAB, and to provide greater understanding of the noise evaluation process. Meeting materials and minutes from the initial NAB meeting were provided prior to and after, respectively, the NAB meeting. It is important to note, NAB participants were made aware during outreach and meetings that the function of the NAB is not to vote on a noise abatement, rather to inform the analysis process. SCDOT follows its Traffic Noise Abatement Policy on every project to determine impacts, and whether abatement is warranted or not. The next NAB meeting will be held following the public hearing comment period for the DEIS.

Additionally, it should be noted that questions and comments about the environmental process, and specifically potential noise impacts, led the project team to post a video describing the noise analysis process. This video may be accessed at http://www.scdotcarolinacrossroads.com/ under "Project Resources".

9 Summary

Based on the future traffic conditions, noise impacts within the refined study area are anticipated for the RA1 and RA5 Modified alternatives. RA1 had the higher number of noise impacts of the two build alternatives with a total of 1,896. For RA1, the majority of impacted receivers consisted of NAC B (residential) properties. RA5 Modified had the lower number of noise impacts of the two build alternatives with a total of 1,858 noise impacts. For RA5 Modified, the majority of impacted receivers consisted of NAC B (residential) properties. The preliminary analysis showed that noise abatement was warranted in some locations, as discussed in Section 5 and shown on the figures in Appendix A.Following the public hearing, a detailed noise analysis will be completed to verify these results. The detailed noise analysis may modify where barriers are located, as well as if barriers are warranted in certain locations. If a barrier is feasible and reasonable in the preliminary analysis and it is determined not to be feasible and reasonable in the detailed analysis, SCDOT will notify the benefited receptors of that barrier that the barrier is no longer warranted per the SCDOT Noise Policy requirements. If a barrier that is determined not to be feasible and reasonable in the preliminary analysis, but is determined to be feasible and reasonable in the detailed analysis per the requirements in the SCDOT noise policy, the benefited receptors of the barrier will be notified by SCDOT.

10 References

South Carolina Department of Transportation, *Traffic Noise Abatement Policy*, Issued: August 2014, Effective: September 1, 2014.

U.S. Department of Transportation, Federal Highway Administration. Measurement of Highway-Related Noise. FHWA Report Number FHWA-PD-96-046. May 1996.

U.S. Department of Transportation, Federal Highway Administration. FHWA Traffic Noise Model: User's Guide. FHWA Report Number FHWA-PD-96-009. January, 1998.

U.S. Department of Transportation, Federal Highway Administration. FHWA Traffic Noise Model: User's Guide (Version 2.5 Addendum). April 2004.

U.S. National Archives and Records Administration, Office of the Federal Register. Title 23, Code of Federal Regulations, Part 772. Procedures for Abatement of Highway Traffic Noise and Construction Noise.

Appendix A—Figures

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NSA A
NSA B
A1
A2
R1
Broad River Rd
Lowman Rd
Westbound
Eastbound
bing
SCDOT
Federal Highway Administration
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A1
Existing Conditions
Noise Analysis Details
05/15/2018
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CAROLINA CROSSROADS


NSA A
NSA B
NSA C
NSA D
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A1
Existing Conditions
Noise Analysis Details
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CAROLINA CROSSROADS
SCDOT
Federal Highway Administration
bing


