MID-CURRITUCK BRIDGE STUDY

TRAFFIC NOISE TECHNICAL REPORT ADDENDUM

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CURRITUCK COUNTY
DARE COUNTY

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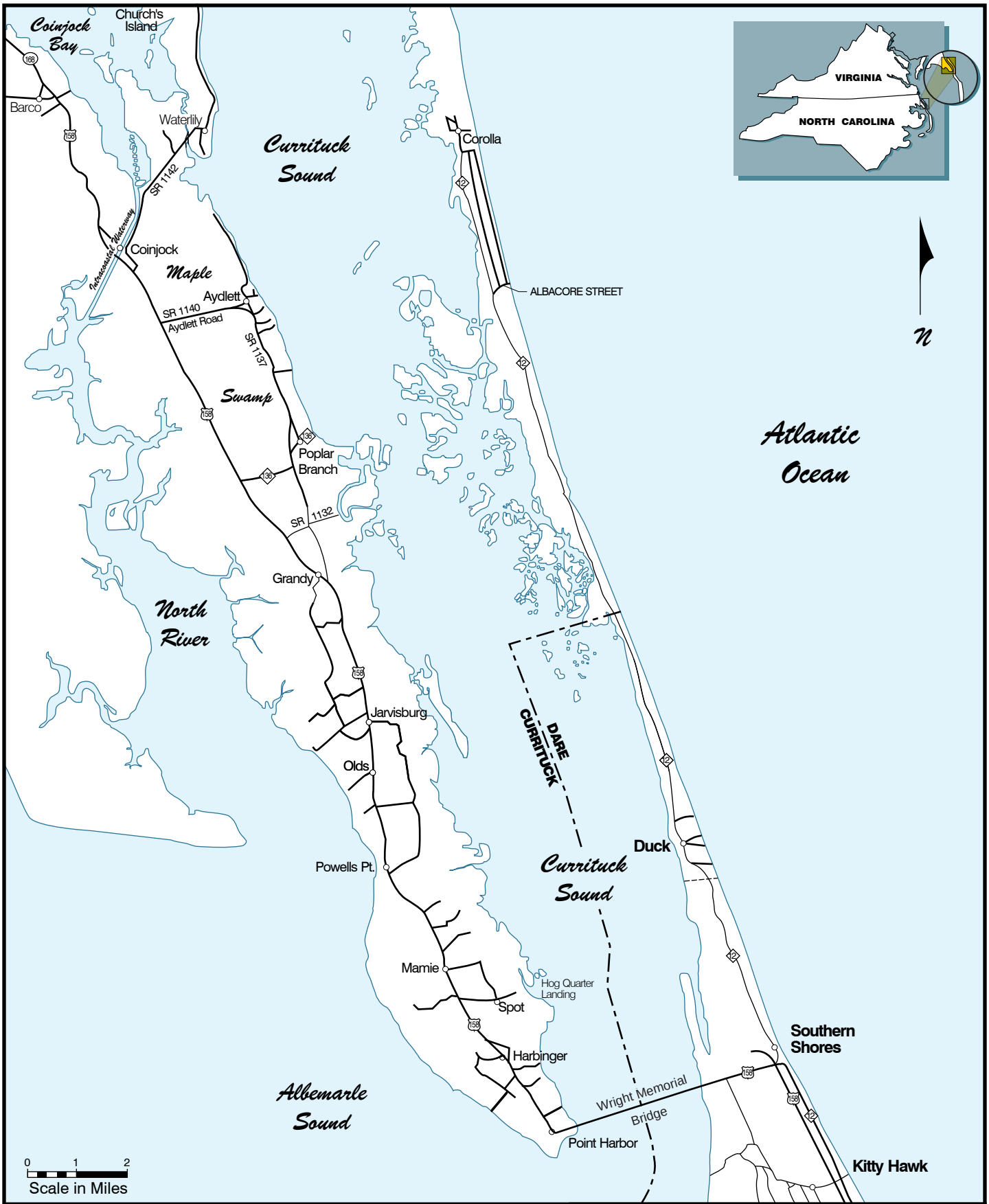
1.0 Introduction and Summary

