FALLS OF NEUSE ROAD WIDENING AND RELOCATION PROJECT

RAVEN RIDGE RD TO FONVILLE RD AND NEW FALLS OF NEUSE RD

WAKE COUNTY, NORTH CAROLINA

TIP PROJECT NO. U-4901

NOISE TECHNICAL MEMORANDUM

PREPARED FOR:

PROJECT DEVELOPMENT AND ENVIRONMENTAL ANALYSIS BRANCH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION

PREPARED BY:

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MAY 2008

PLANNING NOISE TECHNICAL MEMORANDUM

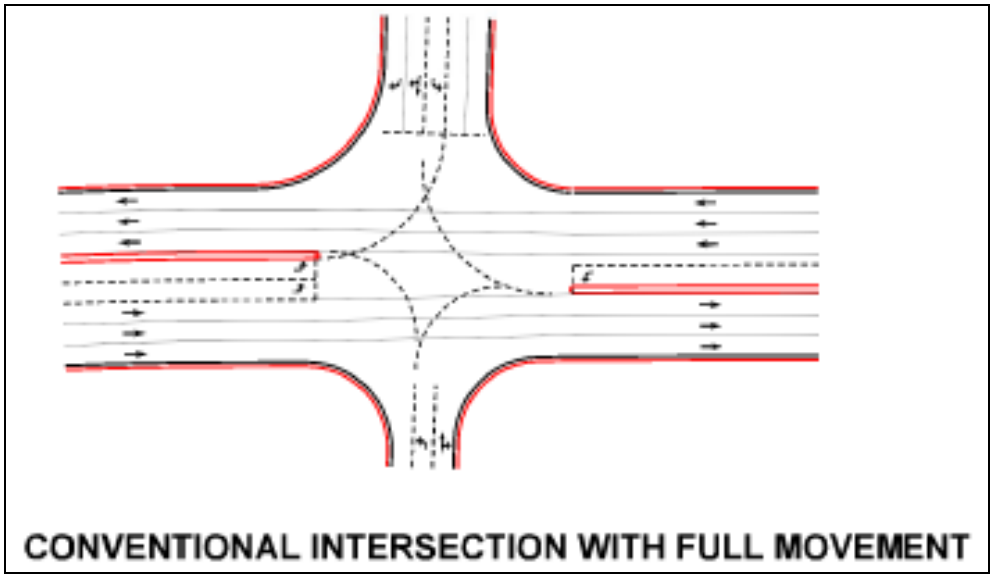
Falls of Neuse Road Widening and Relocation Project
Wake County,
TIP # U-4901

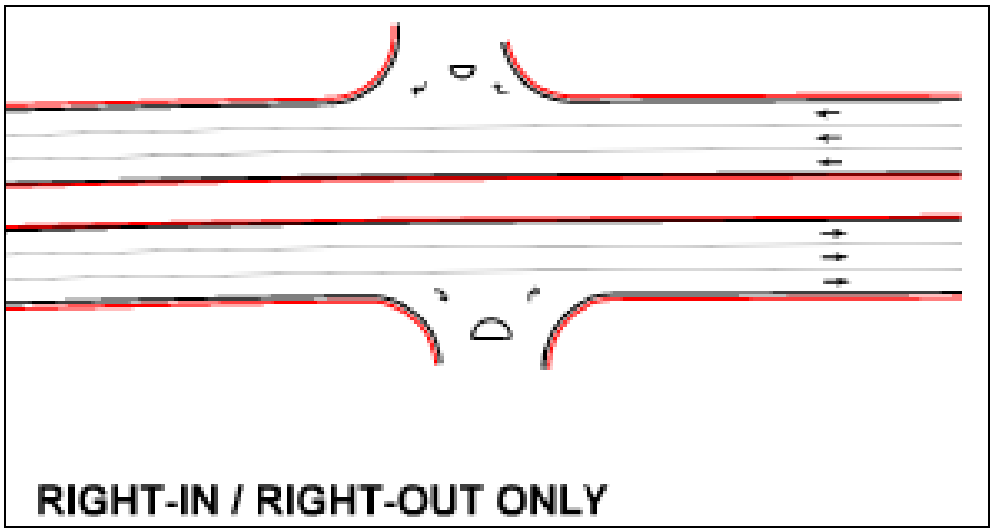
PROJECT LOCATION/DESCRIPTION

The Falls of Neuse Road Widening and Relocation Project (TIP No. U-4901) is located northeast of the City of Raleigh in Wake County, North Carolina (Figure 1). The project study area, consisting of approximately 170 acres, encompasses two proposed project sections (Figure 2). Widening is proposed for Section 1, which includes a 400-foot wide corridor (200 feet from the center line of the road) off-set from the centerline along the existing Falls of Neuse Road from Raven Ridge Road north approximately 1.3 miles until the intersection with Fonville Road. Section 1 will widen the existing two-lane roadway to a four-lane divided road, with the potential to be widened to the outside or inside to six lanes in the future. Relocation is proposed for Section 2. Section 2 begins at the Fonville Road intersection and will continue north approximately 0.8 miles and tie into the existing section of New Falls of Neuse Road in the Wakefield Development. This section will construct a four-lane divided roadway (six-lane future) on new location that will match the existing section of New Falls of Neuse Road. Section 2 will require one bridge crossing of the Neuse River.

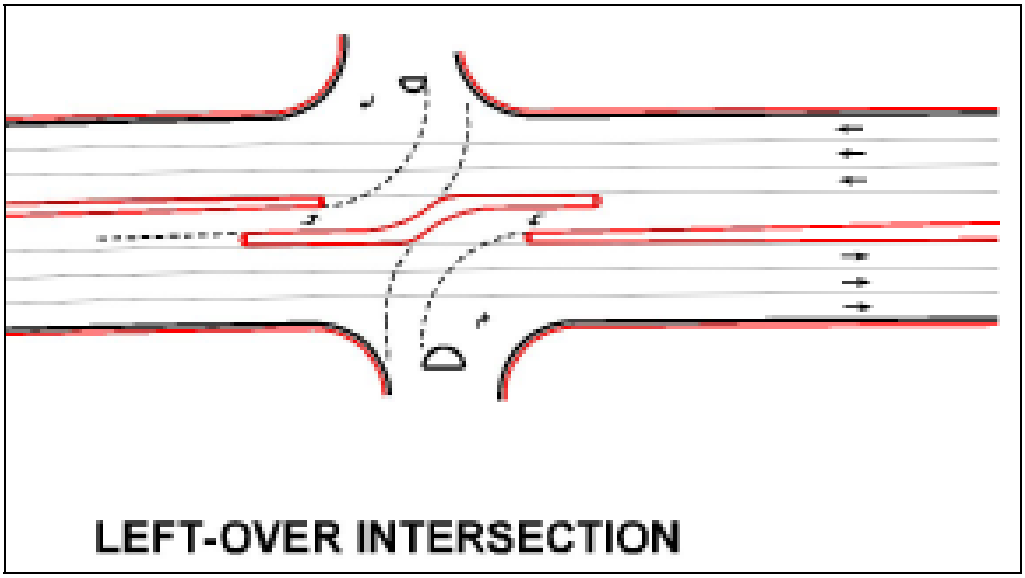
Four different alternatives are evaluated in this report, described as Alternative 1, Alternative 2, Alternative 3, and Alternative 4. The Build Alternatives consist of different intersection treatments, with the mainline or centerline of all alternatives being the same.