NSA C
NSA D
NSA E
NSA F
Lake Murray Blvd
Kinley Rd
Setters Station
Hamilton Park
bing
SCDOT
Federal Highway Administration
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
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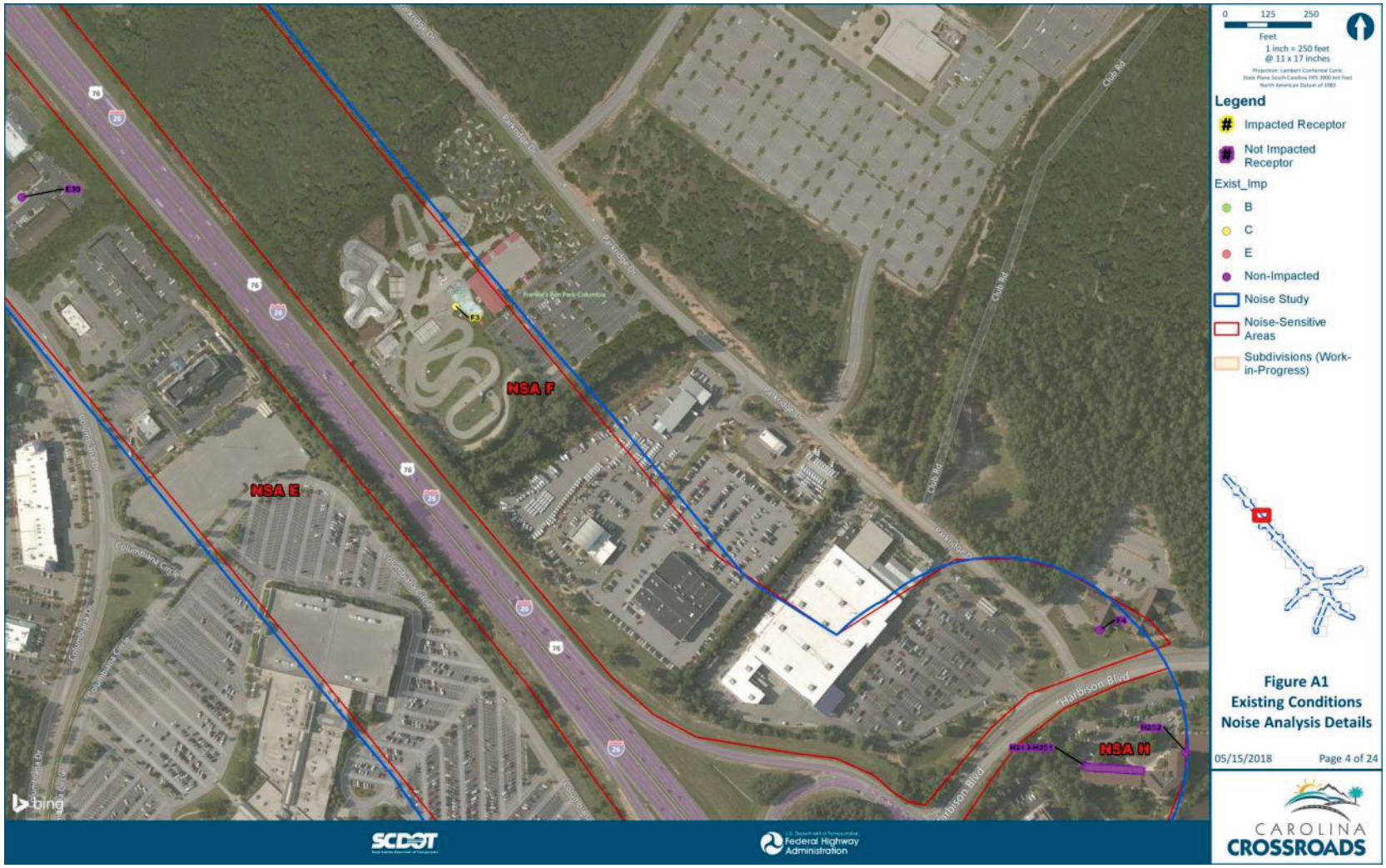
NSA F
NSA E
NSA H
Harbison Blvd
Club Rd
Parkridge Dr
Columbiana Circle
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Feet
1 inch = 250 feet
@ 11 x 17 inches
Figure A1
Existing Conditions
Noise Analysis Details
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NSA E
NSA H
NSA G
Harbison Blvd
Fernandina Rd
Woodcrest Dr
Fairforest Rd
Saturn Pkwy
Harbison Way
Timberlake
Windcrest
Harborchase
Manor View Court
Creekbend
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
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Subdivisions (Work-in-Progress)
Figure A1
Existing Conditions
Noise Analysis Details
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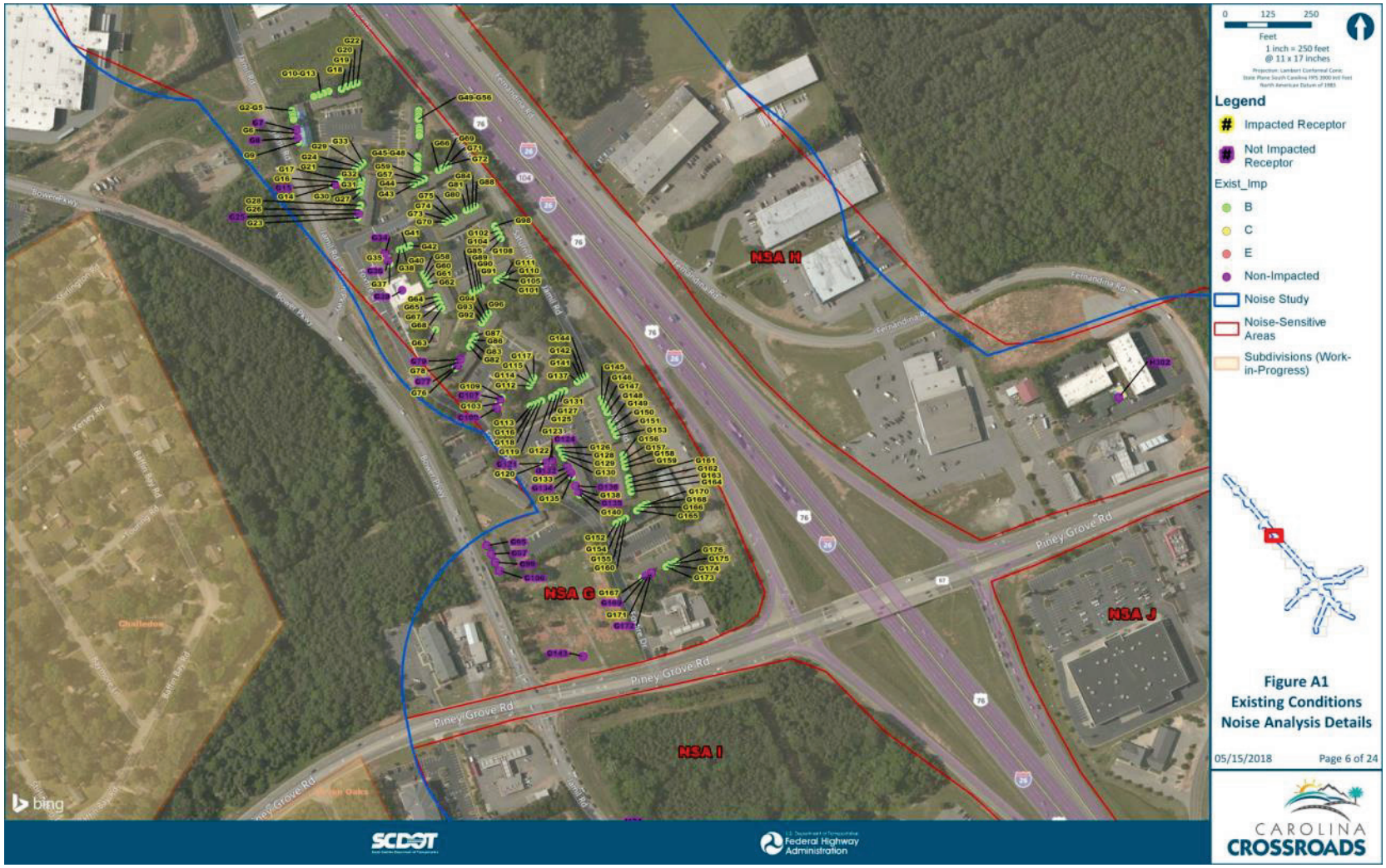
NSA H
NSA I
NSA J
NSA G
Piney Grove Rd
Piney Grove Rd
Piney Grove Rd
Fernandina Rd
Bower Pkwy
Kersey Rd
Battle Key Rd
Challedon
bing
SCDOT
Federal Highway Administration
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
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NSA I
NSA J
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