The North Carolina Turnpike Authority (NCTA), a division of the North Carolina Department of Transportation (NCDOT), in cooperation with the Federal Highway Administration (FHWA), is preparing a Final Environmental Impact Statement (FEIS) to evaluate proposed transportation improvements in the Currituck Sound area. The proposed action is included in NCDOT's *2009 to 2015 State Transportation Improvement Program* (STIP), the 2012 to 2018 Draft STIP, the North Carolina Intrastate System, the *North Carolina Strategic Highway Corridors Concept Development Report*, and the *Thoroughfare Plan for Currituck County*. In those plans, the proposed action is defined as a bridge in Currituck County across Currituck Sound from the mainland to the Outer Banks.

The project area is in northeastern North Carolina and includes the Currituck County peninsula on the mainland and its Outer Banks, as well as the Dare County Outer Banks north of Kitty Hawk (see Figure 1). The project area is south of the Virginia Beach-Norfolk, Virginia (Hampton Roads) metropolitan area. The project area encompasses two thoroughfares, US 158 from NC 168 to NC 12 (including the Wright Memorial Bridge) and NC 12 north of its intersection with US 158 to its terminus in Currituck County. US 158 is the primary north-south route on the mainland. NC 12 is the primary north-south route on the Outer Banks. The Wright Memorial Bridge connects the mainland with the Outer Banks.

The *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009) for the *Draft Environmental Impact Statement* (DEIS) addressed the noise impacts of the DEIS detailed study alternatives (i.e., ER2, MCB2, and MCB4), whereas this *Traffic Noise Technical Report Addendum* (Addendum) focuses primarily on the noise impacts of the Preferred Alternative identified in the FEIS. For noise impacts that have changed, either because of the Preferred Alternative having a different impact than the other detailed study alternatives or because of new noise abatement criteria based on NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011), a new analysis is included in this Addendum. For impacts that are the same as they were in the DEIS, the reader is referred to the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009).



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— - — County Boundaries

Project Area

Figure

1

1.1 Summary of Impacts

The noise analysis found that:

- With the Preferred Alternative, noise is predicted to approach or exceed FHWA noise abatement criteria (NAC) at 1 receptor on the Currituck County mainland and 22 receptors on the Outer Banks. This is the lowest impact of any of the detailed study alternatives. On the Outer Banks, the next lowest impact is MCB4/C2, which would impact 83 receptors.

- With ER2, noise is predicted to approach or exceed NAC at 337 noise-sensitive sites on the Currituck County mainland and 355 noise-sensitive receptors on the Outer Banks.

- With MCB2, noise is predicted to approach or exceed NAC at 27 receptors on the Currituck County mainland, 411 receptors on the Outer Banks with bridge terminus C1, and 348 receptors on the Outer Banks with terminus C2.

- With MCB4, noise is predicted to approach or exceed NAC at 27 receptors on the Currituck County mainland, 146 receptors on the Outer Banks with bridge terminus C1, and 83 receptors on the Outer Banks with terminus C2.

These results would be the same for MCB2 and MCB4 with either Option A or Option B, and in the case of Option B, with or without the toll plaza.

The number shown as approaching or exceeding NAC on the Currituck County mainland is notably higher with ER2 (with the construction of a third outbound emergency lane) than with MCB2 and MCB4. This is because, with ER2, the travel lanes would move closer to surrounding receptors for more than 20 miles with the wider pavement needed to provide for a third outbound emergency lane. This does not mean, however, that noise levels in this area would be notably higher with ER2 and a third outbound emergency lane than with the No-Build Alternative. Since existing noise levels are high and in most cases already exceed the NAC, and because the ER2 improvements would offer no additional traffic carrying capacity, predicted build noise levels would not be notably higher. Typically they would be imperceptibly (no more than 1 dBA) different.