Alternative 1 consists of conventional full movement intersections at October Road, Dunn Road, Tabriz Point and Old Falls of Neuse Road, with all remaining intersections utilizing right-in/right-out configurations. A new traffic signal is proposed at the Old Falls of Neuse Road/New Falls of Neuse Road intersection.

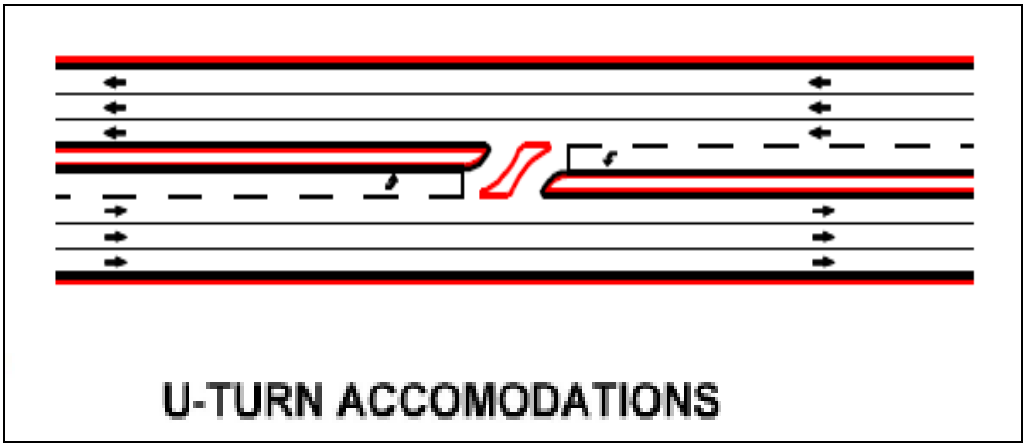




Alternative 2 consists of the same intersection configurations as Alternative 1 with the addition of left-turn directional crossover intersections in the vicinity of Dehijuston Court and Kings Grant Drive/Whittington Drive. Median openings will be provided according to NCDOT Median Crossover Guidelines.



Alternative 3 eliminates full movement intersections and provides left-over intersections in the vicinity of Dehijuston Court, Kings Grant Drive/Whittington Drive, and Wide River Drive. In addition, U-turn accommodations are added to the median at various locations between Raven Ridge Road and New Falls of Neuse Road. New traffic signals are located at Dunn Road, the U-turn south of Falls Dam Road, and Wide River Drive. There is an existing traffic signal at Raven Ridge Road.



Alternative 4 is a combination of Alternatives 2 and 3, which utilizes the Alternative 2 configuration from the southern terminus of this project to between Tabriz Point and Waterwood Court. Alternative 4 would then utilize the Alternative 3 configuration from between Tabriz Point and Waterwood Court to the northern terminus.

PROCEDURE

Analyses of the probable traffic noise impacts of the project will be contained in the Environmental Assessment (EA).

As part of this evaluation, the existing noise levels were measured in the vicinity of the proposed project. The maximum design year (2035) peak hour Leq traffic noise levels expected by receptors in the vicinity of the project were predicted. The Federal Highway Administration (FHWA) Traffic Noise Model 2.5 (TNM 2.5) was used to compute the future design year noise levels in this study. Traffic noise impacts were determined from the current procedures for the abatement of traffic noise and construction noise, defined in 23 Code of Federal Regulations Part 772 (23 CFR 772). Traffic noise impacts were determined based on the procedures set forth in the North Carolina Department of Transportation (NCDOT) Traffic Noise Abatement Policy. Where traffic noise impacts were predicted, the analysis included an examination and evaluation of alternative noise abatement measurements for reducing or eliminating the noise impacts.

CHARACTERISTICS OF NOISE

Noise is basically defined as unwanted sound. It is emitted from many sources including airplanes, factories, railroads, power generating plants, and roadway vehicles. Roadway noise, or traffic noise, is usually a composite of noises from engine exhaust, drive train, and tire-roadway interaction.

The magnitude of noise is usually described by its sound pressure. Since the range of sound pressure varies greatly, a logarithmic scale is used to relate sound pressures to some common reference level, usually the decibel (dB). Sound pressures described in decibels are called sound pressure levels and are often defined in terms of frequency-weighted scales (A, B, C, or D).

The weighted-A scale is used almost exclusively in vehicle noise measurements because it places the most emphasis on the frequency characteristics that correspond to a human's subjective response to noise. Sound levels measured using A-weighting are often expressed as dBA. Throughout this report, references will be made to dBA, which means an A-weighted decibel level. Several examples of noise pressure levels in dBA are listed in Table 1.

Review of Table 1 indicates that most individuals in urbanized areas are exposed to fairly high noise levels from many sources as they go about their daily activities. The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

- The amount and nature of the intruding noise,
- The relationship between the background noise and the intruding noise, and
- The type of activity occurring when the intruding noise is heard.

In considering the first of these three factors, it is important to note that individuals have different hearing sensitivity to noise. Loud noises bother some more than others do and some individuals become angered if an unwanted noise persists. The time patterns of noise also enter into a person's judgment of whether or not a noise is objectionable. For example, noises that occur during sleeping hours are usually considered to be more objectionable than the same noises in the daytime.

With regard to the second factor, individuals tend to judge the annoyance of an unwanted sound in terms of its relationship to noise from other sources (background noise). The blowing of a car or truck horn at night, when background noise levels are approximately 45 dBA, would generally be much more objectionable than the blowing of a car or truck horn in the afternoon, when background noise levels might be 55 dBA.

The third factor is related to the disruption of an individual's activities due to noise. In a 60-dBA environment, normal conversation would be possible while sleep might be difficult. Work activities requiring high levels of concentration may be interrupted by loud noises while activities requiring manual effort may not be interrupted to the same degree.