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Subdivisions (Work-in-Progress)
Figure A1
Existing Conditions
Noise Analysis Details
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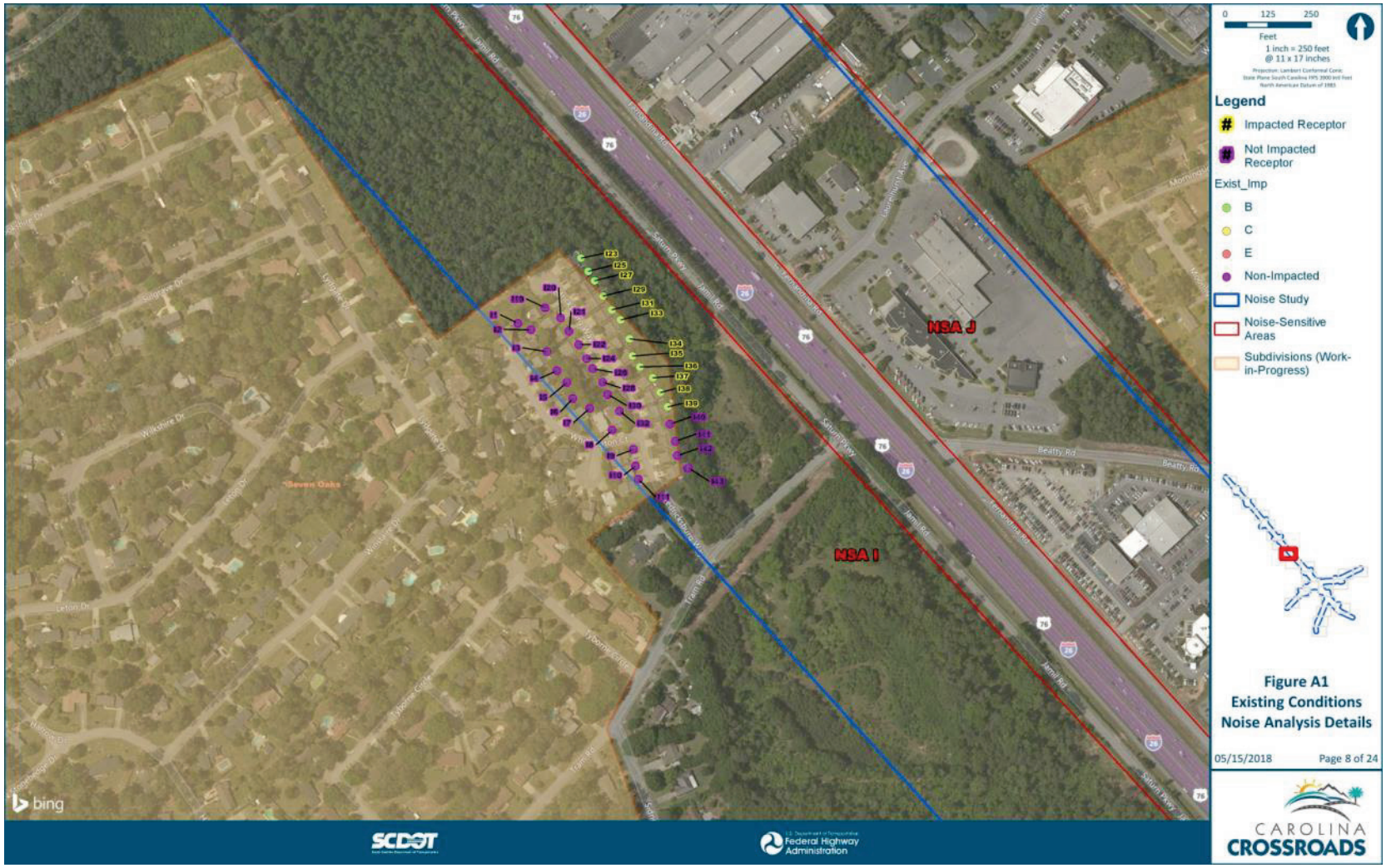
NSA J
NSA I
Seven Oaks
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A1
Existing Conditions
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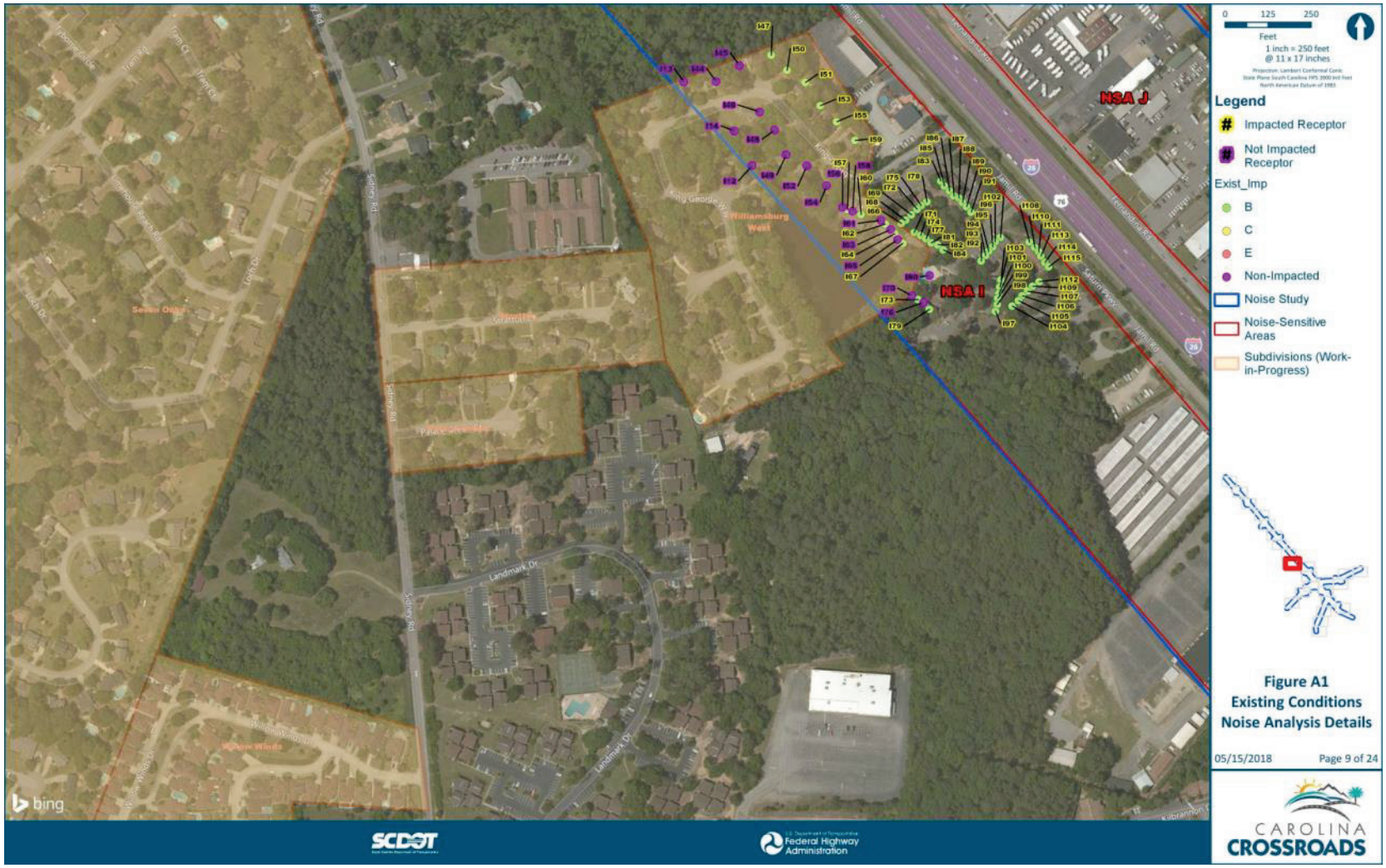
NSA J
NSA I
Landmark Dr
Sidney Rd
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
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Figure A1
Existing Conditions
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NSA J
NSA I
NSA L
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
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Figure A1
Existing Conditions
Noise Analysis Details
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NSA I
NSA K
NSA L
St Andrews Rd
Woodland Hills Rd
Noob Hill Rd
Berryhill Rd
Burning Tree Rd
Browning Rd
Center Point Rd
Fairway Ln
Westover Rd
Woodland Hills
Chartwell
Carriage House Lamplighter Village
SCDOT
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bing
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A1
Existing Conditions
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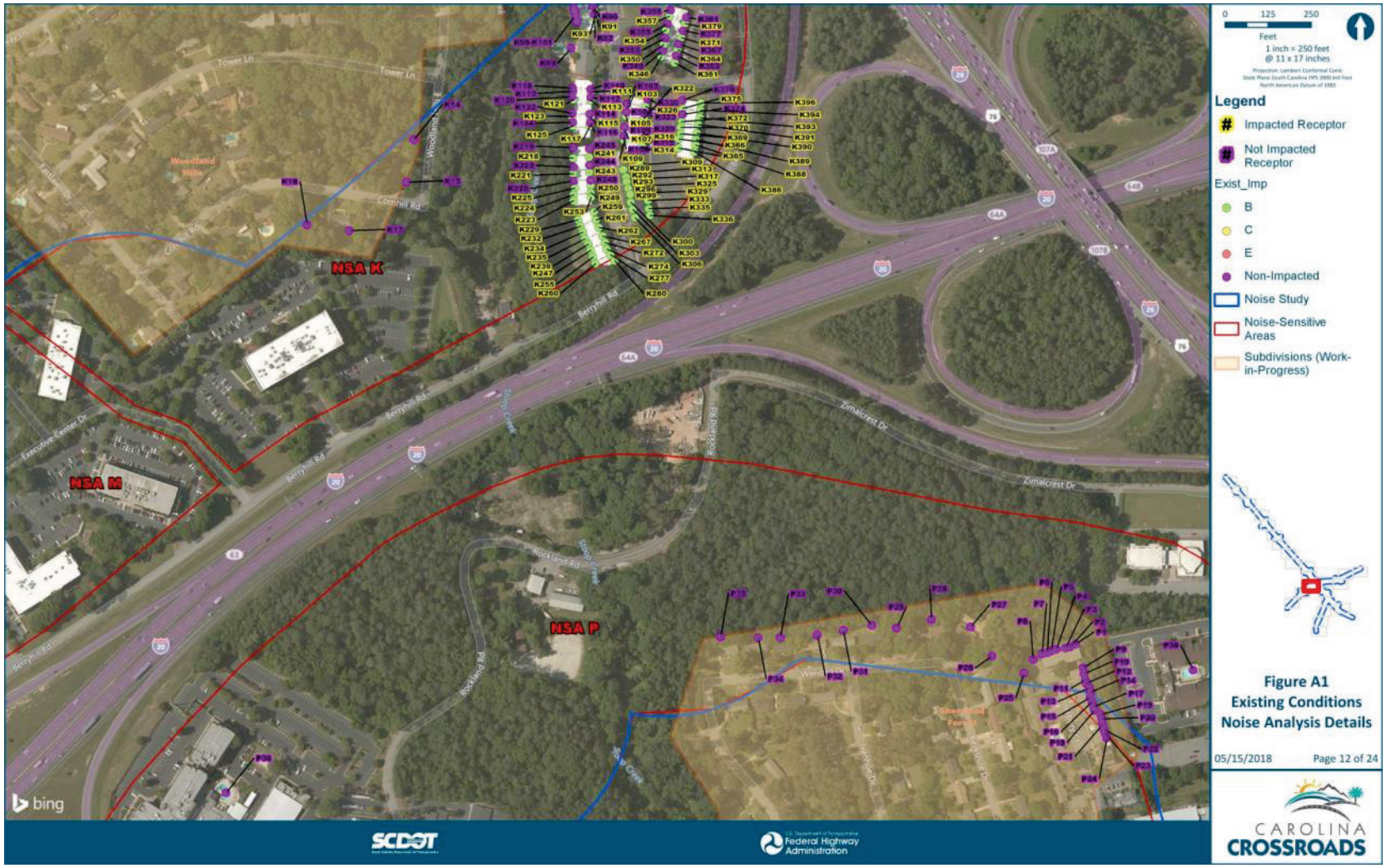
NSA K
NSA M
NSA P