The detailed study alternatives, including the Preferred Alternative, would increase noise levels on the Outer Banks compared to the No-Build Alternative because their wider roads could carry more traffic at the speed limit, and travel lanes would be closer to noise sensitive properties. All noise levels were predicted for the maximum amount of traffic each road could carry traveling the speed limit. When this happens, traffic noise is at its loudest. Noise levels on NC 12 would be up to 10 dBA higher than with the No-Build Alternative in areas where the road would be widened to four lanes. The NAC would not be exceeded in the community of Aydlett on the mainland with any of the detailed study alternatives (including the Preferred Alternative), including with a

toll plaza in Aydlett (Option B). Option B, however, was not included in the Preferred Alternative. The assessment found noise levels in Aydlett of less than 60 dBA at sensitive receptors with a Mid-Currituck Bridge. No properties in the project area would experience a substantial increase in noise levels over existing levels with any of the detailed study alternatives, including the Preferred Alternative.

Noise barriers were found to be reasonable at a few locations along NC 12 in Dare County and along NC 12 in Currituck County. However, noise barrier feasibility, as well as the noise reduction benefits of noise barriers, was found to be sporadic on the three-lane sections of NC 12 (with ER2 and MCB2) because driveway and street accessibility requirements limited the locations where acoustically effective barriers could feasibly be considered. In this area, 232 receptors would be impacted by traffic noise. Of those 232 receptors, three (one percent) would benefit from noise barriers. Those same barriers would lower noise levels for an additional 11 residential properties not impacted.

In the four-lane sections of NC 12 (with all of the detailed study alternatives, including the Preferred Alternative), there are fewer street intersections and driveways, so the benefit of noise barriers would be more pronounced. The Preferred Alternative would impact 23 receptors. Of the 23, 10 (43 percent) would benefit from noise barrier construction. Those same noise barriers would lower noise levels for up to 11 additional receptors not impacted.

MCB2/C1 or MCB4/C1 would see 146 receptors impacted. Of those 146, 111 (76 percent) would benefit from noise barrier construction. Those same noise barriers would lower noise levels for an additional 100 receptors not impacted. With MCB2/C2 or MCB4/C2, the four-lane section of NC 12 would see 83 receptors impacted by traffic noise. Of those 83, 67 (81 percent) would benefit from noise barrier construction. Those same noise barriers would provide lower noise levels for an additional 58 receptors not impacted. The NC 12 noise results for ER2 are similar to those predicted for MCB2/C2.

Barriers would disrupt the drainage patterns along NC 12 in two ways. First, along NC 12 in Dare County and southern Currituck County, the surrounding properties generally drain to the road or sound, so a barrier along NC 12 in that area would block normal drainage from surrounding properties. Second, during severe storms, the walls would be an impediment to flood flow.

NCTA is committed to the construction of feasible and reasonable noise abatement measures at the noise-impacted receptors identified for the Preferred Alternative in this Addendum, contingent upon the following conditions:

1. Detailed noise analysis updates during the final design process continue to support the opportunity to provide noise barriers at Noise Sensitive Area (NSA) 17 and NSA 26 for the Preferred Alternative and, if identified, additional locations;

2. The outcome of hydraulic studies needed to determine the impact of proposed noise barriers on drainage and flood flows, whether the impact can be mitigated, and what would be required to mitigate it and the associated cost;

3. Viewpoints of the property owners and residents of all benefited receptors would be solicited during the final design process;

4. Safety and engineering aspects as related to the roadway users and the adjacent property owners have been reviewed; and

5. Coordination with local officials to identify any new development that has occurred between the date of this Addendum and the Date of Public Knowledge (i.e., the Record of Decision). Any such new development would need to be assessed for noise impacts and given consideration for potential noise abatement measures during the final design process.

1.2 Project Description

The proposed action responds to three underlying needs in the project area. These needs are based on the following travel conditions:

- The project area's main thoroughfares (US 158 and NC 12) are becoming increasingly congested, and congestion will become even more severe in the future.

- Increasing congestion is causing travel time between the Currituck County mainland and the Currituck County Outer Banks to increase, especially during the summer.