Over a period of time, individuals tend to accept the noises that intrude into their daily lives, particularly if the noises occur at predicted intervals and are expected. Attempts have been made to regulate many of these types of noises including airplane noises, factory noise, railroad noise, and roadway traffic noise. In relation to roadway traffic noise, methods of analysis and control have developed rapidly over the past few years.

NOISE ABATEMENT CRITERIA

To determine if roadway noise levels are compatible with various land uses, the FHWA has developed noise abatement criteria and procedures to be used in the planning and design of roadways. These abatement criteria and procedures are in accordance with Title 23 Code of Federal Regulations (CFR), Part 772, U.S. Department of Transportation, Federal Highway Administration (FHWA), Procedures for Abatement of Highway Traffic Noise and Construction Noise. A summary of the FHWA Noise Abatement Criteria (NAC) for various land uses is presented in Table 2. Sound pressure levels in this report are referred to as Leq(h). The hourly Leq, or equivalent sound level, is the level of constant sound that over an hour time interval would contain the same acoustic energy as the time-varying sound. In other words, the fluctuating sound levels of traffic noise are represented in terms of a steady noise level with the same energy content.

Noise mitigation measures must be considered when future noise levels either approach or exceed the criteria levels, or if there are substantial increases over the ambient noise levels. The NCDOT Traffic Noise Abatement Policy uses an “approach value” of 1 dBA less than those shown in Table 2. Additionally the value used for “substantial increase” is shown in the lower portion of Table 2 and

is based on the existing noise level. Title 23 CFR, Section 772.11(a) states, "In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit." For this project, the majority of the identified receptors were residential. Commercial receptors are located sparsely along the corridor.

AMBIENT NOISE LEVELS

Ambient noise measurements were taken in the vicinity of the project to determine ambient (existing) noise levels for the identified land uses. The purpose of this noise level information was to quantify the existing acoustic environment and to provide a base for assessing the impact of noise level increases. Ambient noise levels were measured at eight (8) representative locations in the project vicinity. The measurement locations are shown on Figure 3 and their results summarized in Table 3. Four (4) noise measurements (TN-1 through TN-4) were used to calibrate the noise model, while the other four measurements (AN-A through AN-D) were taken to determine the base ambient noise level in the vicinity of the project absent any nearby traffic noise. The base ambient noise level used for the analysis is 51.7 dBA.

The existing roadway and traffic conditions were used with the most current traffic noise prediction model in order to calculate existing noise levels for comparison with noise levels actually measured. The calculated existing traffic noise levels were predicted to be within 3 dBA of the measured traffic noise levels for the locations where traffic noise measurement were obtained. Hence, the computer model is a reliable tool in the prediction of noise levels. Differences in dBA levels can be attributed to "bunching" of vehicles, low traffic volumes, and actual vehicle speeds versus the computer's "evenly-spaced" vehicles and single vehicular speed.

PROCEDURE FOR PREDICTING FUTURE NOISE LEVELS

In general, the traffic situation is composed of a large number of variables that describe different cars driving at different speeds through a continuously changing roadway configuration and surrounding terrain. Due to the complexity of the problem, certain assumptions and simplifications must be made to predict roadway traffic noise.

The TNM traffic noise prediction model uses the number and type of vehicles on the planned roadway, their speeds, the physical characteristics of the road (curves, hills, depressed, elevated, etc.), receptor location and height, and, if applicable, barrier type, barrier ground elevation, and barrier top elevation.

The noise predictions made in this report are roadway-related noise predictions for the traffic conditions during the year being analyzed. Peak hour design and level-of-service (LOS) C volumes were compared, and the volumes resulting in the noisiest conditions were used with the proposed posted speed

limits. Hence, during all other time periods, the noise levels will be no greater than those indicated in this report. The TNM computer model was utilized in order to determine the number of land uses (by type) which would be impacted during the peak hour of the design year 2035. A land use is considered impacted when exposed to noise levels approaching or exceeding the FHWA noise abatement criteria and/or predicted to sustain a substantial noise level increase.

The Leq traffic noise exposures associated with this project are listed in Table 4. Information included in Table 4 consists of a listing of all receptors in close proximity to the project, their ambient and predicted noise levels, and their estimated noise level increase. The location of each receptor is shown on Figure 4.

TRAFFIC NOISE IMPACTS AND NOISE CONTOURS

Traffic noise impacts occur when the predicted traffic noise levels either: [a] approach or exceed the FHWA noise abatement criteria (with "approach" meaning within 1 dBA of Table 2 value), or [b] substantially exceed the existing noise levels. The NCDOT definition of substantial increase is shown in the lower portion of Table 2. Consideration for noise abatement measures must be given to receptors that fall in either category.

In accordance with NCDOT Traffic Noise Abatement Policy, the Federal/State governments are not responsible for providing noise abatement measures for new developments where building permits are issued within the noise impact area of a proposed roadway after the Date of Public Knowledge. The Date of Public Knowledge of the location of a proposed roadway project will be the approval date of a CE, FONSI, or ROD. For development occurring after this public knowledge date, local governing bodies are responsible to insure that noise compatible designs are utilized along the proposed facility.

The maximum number of receptors in each activity category by Alternative that are impacted by future traffic noise is shown in Tables 5 and 6. Under Title 23 CFR, Part 772, the number of impacted receptors due to roadway traffic noise approaching or exceeding FHWA noise abatement criteria in the project area for Alternative 1 is seventy-three (73); for Alternative 2 is sixty-seven (67); and for Alternative 3 and Alternative 4 is seventy-one (71). The maximum extent of the 72 and 67 dBA noise level contours are 48 and 87 feet, respectively, from the center of the proposed roadway. Additional noise level contour data is included in Table 5. This information should assist local authorities in exercising land use control over the remaining undeveloped lands adjacent to the roadway within local jurisdiction. For example, with the proper information on noise, the local authorities can prevent further development of incompatible activities and land uses with the predicted noise levels of an adjacent roadway.

Table 6 exhibits the exterior traffic noise level increases for the identified receptors by Alternative. Fourteen (14) receptors in Alternative 1; twenty-one (21) in Alternative 2; seventeen (17) receptors in Alternative 3; and twenty-three

(23) in Alternative 4 are expected to experience a substantial increase in exterior noise levels due to the construction of the proposed project. The predicted noise level increases for this project range up to 16 dBA. When real-life noises are heard, a noise level change of 2-3 dBA is barely detectable. A 5-dBA change is more readily noticeable. A 10-dBA change is judged by most people as a doubling or a halving of the loudness of the sound.

TRAFFIC NOISE ABATEMENT MEASURES

If traffic noise impacts are predicted, examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts must be considered. Consideration for noise abatement measures must be given to all impacted receptors. There are 73 total impacted receptors in Alternative 1; 72 total impacted receptors in Alternative 2; 71 total impacted receptors in Alternative 3; and 71 total impacted receptors in Alternative 4 due to roadway traffic noise in the project area.