Berryhill Rd
Rockland Rd
Zimalcrest Dr
Tower Ln
Cornhill Rd
Executive Center Dr
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Feet
1 inch = 250 feet
@ 11 x 17 inches
Figure A1
Existing Conditions
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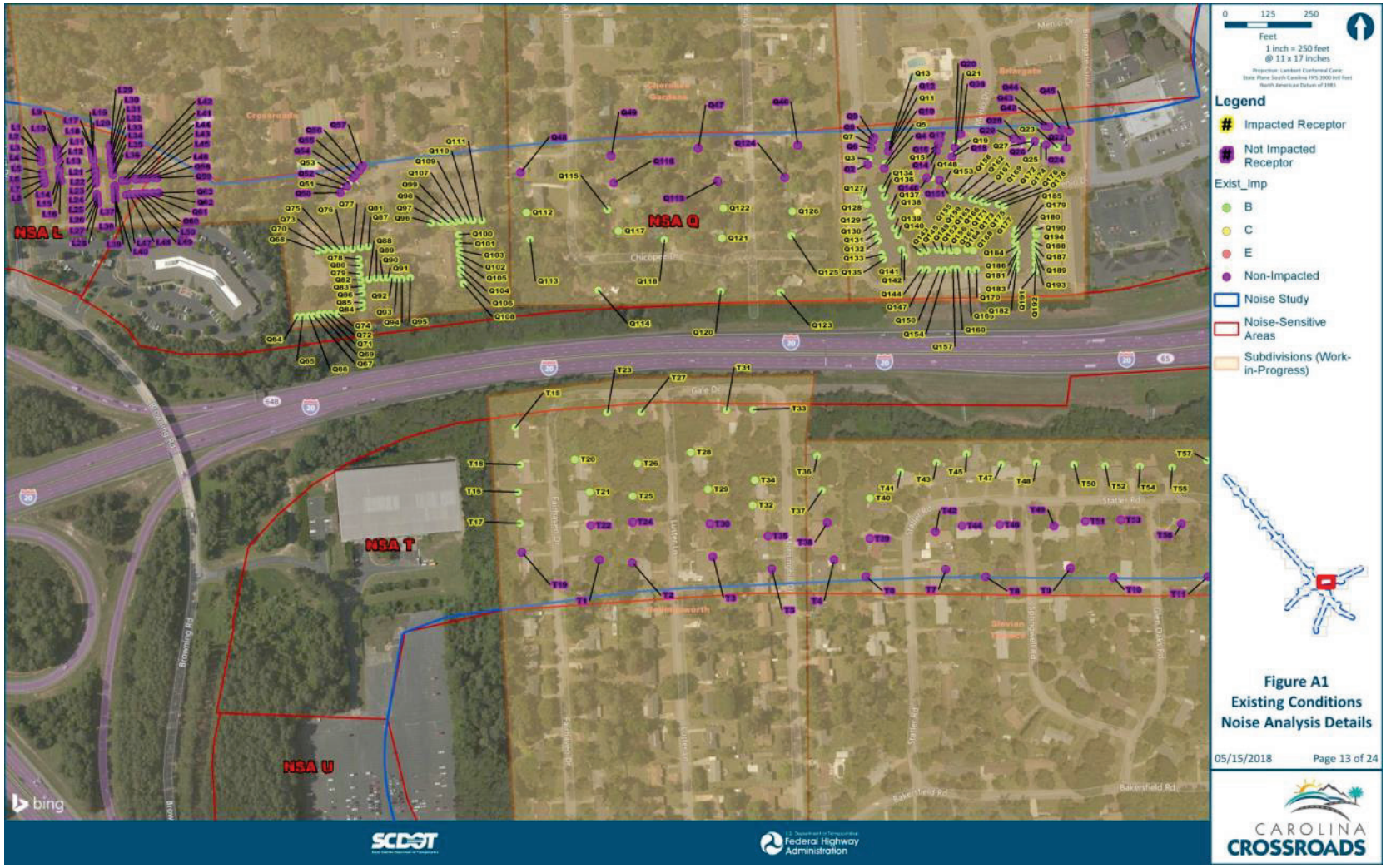
NSA L
NSA Q
NSA T
NSA U
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Feet
1 inch = 250 feet
@ 11 x 17 inches
Figure A1
Existing Conditions
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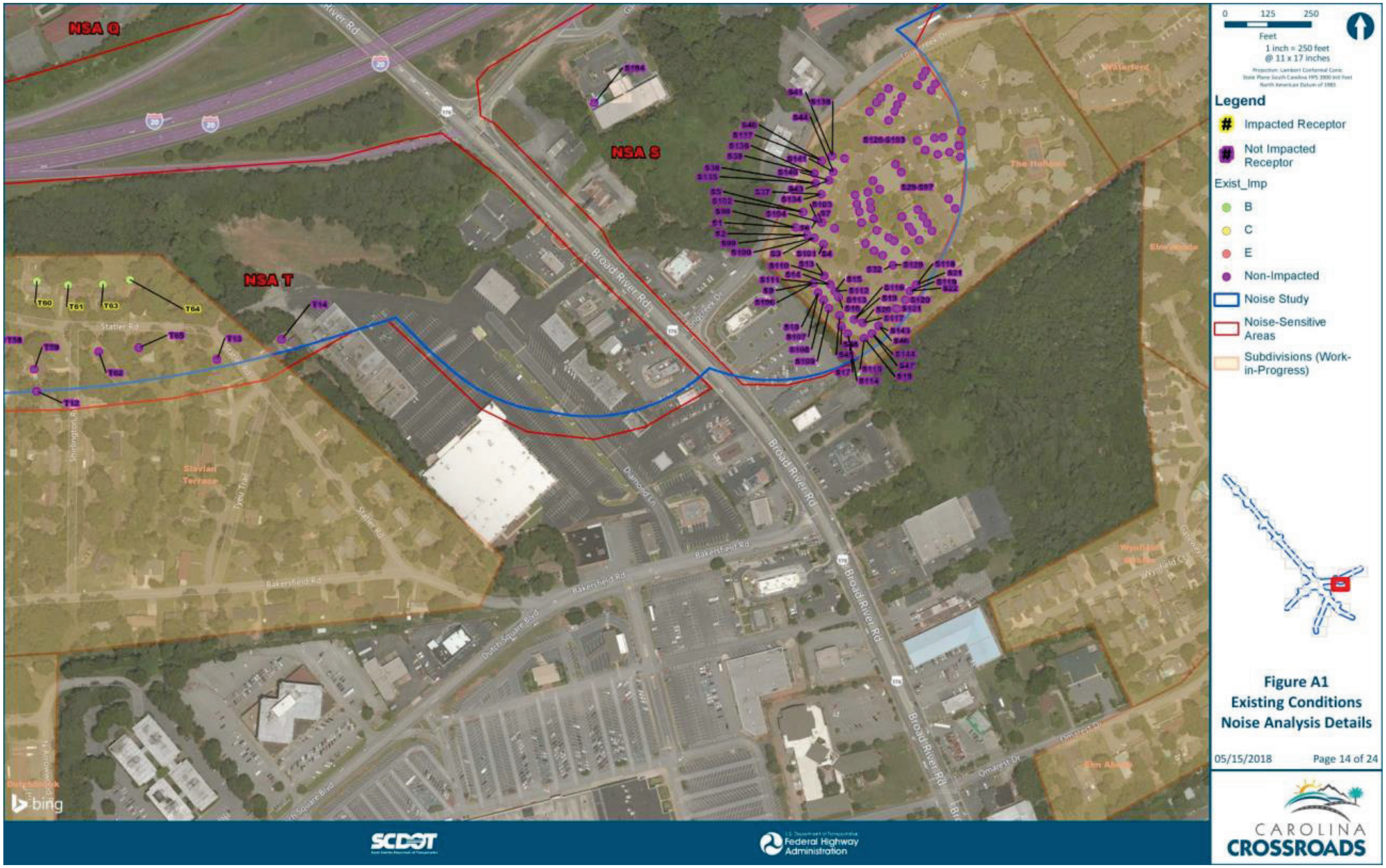
NSA Q
NSA S
NSA T
Broad River Rd
Statler Rd
Bakersfield Rd
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
1 inch = 250 feet
@ 11 x 17 inches
Figure A1
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NSA R
NSA S
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
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Figure A1
Existing Conditions
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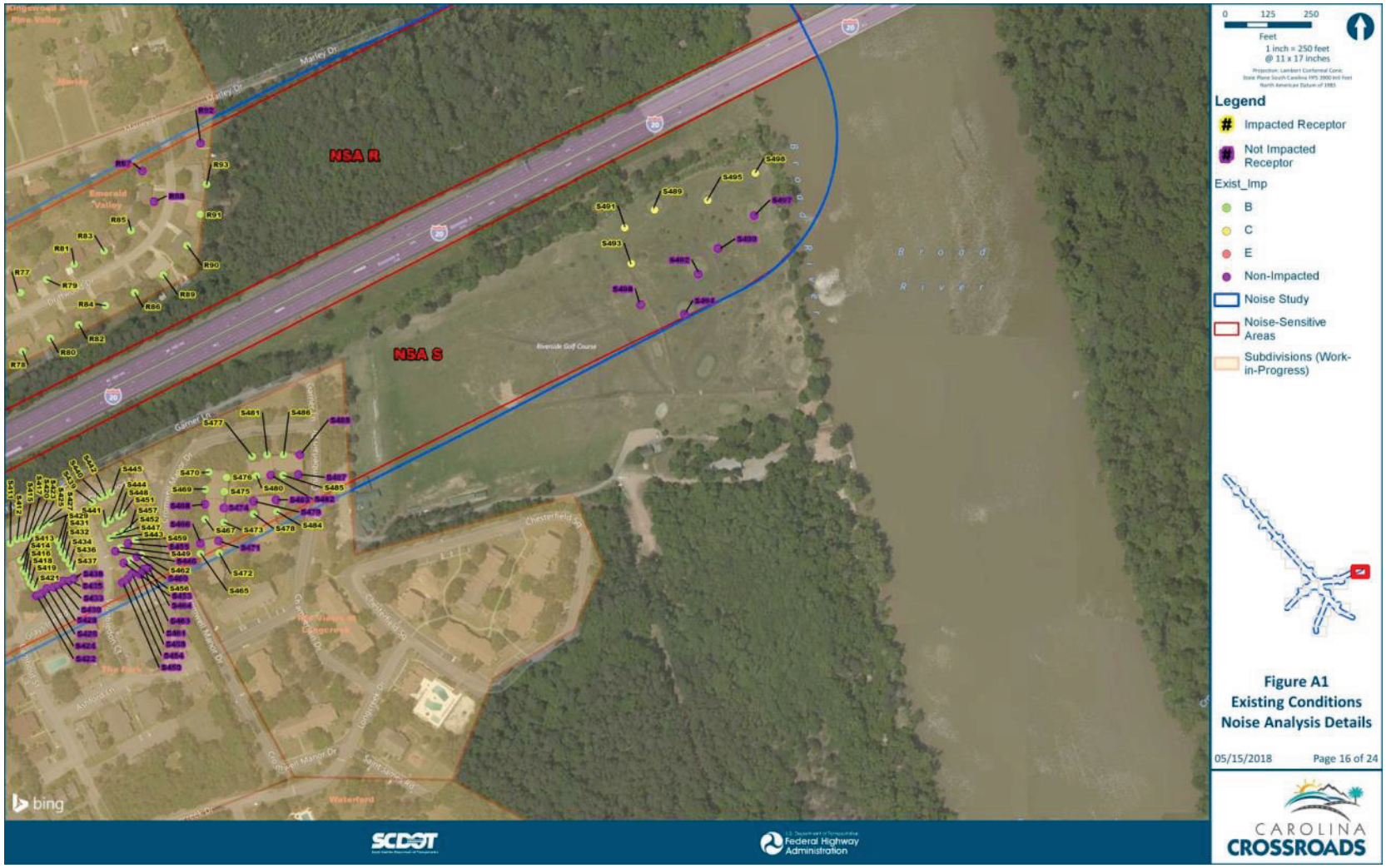
NSA R
NSA S
Broad River
Marley Dr
Chesterfield Dr
Waterford
bing
SCDOT
Federal Highway Administration
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
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Figure A1
Existing Conditions
Noise Analysis Details
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CAROLINA CROSSROADS