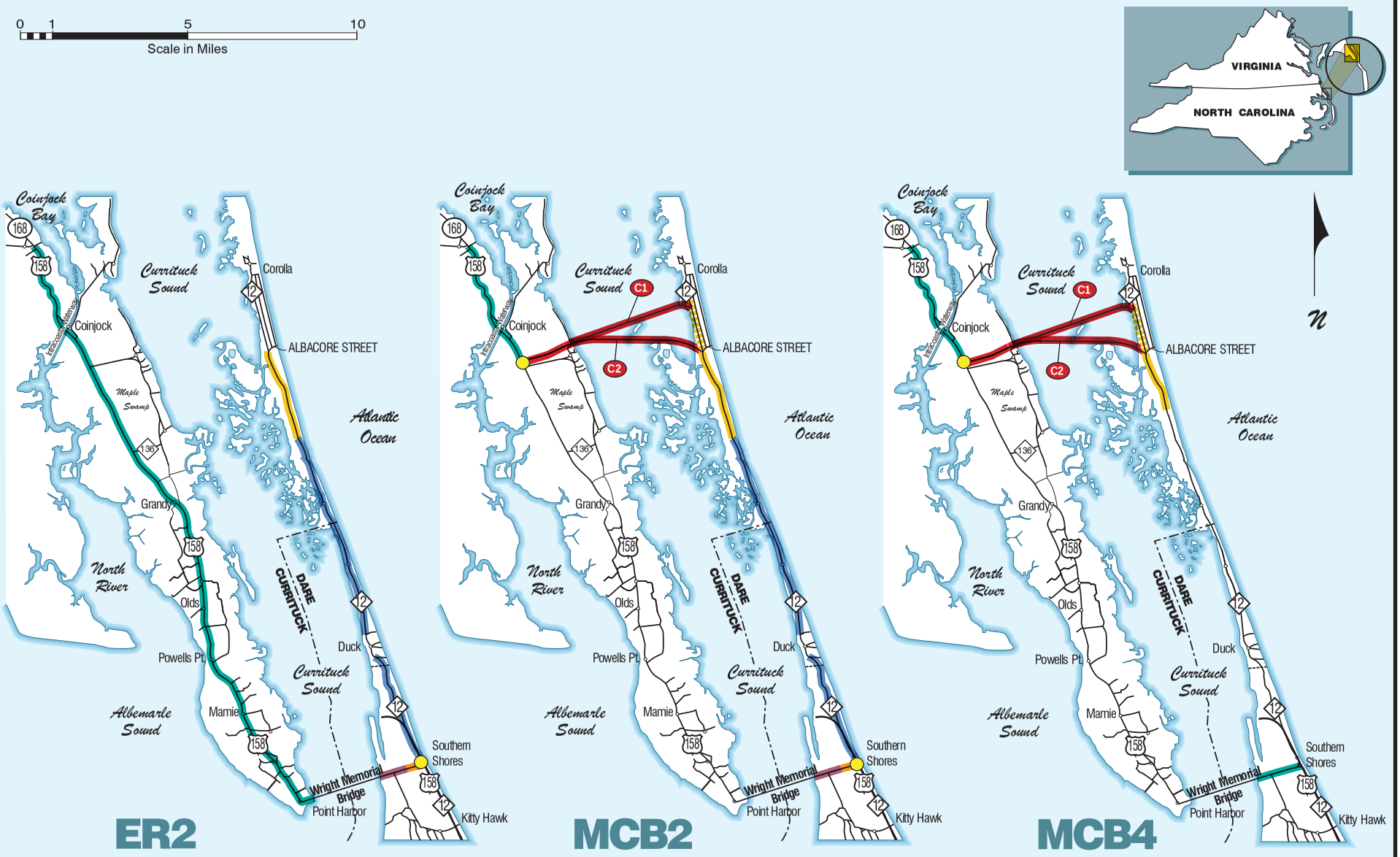
- Evacuation times for residents and visitors who use US 158 and NC 168 as an evacuation route far exceed the state-designated standard of 18 hours.

An alternatives screening study was conducted for the project. Its findings were discussed with federal and state environmental resource and regulatory agencies in a series of Turnpike Environmental Agency Coordination (TEAC) meetings in 2006, 2007, 2008, and 2009. Based on discussions at TEAC meetings, and written comments received from the agencies and public, the *Alternatives Screening Report* (Parsons Brinckerhoff, 2009) for the proposed project identified three alternatives to be carried forward for detailed study in the DEIS along with the No-Build Alternative. The DEIS detailed study alternatives identified are ER2, MCB2, and MCB4. MCB2 and MCB4 also include two bridge corridor alternatives, C1 and C2. The Preferred Alternative is MCB4/C1 with design refinements to reduce potential impacts.