Roadway Alignment

Roadway alignment selection involves the horizontal or vertical orientation of the proposed improvements in such a way as to minimize impacts and costs. The selection of alternative alignments for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For noise abatement, horizontal alignment selection is primarily a matter of siting the roadway at a sufficient distance from noise sensitive areas. Changing the roadway alignment is not a viable alternative for noise abatement.

Traffic System Management Measures

Traffic management measures that limit vehicle type, speed, volume and time of operations are often effective noise abatement measures. For this project, traffic management measures are not considered appropriate for noise abatement due to their effect on the capacity and level-of-service on the proposed roadway.

Noise Barriers

Physical measures to abate anticipated traffic noise levels could often be incorporated with a measurable degree of success by the application of solid mass, attenuable measures to effectively diffract, absorb, and reflect roadway traffic noise emissions. Solid mass, attenuable measures may include earth berms or artificial abatement walls.

Noise abatement on non-controlled or partial access control highways usually is not feasible. Based on the amount of direct access along the corridor, noise barriers are not feasible.

OTHER MITIGATION MEASURES CONSIDERED

The acquisition of property in order to provide buffer zones to minimize noise impacts is not considered to be a feasible noise mitigation measure for this project. The cost to acquire impacted receptors for buffer zones would exceed the abatement threshold of $35,000 per benefited receptor. The use of buffer zones to minimize impacts to future sensitive areas is not recommended because this could be accomplished through land use control.

The use of vegetation for noise mitigation is not considered reasonable for this project, due to the substantial amount of right-of-way necessary to make vegetative barriers effective. FHWA research has shown that a vegetative barrier should be approximately 100' wide to provide a 3-dBA reduction in noise levels. In order to provide a 5-dBA reduction, substantial amounts of additional right-of-way would be required. The cost of the additional right-of-way and planting sufficient vegetation is estimated to exceed the abatement threshold of $35,000 per benefited receptor. Noise insulation was also considered; however, no public or non-profit institutions were identified that would be impacted by this project.

CONSTRUCTION NOISE

The major construction elements of this project are expected to be earth removal, hauling, grading, and paving. General construction noise impacts, such as temporary speech interference for passers-by and those individuals living or working near the project, can be expected particularly from paving operations and from the earth moving equipment during grading operations. However, considering the relatively short-term nature of construction noise, these impacts are not expected to be substantial. The transmission loss characteristics of nearby natural elements and man-made structures are believed to be sufficient to moderate the effects of intrusive construction noise.

SUMMARY

Noise impacts are an unavoidable consequence of roadway projects. A total of 73 receptors in Alternative 1; 72 receptors in Alternative 2; 71 receptors in Alternative 3; and 71 receptors in Alternative 4 will become impacted by roadway traffic noise as a result of the construction of this project. Based on the amount of direct access along the corridor, no noise barriers were determined to be feasible for the proposed project.

Table 1 - Hearing: Sounds Bombarding Us Daily

DECIBELS		
140	Shotgun blast, jet 30m away at takeoff	PAIN
	Motor test chamber	HUMAN EAR PAIN THRESHOLD
130 ----	----------	
	Firecrackers	
120	Severe thunder, pneumatic jackhammer	
	Hockey crowd	
	Amplified rock music	UNCOMFORTABLY LOUD
110 ----	----------	
	Textile loom	
100	Subway train, elevated train, farm tractor	
	Power lawn mower, newspaper press	
	Heavy city traffic, noisy factory	LOUD
90 ----	----------	
	Diesel truck 65 km/h at 15m away	
80	Crowded restaurant, garbage disposal	
	Average factory, vacuum cleaner	
	Passenger car 80 km/h at 15m away	MODERATELY LOUD
70 ----	----------	
	Quiet typewriter	
60	Singing birds, window air-conditioner	
	Quiet automobile	
	Normal conversation, average office	QUIET
50 -----	----------	
	Household refrigerator	
	Quiet office	VERY QUIET
40 -----	----------	
	Average home	
30	Dripping faucet	
	Whisper at 1.5m away	
20	Light rainfall, rustle of leaves	
		AVERAGE PERSON'S THRESHOLD OF HEARING
	Whisper	JUST AUDIBLE
10 -----	----------	
0		THRESHOLD FOR ACUTE HEARING

Sources: World Book, Rand McNally Atlas of the Human Body, Encyclopedia America, "Industrial Noise and Hearing Conversation" by J. B. Olishifski and E. R. Harford (Researched by N. Jane Hunt and published in the Chicago Tribune in an illustrated graphic by Tom Heinz.)

Table 2 - Noise Abatement Criteria

CRITERIA FOR EACH FHWA ACTIVITY CATEGORY HOURLY A-WEIGHTED SOUND LEVEL - DECIBELS (dBA)		
Activity Category	Leq(h)	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities are essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Source: Title 23 of the Code of Federal Regulations (CFR) Part 772, U.S. Department of Transportation, Federal Highway Administration

CRITERIA FOR SUBSTANTIAL INCREASE HOURLY A-WEIGHTED SOUND LEVEL - DECIBELS (dBA)	
Existing Noise Level in Leq(h)	Increase in dBA from Existing Noise Levels to Future Noise Levels
< 50	>= 15
51	>= 14
52	>= 13
53	>= 12
54	>= 11
55	>= 10

Source: North Carolina Department of Transportation Noise Abatement Policy

Table 3 - Ambient Noise Levels (Leq)

Falls of Neuse Rd., Wake County, TIP U-4901

Site	Location	Noise Level (dBA) Measured	Noise Level (dBA) Calculated
Ambient Noise Levels for Model Calibration			
TN-1	Falls of Neuse Rd. - In front of Mount Pleasant Baptist Church	67.7	67.7
TN-2	Falls of Neuse Rd. - 170 feetNorth of High Holly Ln.	67.5	67.5
TN-3	Corner of Falls of Neuse and Fonville Rd.	66.9	66.9
TN-4	Falls of Neuse Rd. - Falls Lake Dam Entrance	64.8	64.8
Ambient Noise Levels to Determine Base Ambient Noise Levels			
AN-A	Falls Tower Dr. - 10 feet from edge of road - 400 feet NW of Falls of Neuse Rd.	52.0	N/A
AN-B	North side corner of Turtle Ridge Way and Paddy Hollow Lane - 15 feet from curb	48.3	N/A
AN-C	Wide River Dr. - 400 feet North of Royal Forest Dr. - 15 feet from curb	57.6	N/A
AN-D	Falls of Neuse Rd. - 1300 feet North of Lowery Farm Dr and 765 feet East of Falls of Neuse Rd.	48.8	N/A