NSA M
NSA P
NSA N
NSA O
Bush River Rd
Berryhill Rd
Executive Center Dr
Rockland Rd
Crews Dr
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
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Subdivisions (Work-in-Progress)
Feet
1 inch = 250 feet
@ 11 x 17 inches
Figure A1
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Saluda River
Saluda River
Saluda River
NSA N
NSA O
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Figure A1
Existing Conditions
Noise Analysis Details
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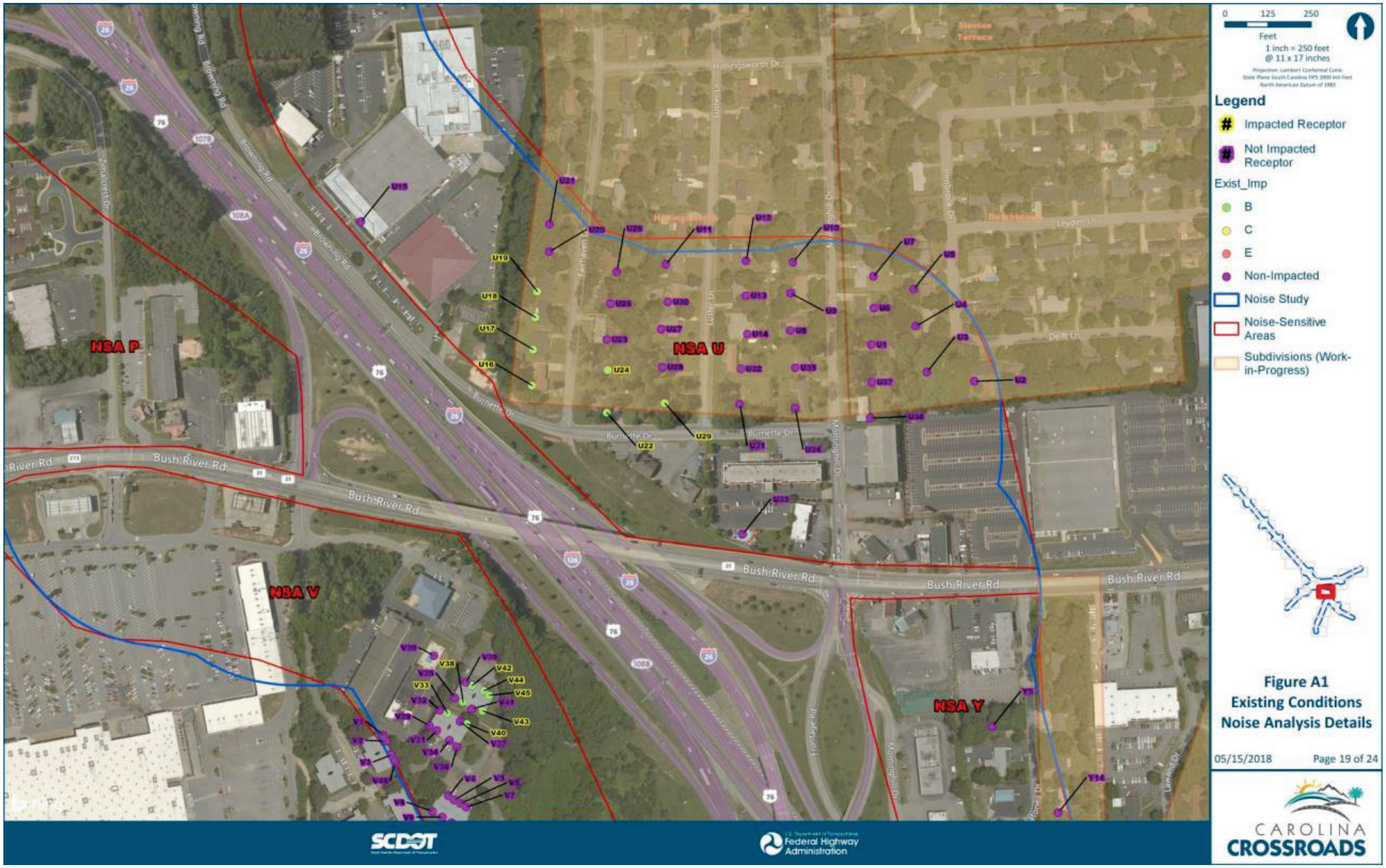