1.2.1 DEIS Detailed Study Alternatives

The DEIS detailed study alternatives are shown on Figure 2 and described below:

- **ER2**
  - Adding for evacuation use only, a third outbound evacuation lane on US 158 between NC 168 and the Wright Memorial Bridge as a hurricane evacuation improvement or using the existing center turn lane as a third outbound evacuation lane; in either case one inbound lane on the Wright Memorial Bridge and on the Knapp (Intracoastal Waterway) Bridge would be used as a third outbound evacuation lane
  - Widening US 158 to a six-lane super-street between the Wright Memorial Bridge and Cypress Knee Trail that widens to eight lanes between Cypress Knee Trail and the Home Depot driveway;
  - Constructing an interchange at the current intersection of US 158, NC 12, and the Aycock Brown Welcome Center entrance, including six through lanes on US 158 starting at the Home Depot driveway and returning to four lanes just south of Grissom Street; and
  - Widening NC 12 to three lanes between US 158 and a point just north of Hunt Club Drive in Currituck County (except where NC 12 is already three lanes in Duck) and to four lanes with a median from just north of Hunt Club Drive to Albacore Street.
- **MCB2**
  - Constructing a 4.7- to 5.3-mile-long two-lane toll bridge across Currituck Sound, as well as approach roads and/or bridges and an interchange at US 158;
  - Adding for evacuation use only, a third outbound evacuation lane on US 158 between NC 168 and the Mid-Currituck Bridge as a hurricane evacuation improvement or using the existing center turn lane as a third outbound evacuation lane; in either case one inbound lane on the Knapp (Intracoastal Waterway) Bridge would be used as a third outbound evacuation lane;
  - Widening US 158 to a six-lane super-street between the Wright Memorial Bridge and Cypress Knee Trail and an eight-lane super-street between Cypress Knee Trail and the Home Depot driveway;
  - Constructing an interchange at the intersection of US 158, NC 12, and the Aycock Brown Welcome Center entrance, including six through lanes on US 158 starting at the Home Depot driveway and returning to four lanes just south of Grissom Street; and



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- Eight Lanes (Super-street)
- Six Lanes (Super-street)
- Four Lanes
- Four Lanes (Only with C1)
- Three Lanes
- Mid-Currituck Bridge
- Third Outbound Lane (Contraflow of an existing lane is an option)
- C1 / C2 Bridge Corridor Alternatives
- Interchange

NOTE: Existing 3-lane segment of NC 12 in Duck is unchanged.

DEIS Detailed Study Alternatives

Figure

2

- Widening NC 12 to three lanes between US 158 and a point just north of Hunt Club Drive in Currituck County (except where NC 12 is already three lanes in Duck) and to four lanes with a median from just north of Hunt Club Drive to NC 12's intersection with the Mid-Currituck Bridge.

- **MCB4**

  - Constructing a 4.7- to 5.3-mile-long two-lane toll bridge across Currituck Sound, as well as approach roads and/or bridges and an interchange at US 158;

  - Adding for evacuation use only, a third outbound evacuation lane on US 158 between NC 168 and the Mid-Currituck Bridge as a hurricane evacuation improvement or using the existing center turn lane as a third outbound evacuation lane; in either case one inbound lane on the Knapp (Intracoastal Waterway) Bridge would be used as a third outbound evacuation lane;

  - Adding for evacuation use only, a third outbound evacuation lane on US 158 between the Wright Memorial Bridge and NC 12 as a hurricane evacuation improvement or using the existing center turn lane as a third outbound evacuation lane; in either case one inbound lane on the Wright Memorial Bridge would be used as a third outbound evacuation lane; and

  - Widening NC 12 in Currituck County to four lanes with a median from Seashell Lane to NC 12's intersection with the Mid-Currituck Bridge.

The unique characteristic of a super-street, included along US 158 east of the Wright Memorial Bridge with ER2 and MCB2, is the configuration of the intersections. Side-street traffic wishing to turn left or go straight must turn right onto the divided highway where it can make a U-turn through the median a short distance away from the intersection. After making the U-turn, drivers can then either go straight (having now accomplished the equivalent of an intended left turn) or make a right turn at their original intersection (having now accomplished the equivalent of an intention to drive straight through the intersection).