Table 4 - Traffic Noise Exposures
Falls of Neuse Rd., Wake County, TIP U-4901

						Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Receiver ID#	Noise Barrier Analysis Area	Land Use	NAC Category	Number of Dwelling Units	Ambient Leq Noise Level (dBA)	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted
1	N/A	Residence	B	1	56.1	61.6	5.5		61.6	5.5		61.6	5.5		61.6	5.5	
2	N/A	Residence	B	1	56.1	62.7	6.6		62.7	6.6		62.7	6.6		62.7	6.6	
3	N/A	Residence	B	1	63.9	71.4	7.5	X	71.4	7.5	X	71.4	7.5	X	71.4	7.5	X
4	N/A	Residence	B	1	55.7	62.4	6.7		63.2	7.5		63.1	7.4		63.2	7.5	
5	N/A	Church	B	1	69.5	72.9	3.4	X	72.9	3.4	X	72.9	3.4	X	72.9	3.4	X
6	N/A	Residence	B	1	63.9	69.3	5.4	X	69.4	5.5	X	69.3	5.4	X	69.4	5.5	X
7	N/A	Residence	B	1	63	68.6	5.6	X	68.8	5.8	X	68.6	5.6	X	68.8	5.8	X
8	N/A	Residence	B	1	65.5	71	5.5	X	71.1	5.6	X	71.1	5.6	X	71.1	5.6	X
9	N/A	Residence	B	1	55.7	61.6	5.9		62	6.3		61.5	5.8		62	6.3	
10	N/A	Residence	B	1	56.2	62	5.8		62.3	6.1		61.8	5.6		62.3	6.1	
11	N/A	Residence	B	1	65.6	71.3	5.7	X	71.3	5.7	X	71.3	5.7	X	71.3	5.7	X
12	N/A	Residence	B	1	66.2	71.8	5.6	X	71.8	5.6	X	71.7	5.5	X	71.8	5.6	X
13	N/A	Residence	B	1	57.6	62.7	5.1		62.9	5.3		62.5	4.9		62.9	5.3	
14	N/A	Residence	B	1	60.7	67.2	6.5	X	67.2	6.5	X	67	6.3	X	67.2	6.5	X
15	N/A	Residence	B	1	56.1	62.5	6.4		62.6	6.5		62.4	6.3		62.6	6.5	
16	N/A	Residence	B	1	62.4	69.3	6.9	X	69.2	6.8	X	69.2	6.8	X	69.2	6.8	X
17	N/A	Residence	B	1	55.1	61.6	6.5		61.7	6.6		61.3	6.2		61.7	6.6	
18	N/A	Residence	B	1	60	67.1	7.1	X	67.1	7.1	X	66.9	6.9	X	67.1	7.1	X
19	N/A	Residence	B	1	59.1	65.3	6.2		65.6	6.5		64.8	5.7		65.6	6.5	
20	N/A	Residence	B	1	59.6	66.7	7.1	X	67	7.4	X	66.5	6.9	X	67	7.4	X
21	N/A	Residence	B	1	60.4	65.4	5.0		65.9	5.5		64.2	3.8		65.9	5.5	
22	N/A	Residence	B	1	57.9	64.4	6.5		65	7.1		64.1	6.2		65	7.1	
23	N/A	Residence	B	1	66	71.3	5.3	X	71.6	5.6	X	70.3	4.3	X	71.6	5.6	X
24	N/A	Residence	B	1	63	69.2	6.2	X	69.2	6.2	X	67.9	4.9	X	69.2	6.2	X
25	N/A	Residence	B	1	65.4	71.4	6.0	X	71.3	5.9	X	70	4.6	X	71.3	5.9	X
26	N/A	Residence	B	1	56.4	61.6	5.2		61.6	5.2		61.1	4.7		61.6	5.2	
27	N/A	Residence	B	1	59.5	64.9	5.4		64.8	5.3		63.7	4.2		64.8	5.3	
28	N/A	Residence	B	1	57.3	62.5	5.2		62.5	5.2		61.7	4.4		62.5	5.2	
29	N/A	Residence	B	1	63.7	69.7	6.0	X	69.7	6.0	X	69.9	6.2	X	69.7	6.0	X
30	N/A	Residence	B	1	59.3	65.1	5.8		65.1	5.8		65.5	6.2		65.1	5.8	
31	N/A	Residence	B	1	64.8	70.6	5.8	X	70.6	5.8	X	71	6.2	X	70.6	5.8	X
32	N/A	Residence	B	1	66	72.3	6.3	X	72.3	6.3	X	72.8	6.8	X	72.3	6.3	X
33	N/A	Residence	B	1	65.9	72.1	6.2	X	72.1	6.2	X	72.7	6.8	X	72.1	6.2	X
34	N/A	Residence	B	1	67.2	72.7	5.5	X	72.7	5.5	X	73.7	6.5	X	72.7	5.5	X
35	N/A	Residence	B	1	55.9	62	6.1		62	6.1		62	6.1		62	6.1	
36	N/A	Residence	B	1	57.1	63.1	6.0		63.1	6.0		63.1	6.0		63.1	6.0	
37	N/A	Residence	B	1	60.3	66.8	6.5	X	66.8	6.5	X	66.8	6.5	X	66.8	6.5	X
38	N/A	Residence	B	1	66.4	72.3	5.9	X	72.3	5.9	X	72.4	6.0	X	72.3	5.9	X
39	N/A	Residence	B	1	63.2	69.3	6.1	X	69.3	6.1	X	69.3	6.1	X	69.3	6.1	X
40	N/A	Residence	B	1	65.8	71.5	5.7	X	71.5	5.7	X	71.5	5.7	X	71.5	5.7	X
41	N/A	Residence	B	1	58.7	64.8	6.1		64.8	6.1		64.6	5.9		64.8	6.1	
42	N/A	Residence	B	1	63.9	70.1	6.2	X	70.1	6.2	X	70.1	6.2	X	70.1	6.2	X
43	N/A	Residence	B	1	54.5	60.7	6.2		60.7	6.2		60.5	6.0		60.7	6.2	
44	N/A	Residence	B	1	55.9	62	6.1		62	6.1		61.6	5.7		62	6.1	
45	N/A	Residence	B	1	65.1	70.9	5.8	X	70.9	5.8	X	71	5.9	X	70.9	5.8	X
46	N/A	Residence	B	1	56.5	62.6	6.1		62.6	6.1		62	5.5		62.6	6.1	
47	N/A	Residence	B	1	64.8	70.9	6.1	X	70.9	6.1	X	71	6.2	X	70.9	6.1	X