0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
NSA P
NSA U
NSA V
NSA Y
Bush River Rd
Figure A1
Existing Conditions
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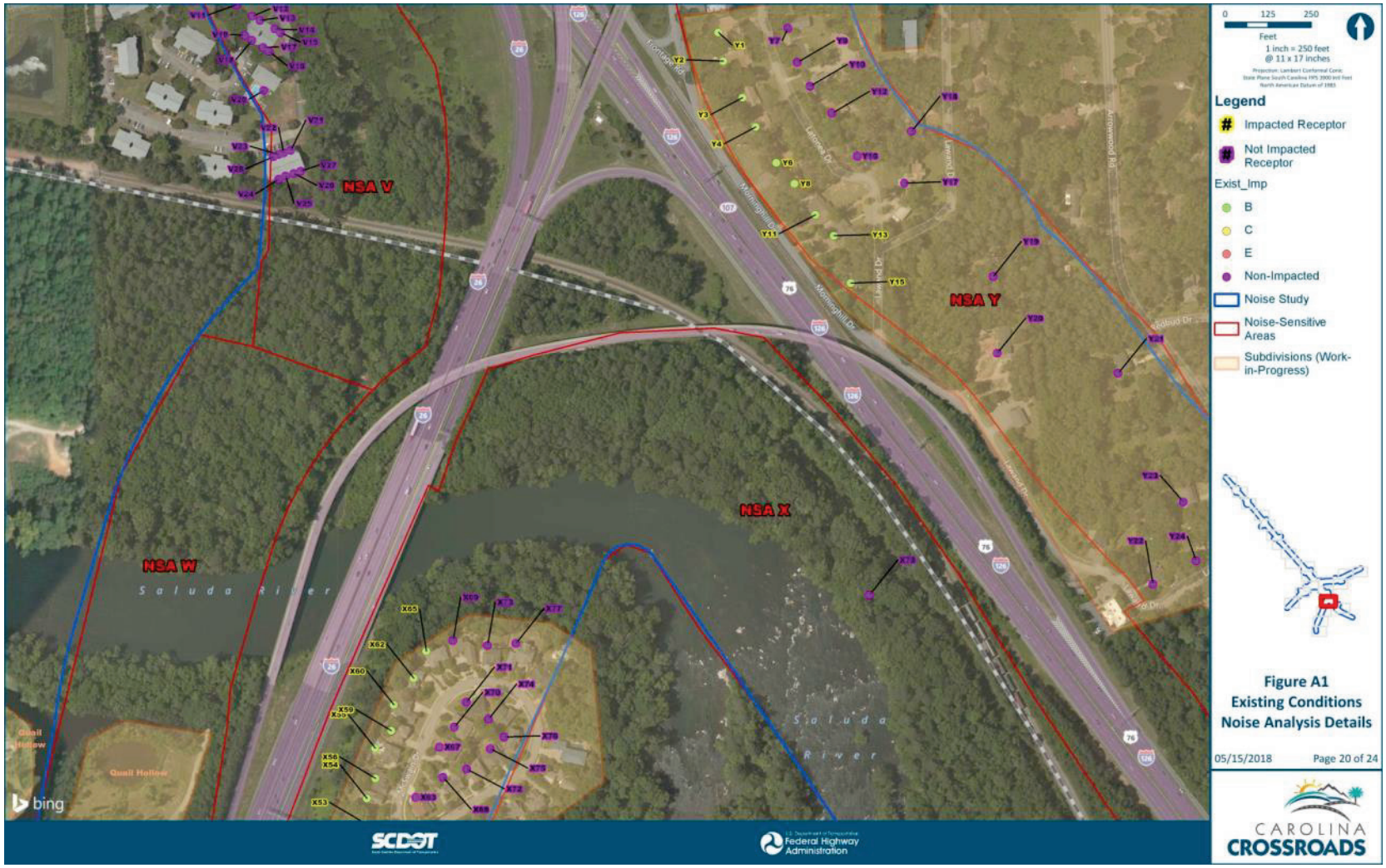
NSA V
NSA W
NSA X
NSA Y
Saluda River
Quail Hollow
bing
SCDOT
Federal Highway Administration
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
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Existing Conditions
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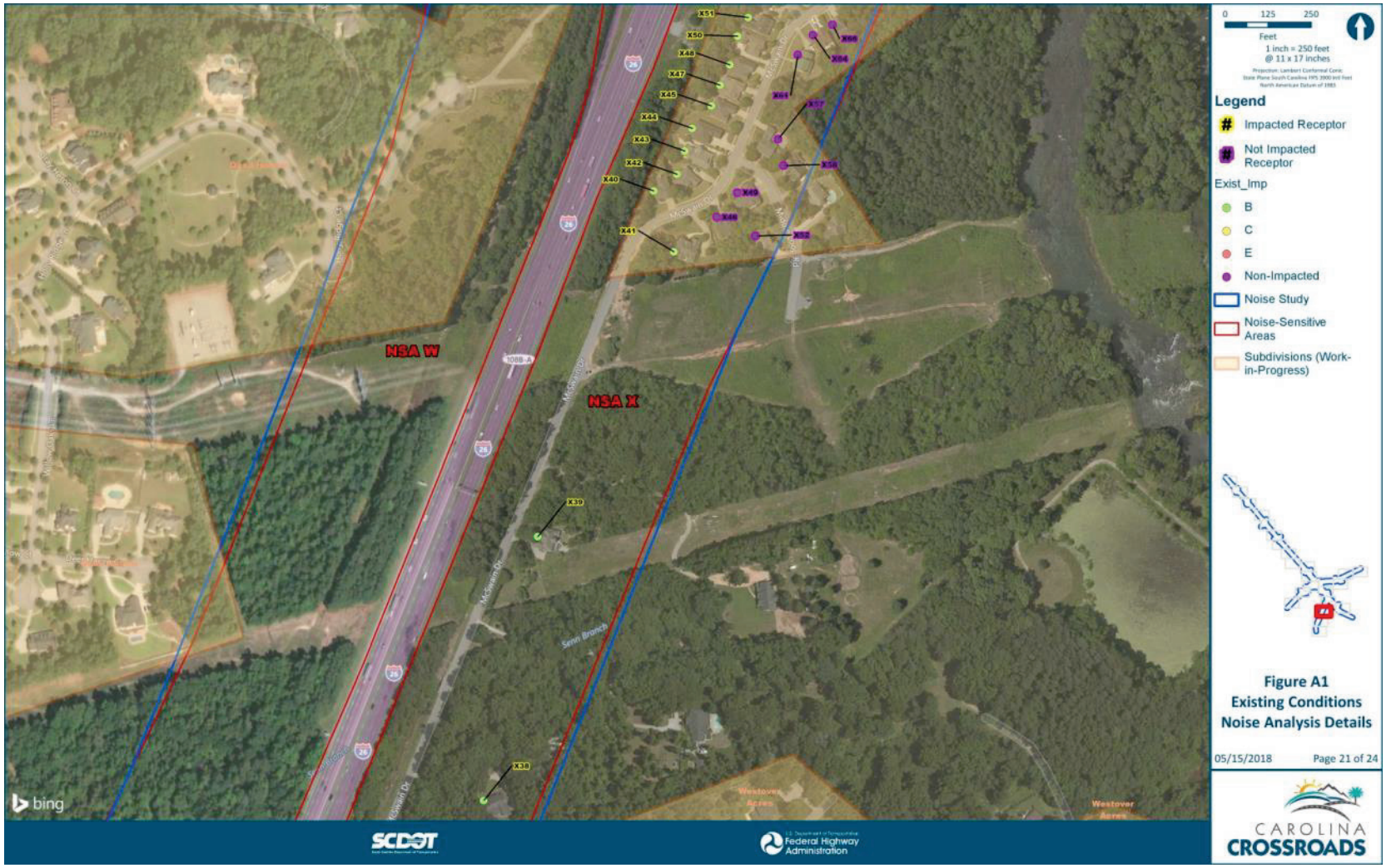
NSA W
NSA X
X51
X50
X48
X47
X45
X44
X43
X42
X40
X41
X66
X64
X57
X56
X49
X46
X52
X39
X38
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
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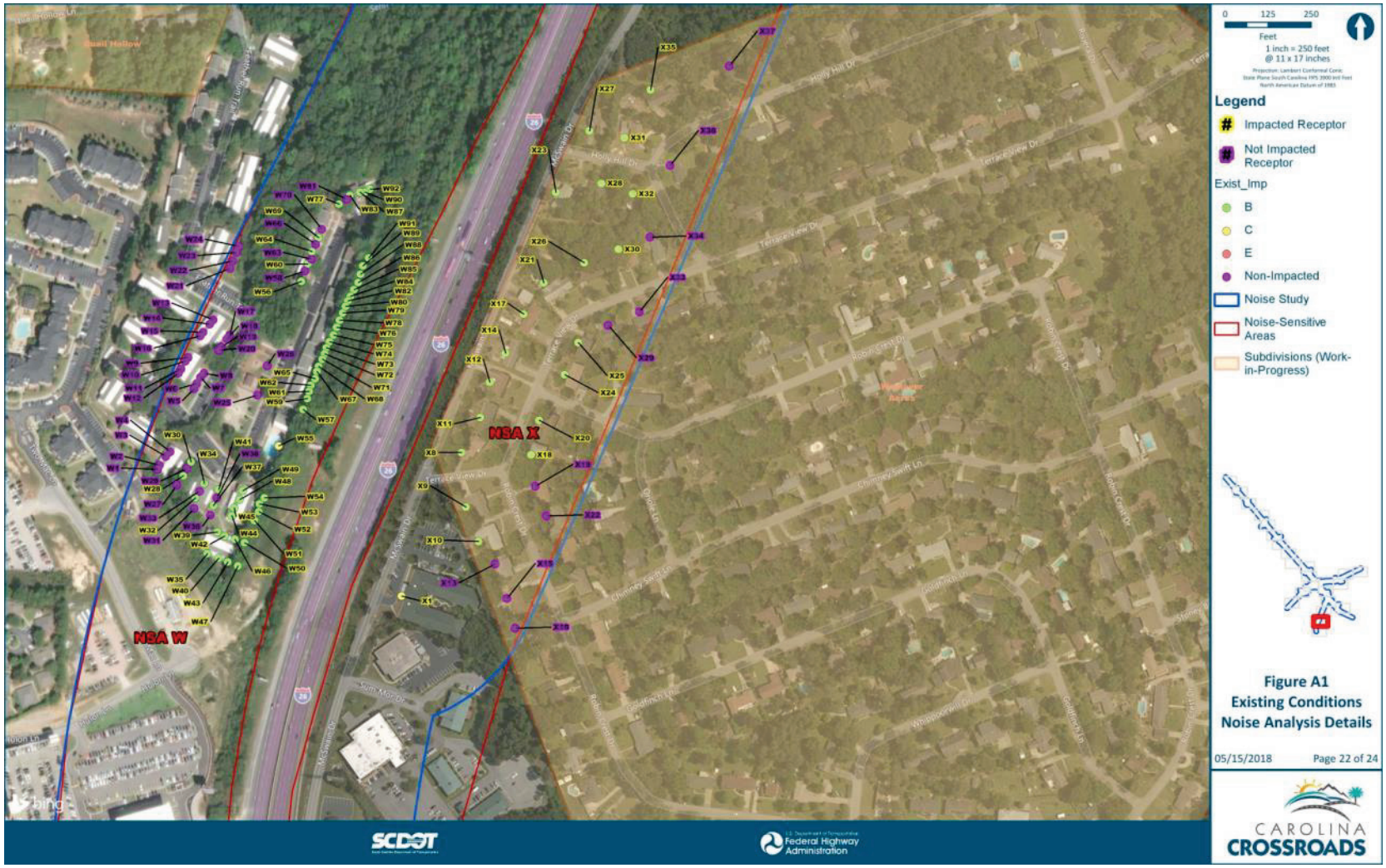
NSA X
NSA W
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A1
Existing Conditions
Noise Analysis Details
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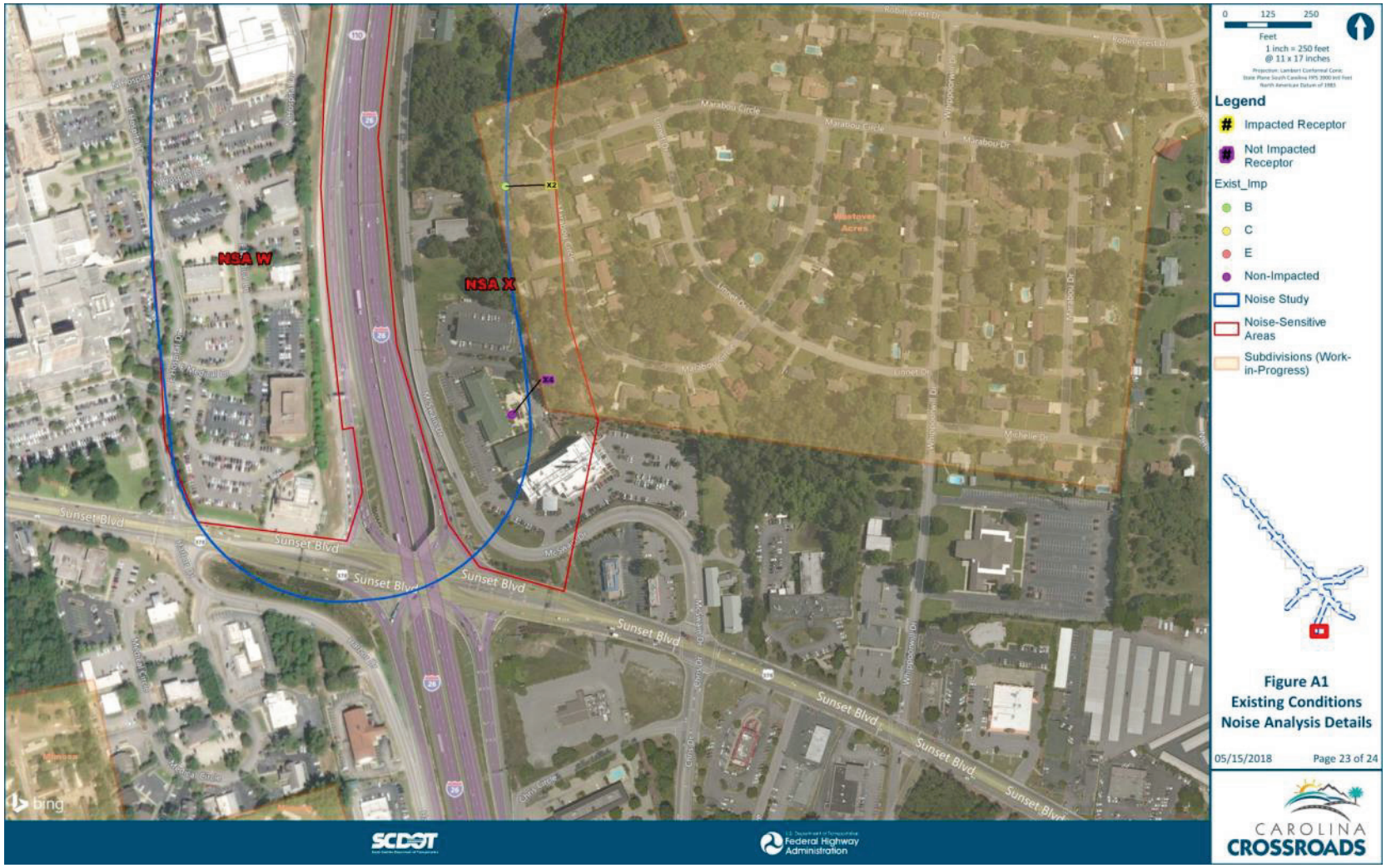
NSA W
NSA X
Sunset Blvd