For MCB2 and MCB4, two design options are evaluated for the approach to the bridge over Currituck Sound, between US 158 and Currituck Sound. Option A would place a toll plaza within the US 158 interchange. The mainland approach road to the bridge over Currituck Sound would include a bridge over Maple Swamp. With Option B, the approach to the bridge over Currituck Sound would be a road placed on fill within Maple Swamp. Aydlett Road would be removed and the roadbed restored as a wetland. Traffic traveling between US 158 and Aydlett would use the new bridge approach road. A local connection would be provided between the bridge approach road and the local Aydlett street system. The toll plaza would be placed in Aydlett east of that local connection so that Aydlett traffic would not pass through the toll plaza when traveling

between US 158 and Aydlett. No access to and from the Mid-Currituck Bridge would be provided at Aydlett.

Also, for MCB2 and MCB4, there are two variations of the proposed bridge corridor (see Figure 2) in terms of its terminus on the Outer Banks. Bridge corridor C1 would enter the Outer Banks through the southern end of Phase I of the Corolla Bay subdivision, physically dividing it into two parts and using three residential lots in a subdivided but undeveloped portion. It would then connect with NC 12 at an intersection approximately two miles north of the Albacore Street retail area. Bridge corridor C2 would connect with NC 12 approximately one-half mile south of the Albacore Street retail area. The length of the proposed bridge over Currituck Sound would be approximately 4.7 miles with bridge corridor C1, whereas it would be approximately 5.3 miles with bridge corridor C2.

1.2.2 Preferred Alternative

The Preferred Alternative is MCB4/C1 with Option A (Figure 3). It also includes several design refinements to reduce impacts, in response to government agency and public input and comments. These refinements include:

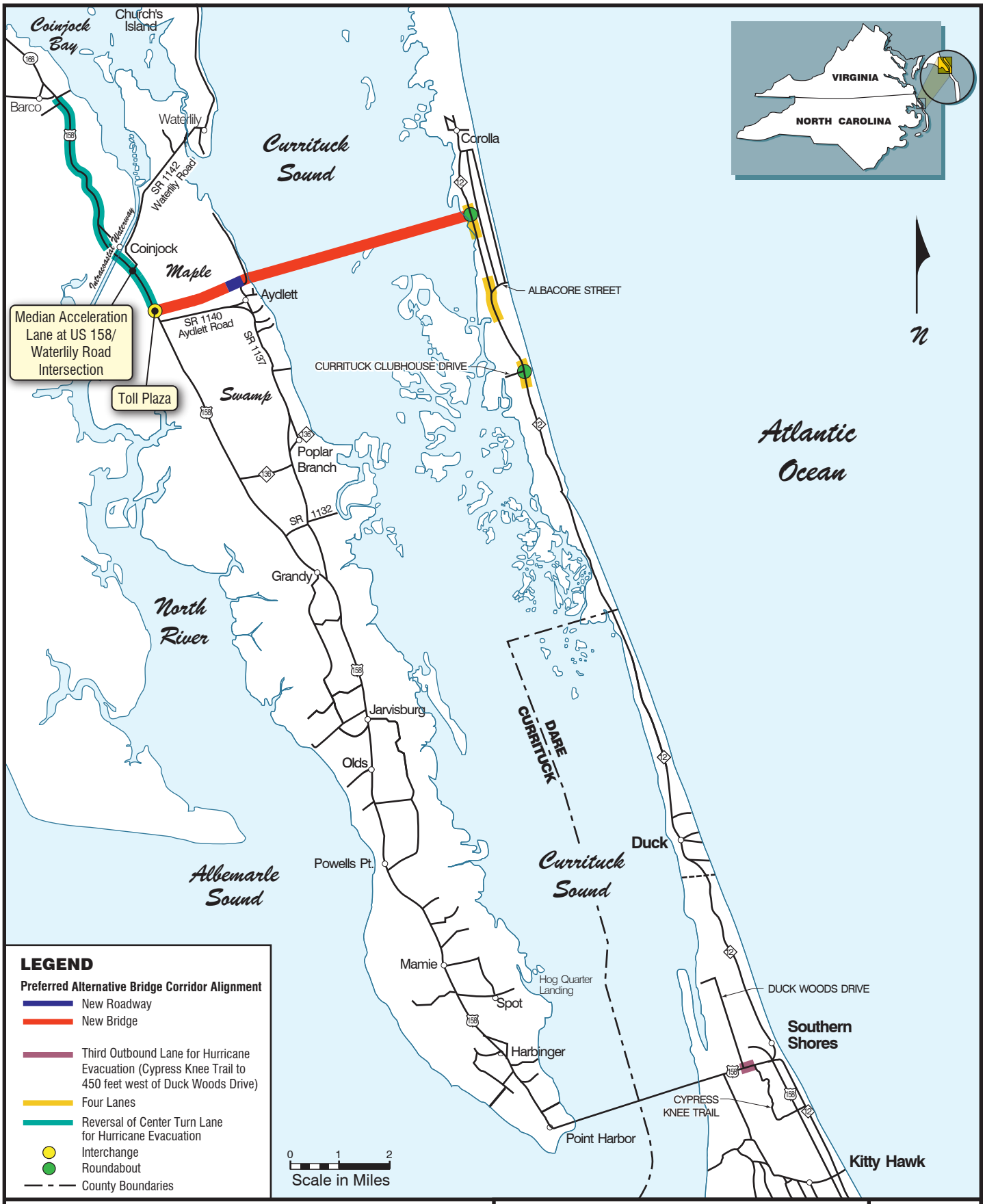
- Provision of a median acceleration lane at Waterlily Road. This safety feature would allow left turns to continue to be made at Waterlily Road and US 158. Bulb-outs for U-turning vehicles also would be provided at the re-aligned US 158/Aydlett Road intersection and the US 158/Worth Guard Road intersection to provide greater flexibility for local traffic in turning to and from existing side streets near the US 158/ Mid-Currituck Bridge interchange.