Table 4 - Traffic Noise Exposures
Falls of Neuse Rd., Wake County, TIP U-4901

						Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Receiver ID#	Noise Barrier Analysis Area	Land Use	NAC Category	Number of Dwelling Units	Ambient Leq Noise Level (dBA)	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted
48	N/A	Residence	B	1	56.7	62.9	6.2		62.9	6.2		62.2	5.5		62.9	6.2	
49	N/A	Residence	B	1	65.7	70.7	5.0	X	70.7	5.0	X	70.7	5.0	X	70.7	5.0	X
50	N/A	Residence	B	1	57.5	63.2	5.7		63.2	5.7		62.7	5.2		63.2	5.7	
51	N/A	Residence	B	1	56.9	62.8	5.9		62.7	5.8		62.6	5.7		62.6	5.7	
52	N/A	Residence	B	1	70.8	75.9	R		R	R		R	R		R	R	
53	N/A	Residence	B	1	60.2	66.2	6.0	X	66.2	6.0	X	66.1	5.9	X	66.1	5.9	X
54	N/A	Residence	B	1	66.5	72.1	5.6	X	72.1	5.6	X	72.2	5.7	X	72.2	5.7	X
55	N/A	Residence	B	1	65.3	70.7	5.4	X	70.7	5.4	X	70.7	5.4	X	70.7	5.4	X
56	N/A	Residence	B	1	62.9	69.3	6.4	X	69.3	6.4	X	69.3	6.4	X	69.3	6.4	X
57	N/A	Residence	B	1	58.9	65.2	6.3		65.2	6.3		65.1	6.2		65.2	6.3	
58	N/A	Residence	B	1	62.6	68.9	6.3	X	68.9	6.3	X	68.9	6.3	X	68.9	6.3	X
59	N/A	Residence	B	1	62.1	68.4	6.3	X	68.4	6.3	X	68.3	6.2	X	68.3	6.2	X
60	N/A	Residence	B	1	57.4	63.6	6.2		63.6	6.2		63.2	5.8		63.2	5.8	
61	N/A	Residence	B	1	60.6	67.6	7.0	X	67.6	7.0	X	67.5	6.9	X	67.5	6.9	X
62	N/A	Residence	B	1	57	63.4	6.4		63.3	6.3		62.9	5.9		62.9	5.9	
63	N/A	Residence	B	1	56.7	63.1	6.4		63	6.3		62.7	6.0		62.7	6.0	
64	N/A	Residence	B	1	65.8	72.1	6.3	X	72.1	6.3	X	72.1	6.3	X	72.1	6.3	X
65	N/A	Residence	B	1	65.8	71.6	5.8	X	71.6	5.8	X	71.6	5.8	X	71.6	5.8	X
66	N/A	Residence	B	1	59.3	66	6.7	X	66	6.7	X	65.9	6.6		65.9	6.6	
67	N/A	Residence	B	1	65	71.2	6.2	X	71.1	6.1	X	71.1	6.1	X	71.1	6.1	X
68	N/A	Residence	B	1	58.7	65.4	6.7		65.3	6.6		65.3	6.6		65.3	6.6	
69	N/A	Residence	B	1	55.5	61.9	6.4		61.8	6.3		61.7	6.2		61.7	6.2	
70	N/A	Residence	B	1	55.5	61.8	6.3		61.7	6.2		61.7	6.2		61.7	6.2	
71	N/A	Residence	B	1	61.9	68.4	6.5	X	68.3	6.4	X	68.3	6.4	X	68.3	6.4	X
72	N/A	Residence	B	1	58.2	64.8	6.6		64.6	6.4		64.6	6.4		64.6	6.4	
73	N/A	Residence	B	1	55.3	61.9	6.6		61.6	6.3		61.7	6.4		61.7	6.4	
74	N/A	Residence	B	1	65.1	71.6	6.5	X	71.5	6.4	X	71.5	6.4	X	71.5	6.4	X
75	N/A	Residence	B	1	65.5	71.9	6.4	X	71.9	6.4	X	71.9	6.4	X	71.9	6.4	X
76	N/A	Residence	B	1	57.8	64.4	6.6		64.1	6.3		64.1	6.3		64.1	6.3	
77	N/A	Residence	B	1	68.5	73.6	5.1	X	73.6	5.1	X	73.6	5.1	X	73.6	5.1	X
78	N/A	Residence	B	1	64.6	71.7	7.1	X	71.6	7.0	X	71.6	7.0	X	71.6	7.0	X
79	N/A	Residence	B	1	65.3	72.5	7.2	X	72.4	7.1	X	72.4	7.1	X	72.4	7.1	X
80	N/A	Residence	B	1	66.3	71.6	5.3	X	71.5	5.2	X	71.5	5.2	X	71.5	5.2	X
81	N/A	Residence	B	1	65.1	71.3	6.2	X	71.3	6.2	X	71.3	6.2	X	71.3	6.2	X
82	N/A	Residence	B	1	66.7	72.7	6.0	X	72.7	6.0	X	72.7	6.0	X	72.7	6.0	X
83	N/A	Residence	B	1	55.3	64.2	8.9		64.1	8.8		64	8.7		64	8.7	
84	N/A	Residence	B	1	58.2	69.6	11.4	X	69.6	11.4	X	69.5	11.3	X	69.5	11.3	X
85	N/A	Residence	B	1	52.4	61.4	9.0		61.2	8.8		61.1	8.7		61.1	8.7	
86	N/A	Residence	B	1	58.3	72.2	13.9	X	72.2	13.9	X	72.2	13.9	X	72.2	13.9	X
87	N/A	Residence	B	1	51.7	60.5	8.8		60.4	8.7		60.2	8.5		60.2	8.5	
88	N/A	Residence	B	1	51.7	61.1	9.4		61	9.3		60.8	9.1		60.8	9.1	
89	N/A	Residence	B	1	54.6	70.6	16.0	X	70.6	16.0	X	70.7	16.1	X	70.7	16.1	X
90	N/A	Residence	B	1	52.6	62.4	9.8		62.4	9.8		62.1	9.5		62.1	9.5	
91	N/A	Residence	B	1	53.8	64.5	10.7		64.4	10.6		64.3	10.5		64.3	10.5	
92	N/A	Fire Station	C	1	67.4	68	0.6		67.9	0.5	X	67.7	0.3		67.7	0.3	
93	N/A	Residence	B	1	65.4	R	R		77.1	R		R	R		R	R	
94	N/A	Church	B	1	68.1	68.6	0.5	X	68.5	0.4	X	68.5	0.4	X	68.5	0.4	X