Marabou Circle
Marabou Dr
Whippoorwill Dr
Michelle Dr
Westover Acres
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
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Figure A1
Existing Conditions
Noise Analysis Details
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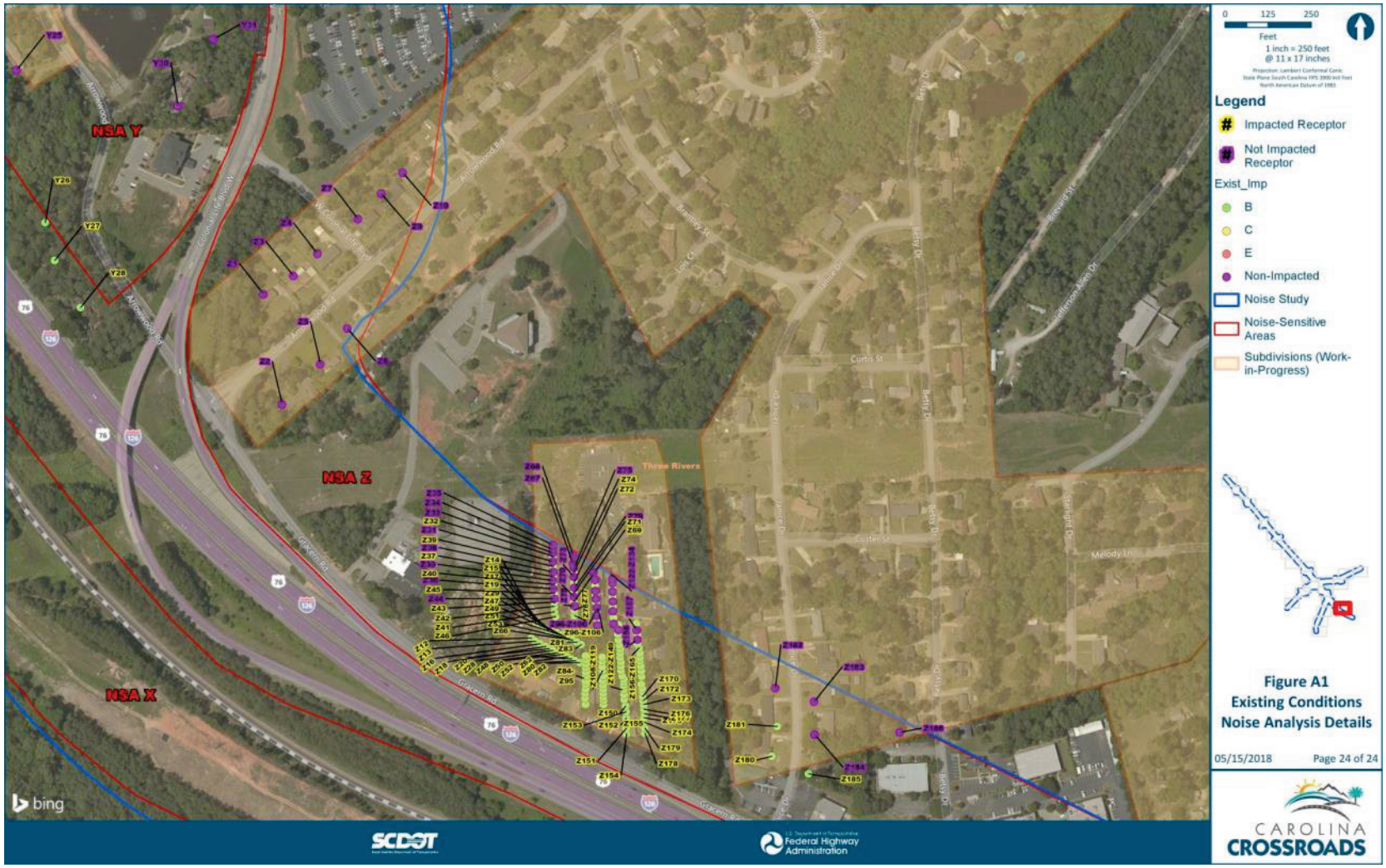
NSA Y
NSA Z
NSA X
Three Rivers
Curtis St
Custer St
Melody Ln
Graham Rd
Berry Dr
Legend
Impacted Receptor
Not Impacted Receptor
Exist_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Figure A1
Existing Conditions
Noise Analysis Details
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CAROLINA CROSSROADS
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NSA A
NSA B
A1
A2
B1
Broad River Rd
Lowman Rd
Watkins Dr
bing
SCDOT
Federal Highway Administration
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
RA10_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A2
No-Build
Noise Analysis Details
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CAROLINA CROSSROADS