- Reducing the amount of four-lane widening along NC 12 from that with MCB4/C1 from approximately 4 miles to approximately 2.1 miles, plus left turn lanes at two additional locations over approximately 0.5 mile. The 2.1 miles of NC 12 widening would be concentrated at three locations: the bridge terminus, the commercial area surrounding Albacore Street, and Currituck Clubhouse Drive.

- Constructing roundabouts on NC 12 instead of signalized intersections at the bridge terminus and Currituck Clubhouse Drive.

- Terminating the bridge in a roundabout at NC 12 also allowed the C1 bridge alignment to be adjusted to remove curves and thereby reduced its length across Currituck Sound by approximately 250 feet (from approximately 24,950 feet [4.7 miles] to 24,700 feet).

- Provision of marked pedestrian crossings along NC 12 where it would be widened. They would be placed at locations identified by Currituck County plans (Albacore Street, Orion's Way, and Currituck Clubhouse Drive are under consideration for inclusion in the next Currituck County thoroughfare plan), as well as at North



Preferred Alternative

Figure 3

Harbor View Drive and the bridge terminus (one across NC 12 and one across the bridge approach road).

For hurricane evacuation, the Preferred Alternative includes:

- On the mainland, reversing the center turn lane on US 158 between the US 158/Mid-Currituck Bridge interchange and NC 168 to provide additional road capacity during a hurricane evacuation and reduce clearance times.

- On the Outer Banks, adding approximately 1,600 feet of new third outbound lane to the west of the US 158/NC 12 intersection to provide additional road capacity during a hurricane evacuation. The additional lane would start at the US 158/Cypress Knee Trail/Market Place Shopping Center intersection and end approximately 450 feet west of the Duck Woods Drive intersection, a total distance of approximately 1,600 feet. From this point, the new lane would merge back into the existing US 158 westbound lanes over a distance of approximately 300 feet.