Table 4 - Traffic Noise Exposures
Falls of Neuse Rd., Wake County, TIP U-4901

						Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Receiver ID#	Noise Barrier Analysis Area	Land Use	NAC Category	Number of Dwelling Units	Ambient Leq Noise Level (dBA)	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted
95	N/A	Residence	B	1	68.9	70.2	1.3	X	70.2	1.3	X	70.2	1.3	X	70.2	1.3	X
96	N/A	Residence	B	1	64.2	67.1	2.9	X	66.9	2.7	X	66.9	2.7	X	66.9	2.7	X
97	N/A	Residence	B	1	60.5	61.9	1.4		61.6	1.1		61.5	1.0		61.5	1.0	
98	N/A	Residence	B	1	60.8	64.5	3.7		64.2	3.4		64.1	3.3		64.1	3.3	
99	N/A	Residence	B	1	58.7	63.1	4.4		62.7	4.0		62.6	3.9		62.6	3.9	
100	N/A	Residence	B	1	57.5	61.9	4.4		61.5	4.0		61.5	4.0		61.5	4.0	
101	N/A	Residence	B	1	58.1	58.8	0.7		58.4	0.3		58.3	0.2		58.3	0.2	
102	N/A	Residence	B	1	56.2	60.7	4.5		60.3	4.1		60.2	4.0		60.2	4.0	
103	N/A	Residence	B	1	61.8	59.2	-2.6		58.7	-3.1		58.5	-3.3		58.5	-3.3	
104	N/A	Residence	B	1	61.2	58.2	-3.0		57.3	-3.9		57.3	-3.9		57.3	-3.9	
105	N/A	Business	C	1	67.5	63.1	-4.4		62.2	-5.3		61.9	-5.6		61.9	-5.6	
106	N/A	Residence	B	1	63.8	67.2	3.4	X	66.6	2.8	X	66.4	2.6	X	66.4	2.6	X
107	N/A	Residence	B	1	51.7	R	R		75.6	R		R	R		R	R	
108	N/A	Residence	B	1	51.7	67.1	15.4	X	67	15.3	X	67.1	15.4	X	67.1	15.4	X
109	N/A	Residence	B	1	51.7	65.2	13.5		65.1	13.4		65	13.3		65	13.3	
110	N/A	Residence	B	1	51.7	62.8	11.1		62.8	11.1		62.5	10.8		62.5	10.8	
111	N/A	Residence	B	1	51.7	61.8	10.1		61.8	10.1		61.5	9.8		61.5	9.8	
112	N/A	Residence	B	1	51.7	64	12.3		64	12.3		63.7	12.0		63.7	12.0	
113	N/A	Residence	B	1	51.7	65.5	13.8		65.5	13.8		65.3	13.6		65.3	13.6	
114	N/A	Residence	B	1	51.7	60.7	9.0		60.6	8.9		60.4	8.7		60.4	8.7	
115	N/A	Residence	B	1	51.7	63.2	11.5		63.2	11.5		62.9	11.2		62.9	11.2	
116	N/A	Residence	B	1	52	R	R		74	R		R	R		R	R	
117	N/A	Residence	B	1	53.5	65.1	11.6		63.6	10.1		63.4	9.9		63.4	9.9	
118	N/A	Residence	B	1	60.9	62.1	1.2		61	0.1		61.2	0.3		61.2	0.3	
119	N/A	Residence	B	1	70	60.7	-9.3		59	-11.0		58.8	-11.2		58.8	-11.2	
120	N/A	Residence	B	1	61	57.3	-3.7		56.3	-4.7		56.4	-4.6		56.4	-4.6	
121	N/A	Residence	B	1	57.8	55.8	-2.0		54.9	-2.9		55.1	-2.7		55.1	-2.7	
122	N/A	Residence	B	1	69.4	59.1	-10.3		58.2	-11.2		59.1	-10.3		59.1	-10.3	
123	N/A	Residence	B	1	57.9	55.7	-2.2		54.8	-3.1		55	-2.9		55	-2.9	
124	N/A	Residence	B	1	58.6	55.9	-2.7		55	-3.6		55.4	-3.2		55.4	-3.2	
125	N/A	Residence	B	1	60.4	56.4	-4.0		55.6	-4.8		56.3	-4.1		56.3	-4.1	
126	N/A	Church	B	1	66.1	59.3	-6.8		59	-7.1		60.1	-6.0		60.1	-6.0	
127	N/A	Residence	B	1	68.2	63	-5.2		62.9	-5.3		64.6	-3.6		64.6	-3.6	
128	N/A	Residence	B	1	58.7	59.1	0.4		58.5	-0.2		59.6	0.9		59.6	0.9	
129	N/A	Residence	B	1	69.2	64.8	-4.4		64.8	-4.4		66.3	-2.9	X	66.3	-2.9	X
130	N/A	Residence	B	1	68.8	66.9	-1.9	X	66.8	-2.0	X	67.7	-1.1	X	67.7	-1.1	X
131	N/A	Residence	B	1	70.7	69.8	-0.9	X	69.7	-1.0	X	69.7	-1.0	X	69.7	-1.0	X
132	N/A	Residence	B	1	69.6	69.4	-0.2	X	68.9	-0.7	X	69	-0.6	X	69	-0.6	X
133	N/A	Residence	B	1	68.8	68.7	-0.1	X	66.4	-2.4	X	66.4	-2.4	X	66.4	-2.4	X
134	N/A	Residence	B	1	60.7	61.1	0.4		59.7	-1.0		59	-1.7		59	-1.7	
135	N/A	Residence	B	1	63.5	63.7	0.2		62	-1.5		60.3	-3.2		60.3	-3.2	
136	N/A	Residence	B	1	68.7	68.8	0.1	X	66.8	-1.9	X	66.8	-1.9	X	66.8	-1.9	X
137	N/A	Residence	B	1	66.5	66.7	0.2	X	64.3	-2.2		62.8	-3.7		62.8	-3.7	
138	N/A	Residence	B	1	59.9	57.5	-2.4		56.3	-3.6		56.3	-3.6		56.3	-3.6	
139	N/A	Residence	B	1	58.4	57.2	-1.2		55.6	-2.8		55.3	-3.1		55.3	-3.1	
140	N/A	Residence	B	1	68.6	68.7	0.1	X	65.8	-2.8		64.7	-3.9		64.7	-3.9	
141	N/A	Business	C	1	63.3	62.5	-0.8		60.2	-3.1		59	-4.3		59	-4.3	