NSA A
NSA B
NSA C
NSA D
Legend
Impacted Receptor
Not Impacted Receptor
RA10_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A2
No-Build
Noise Analysis Details
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NSA C
NSA D
NSA E
NSA F
Lake Murray Blvd
Kinley Rd
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
RA10_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A2
No-Build
Noise Analysis Details
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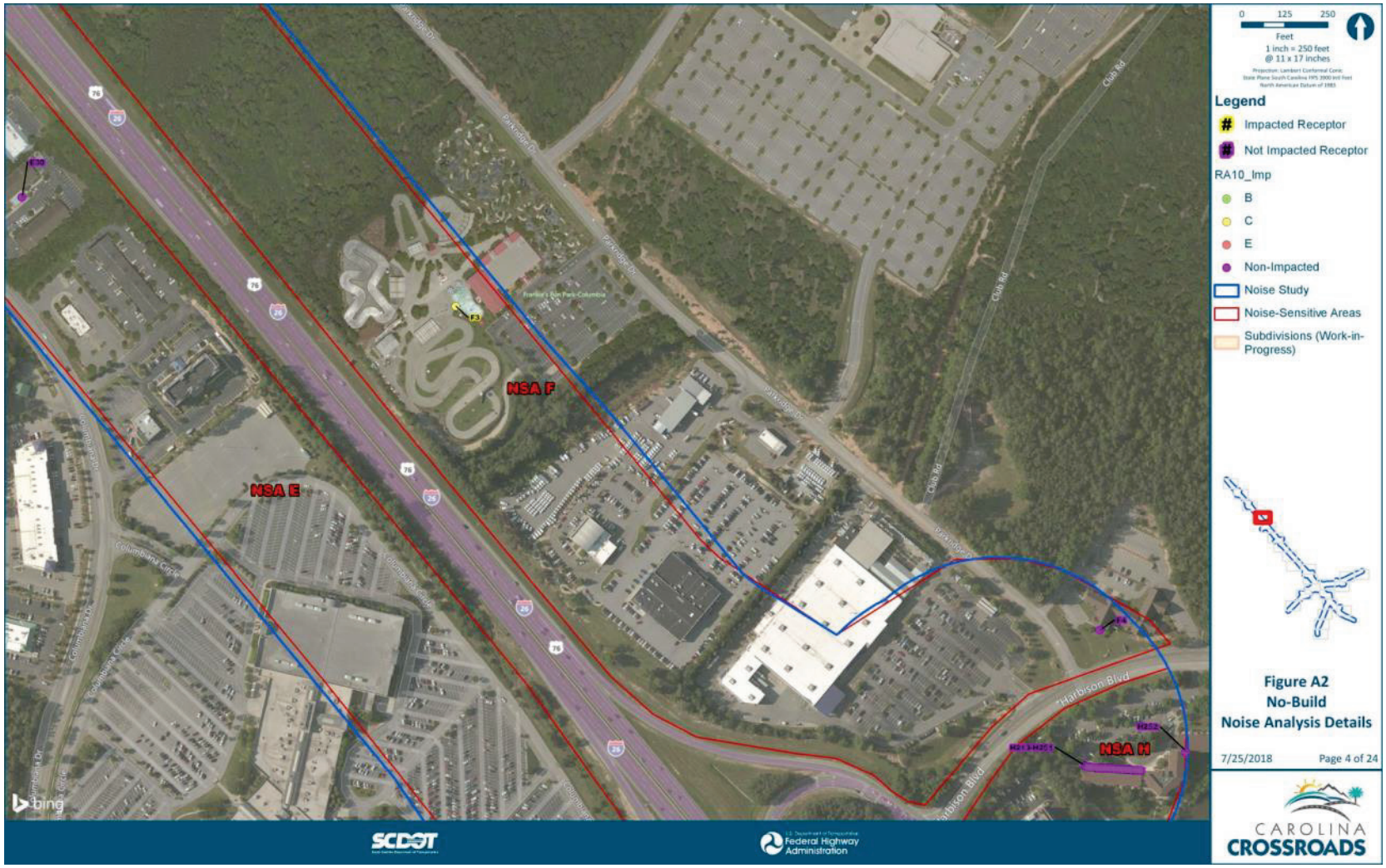
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NSA E
NSA H
Harbison Blvd
Club Rd
Parkridge Dr
Columbiana Circle
Legend
Impacted Receptor
Not Impacted Receptor
RA10_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Feet
1 inch = 250 feet
@ 11 x 17 inches
Figure A2
No-Build
Noise Analysis Details
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NSA E
NSA H
NSA G
Harbison Blvd
Fernandina Rd
Woodcrest Dr
Fairforest Rd
Saturn Pkwy
Harbison Way
Timberlake
Windcrest
Harborchase
Manor View Court
Creekbend
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
RA10_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A2
No-Build
Noise Analysis Details
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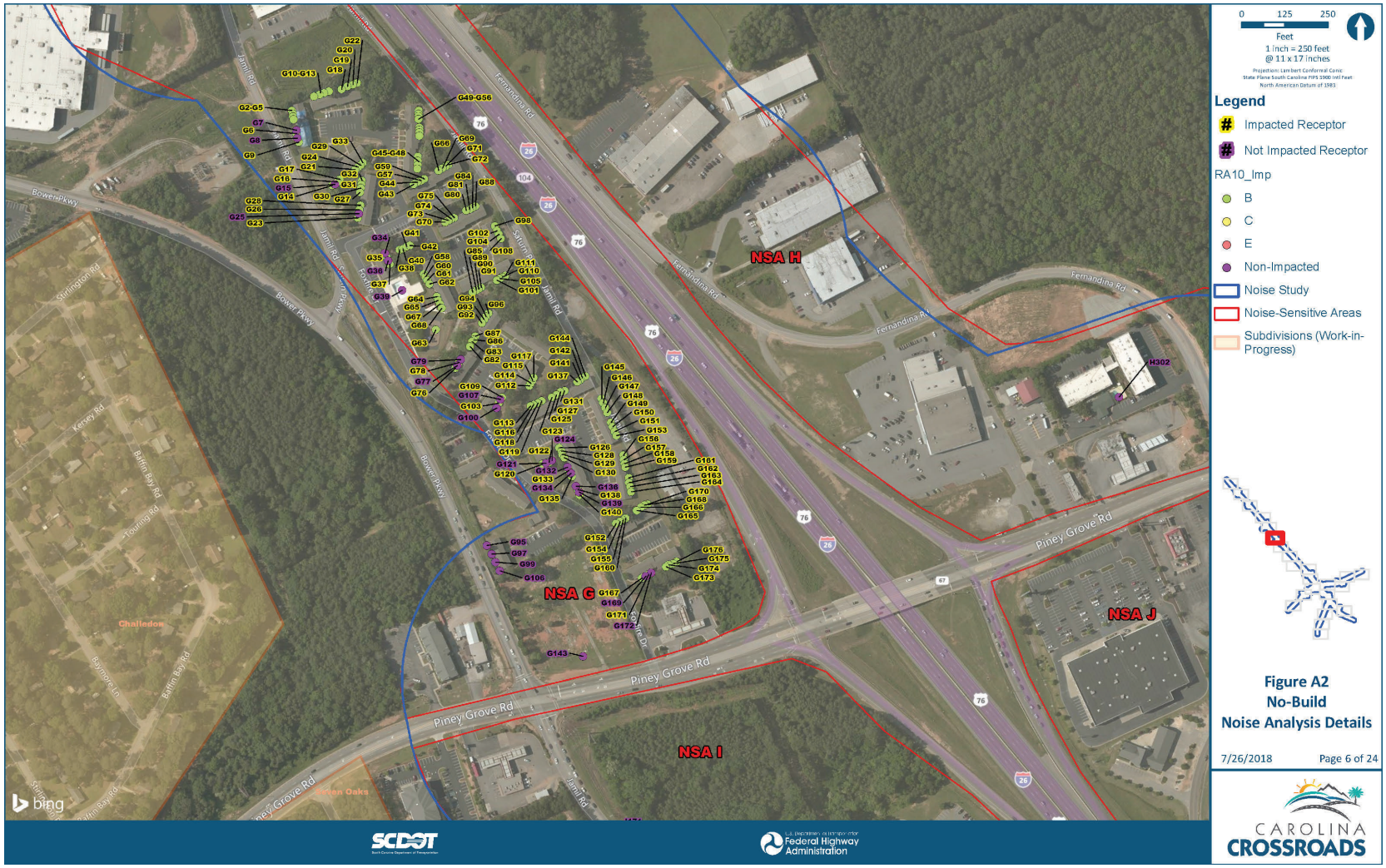
NSA H
NSA G
NSA I
NSA J
H302
Piney Grove Rd
Fernandina Rd
Bower Pkwy
Jamil Rd
Saturn Rd
Challedon
Baymore Ln
Baffin Bay Rd
Touring Rd
Kesey Rd
Stirlington Rd
Green Oaks
Spire Dr
bing
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 Inches
Legend
Impacted Receptor
Not Impacted Receptor
RA10_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A2
No-Build
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NSA I
NSA J
H171
H172
H15
H16
H17
H18
J31
J32
J33
0 125 250
Feet
1 inch = 250 feet
@ 11 x 17 inches
Legend
Impacted Receptor
Not Impacted Receptor
RA10_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Figure A2
No-Build
Noise Analysis Details
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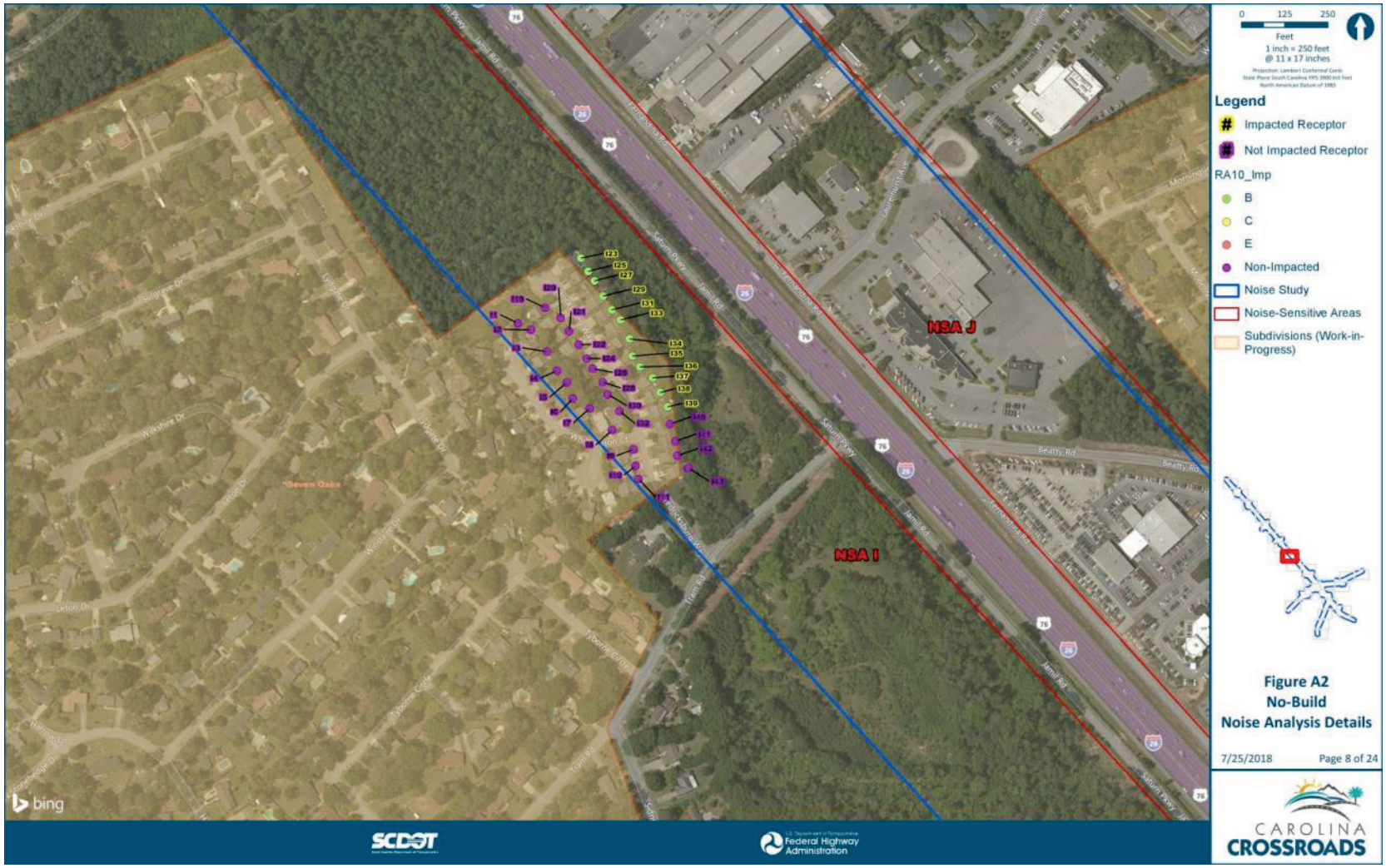
NSA J
NSA I
Seven Oaks
Legend
Impacted Receptor
Not Impacted Receptor
RA10_Imp
B
C
E
Non-Impacted
Noise Study
Noise-Sensitive Areas
Subdivisions (Work-in-Progress)
Feet
1 inch = 250 feet
@ 11 x 17 inches
Figure A2
No-Build
Noise Analysis Details
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