Table 4 - Traffic Noise Exposures
Falls of Neuse Rd., Wake County, TIP U-4901

						Alternative 1			Alternative 2			Alternative 3			Alternative 4		
Receiver ID#	Noise Barrier Analysis Area	Land Use	NAC Category	Number of Dwelling Units	Ambient Leq Noise Level (dBA)	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted	Predicted 2030 Leq Noise Level (dBA)	Increase Over Existing (dBA)	Impacted
142	N/A	Business	C	1	63.3	63.2	-0.1		60.7	-2.6		59.4	-3.9		59.4	-3.9	
143	N/A	Residence	B	1	51.7	63	11.3		63.2	11.5		63.1	11.4		63.1	11.4	
144	N/A	Residence	B	1	51.7	59.5	7.8		59.6	7.9		59.4	7.7		59.4	7.7	
145	N/A	Residence	B	1	51.7	64.7	13.0		64.8	13.1		64.7	13.0		64.7	13.0	
146	N/A	Residence	B	1	51.7	66	14.3	X	66.3	14.6	X	66.2	14.5	X	66.2	14.5	X
147	N/A	Residence	B	1	51.7	62.1	10.4		62.2	10.5		62	10.3		62	10.3	
148	N/A	Residence	B	1	51.7	67.6	15.9	X	67.6	15.9	X	67.5	15.8	X	67.5	15.8	X
149	N/A	Residence	B	1	51.7	58.6	6.9		58.7	7.0		58.5	6.8		58.5	6.8	
150	N/A	Residence	B	1	51.7	60.3	8.6		60.4	8.7		60.3	8.6		60.3	8.6	
151	N/A	Residence	B	1	51.7	58.4	6.7		58.5	6.8		58.3	6.6		58.3	6.6	
152	N/A	Residence	B	1	51.7	64.9	13.2		64.9	13.2		64.8	13.1		64.8	13.1	
153	N/A	Residence	B	1	53.8	68	14.2	X	68	14.2	X	67.9	14.1	X	67.9	14.1	X
154	N/A	Residence	B	1	51.7	58.4	6.7		58.5	6.8		58.4	6.7		58.4	6.7	
155	N/A	Residence	B	1	51.7	58.5	6.8		58.6	6.9		58.4	6.7		58.4	6.7	
156	N/A	Residence	B	1	56.2	68.1	11.9	X	68.1	11.9	X	68	11.8	X	68	11.8	X
157	N/A	Residence	B	1	57.1	68.1	11.0	X	68.1	11.0	X	68.1	11.0	X	68.1	11.0	X
158	N/A	Residence	B	1	51.7	58.4	6.7		58.5	6.8		58.4	6.7		58.4	6.7	
159	N/A	Residence	B	1	51.7	58.4	6.7		58.5	6.8		58.3	6.6		58.3	6.6	
160	N/A	Residence	B	1	57.1	68.1	11.0	X	68.1	11.0	X	68.1	11.0	X	68.1	11.0	X
161	N/A	Residence	B	1	56.7	67.6	10.9	X	67.7	11.0	X	67.6	10.9	X	67.6	10.9	X
162	N/A	Residence	B	1	51.7	58.5	6.8		58.6	6.9		58.4	6.7		58.4	6.7	
163	N/A	Residence	B	1	51.7	58.2	6.5		58.2	6.5		58	6.3		58	6.3	
164	N/A	Residence	B	1	58.1	67.6	9.5	X	67.6	9.5	X	67.5	9.4	X	67.5	9.4	X
165	N/A	Residence	B	1	56.2	66.5	10.3	X	66.6	10.4	X	66.5	10.3	X	66.5	10.3	X
166	N/A	Residence	B	1	51.7	62.9	11.2		62.9	11.2		62.7	11.0		62.7	11.0	
167	N/A	Residence	B	1	55.4	67.1	11.7	X	67.1	11.7	X	67	11.6	X	67	11.6	X
168	N/A	Residence	B	1	51.7	66.5	14.8	X	66.4	14.7	X	66.3	14.6	X	66.3	14.6	X
169	N/A	Residence	B	1	51.7	63	11.3		63	11.3		62.8	11.1		62.8	11.1	
170	N/A	Residence	B	1	51.7	62.3	10.6		62.1	10.4		61.9	10.2		61.9	10.2	
171	N/A	Residence	B	1	51.7	59.8	8.1		59.8	8.1		59.6	7.9		59.6	7.9	
172	N/A	Residence	B	1	51.7	58.9	7.2		58.8	7.1		58.5	6.8		58.5	6.8	
173	N/A	Residence	B	1	51.7	57.8	6.1		57.7	6.0		57.5	5.8		57.5	5.8	
174	N/A	Residence	B	1	51.7	57.2	5.5		57	5.3		56.8	5.1		56.8	5.1	
175	N/A	Residence	B	1	56.5	62.5	6.0		62.5	6.0		62.4	5.9		62.5	6.0	
176	N/A	Residence	B	1	55.6	61.7	6.1		61.6	6.0		61.5	5.9		61.6	6.0	
						Total Impacted:		**73**	**Total Impacted:**		**72**	**Total Impacted:**		**71**	**Total Impacted:**		**71**

X = A noise Impact per 23 CFR Part 772
R = Relocation

N/A: The Noise Analysis area is labeled "not applicable " because the receptor was not included in a detailed noise barrier analysis because it is not impacted or located within a cluster of unimpacted receptors, or it is impacted but a noise barrier would not be feasible due to one or a combination of factors. For example the receptor may be isolated, or located near an intersection that would require openings in the noise wall that would substantially reduce the barrier's ability to reduce noise levels

Table 5 - FHWA Noise Abatement Criteria Summary
Falls of Neuse Rd., Wake County, TIP U-4901

Description	Leq Noise Levels			Maximum Contour Distances (ft)		Impacted Receptors According to Title 23 CFR Part 772				
						Activity Category				
	50 ft	100 ft	200 ft	72 dBA	67 dBA	A	B	C	D	E
1. Alternative 1	71.6	65.7	60.4	48	87	0	73	0	0	0
2. Alternative 2	71.6	65.7	60.4	48	87	0	67	0	0	0
3. Alternative 3	71.7	65.8	60.4	48	87	0	71	0	0	0
3. Alternative 4	71.7	65.8	60.4	48	87	0	71	0	0	0

Table 6 - Traffic Noise Level Increase Summary
Falls of Neuse Rd., Wake County, TIP # U-4901

Description	Receptor Exterior Noise Level Increases							Impact Based on Substantial Noise Level Increase	Impacts Due to Both Criteria
	<=0	1-4	5-9	10-14	15-19	20-24	>=25		
1. Alternative 1	29	10	102	26	3	0	0	14	14
2. Alternative 2	31	9	103	26	3	0	0	21	16
3. Alternative 3	31	17	97	24	3	0	0	17	17
3. Alternative 4	31	9	105	24	3	0	0	23	14