1.2.3 Noise Assessment

The *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009) for the DEIS was prepared in accordance with Title 23 Code of Federal Regulations (CFR), Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*, the FHWA *Highway Traffic Noise Analysis and Abatement Policy and Guidance* (June 1995), and the NCDOT *Traffic Noise Abatement Policy* (September 2004). This Addendum was prepared in accordance with these same federal regulations and FHWA policy; however, this Addendum also was prepared in accordance with NCDOT's *Traffic Noise Abatement Policy* (effective July 13, 2011), which replaces the September 2004 NCDOT policy. All noise levels described herein are expressed in A-weighted decibels (dBA) in terms of one-hour equivalent steady-state sound level – $L_{eq}(h)$.

The objectives of the traffic noise study documented in this Addendum are to:

- Identify noise-sensitive receptors adjacent to the project corridor for the Preferred Alternative;

- Evaluate future traffic noise levels at the receptors with and without the proposed project improvements associated with the Preferred Alternative;

- Identify impacts to noise sensitive receptors; and

- Evaluate the feasibility and reasonableness of potential noise abatement measures to mitigate these impacts.

Additional objectives include the evaluation of construction noise and the identification of future noise level contours adjacent to the project corridor.

2.0 Traffic Noise Analysis

Definitions of sound, magnitude of noise, measurement of noise, and typical noise sources are discussed in the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009). In addition, descriptions of the noise model, traffic data, and measured noise levels are included in Sections 2.3, 2.4, and 2.5, respectively, of the 2009 technical report.

2.1 Noise Abatement Criteria

FHWA has developed noise abatement criteria (NAC) and procedures to be used in the planning and design of highways to determine noise levels at which mitigation should be considered. These NAC and procedures are based in Title 23 CFR, Part 772, *Procedures for Abatement of Highway Traffic Noise and Construction Noise*. Table 1 provides a summary of the NAC for various land use activity categories based on NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011).

FHWA requires that noise abatement measures must be considered when future noise levels either approach or exceed the NAC levels shown in Table 1, or if there are substantial increases over the ambient noise levels. NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011) states that "traffic noise abatement for NCDOT highway projects is warranted and must be considered when traffic noise impacts are created by either of the following two conditions:"

1. The predicted traffic noise levels for the design year approach (i.e., reach one decibel less than, for example 66 dBA for land use Activity Category B) or exceed the NAC shown in Table 1; or

2. The predicted traffic noise levels for the design year [2035 for this project] substantially exceed existing noise levels. NCDOT definitions for substantial noise level increases are presented in Table 2.

Title 23 CFR, Section 772.11(b) states, "In determining traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs" and Title 23 CFR, Section 772.13(b) states, "In abating traffic noise impacts, a highway agency shall give primary consideration to exterior areas where frequent human use occurs." For this project, identified potentially noise-sensitive receptors were commercial uses, residences, a library, churches, and recreation areas.

Table 1. Noise Abatement Criteria
(Hourly Equivalent A-Weighted Sound Level (decibels – dBA)

Activity Category	Activity Criteria[1] $L_{eq}(h)$[2]	Evaluation Location	Activity Description
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 is essential if the area is to continue to serve its intended purpose.
B[3]	67	Exterior	Residential
C[3]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare 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, Section4(f) sites, schools, television studios, trails, and trail crossings.
D	52	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	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: NCDOT *Traffic Noise Abatement Policy*, July 13, 2011.

[1]The $L_{eq}(h)$ activity criteria values are for impact determination only, and are not design standards for noise abatement measures.

[2]The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with $L_{eq}(h)$ being the hourly value of L_{eq}.

[3]Includes undeveloped lands permitted for this activity category.

Table 2. Substantial Noise Level Increase
(Hourly Equivalent A-Weighted Sound Level (decibels - dBA)

Existing Noise Level[1] ($L_{eq}(h)$)	Predicted Design Year Noise Level Increase[2] ($L_{eq}(h)$)
50 or less	15 or more
51	14 or more
52	13 or more
53	12 or more
54	11 or more
55 or more	10 or more

Source: NCDOT *Traffic Noise Abatement Policy*, July 13, 2011.
[1]Loudest hourly equivalent noise level from the combination of natural and mechanical sources and human activity usually present in a particular area.
[2]Predicted hourly equivalent design year traffic noise level minus existing noise level.

2.2 Noise-Sensitive Receptors

This noise study was based on the number and location of established noise-sensitive receptors, as well as currently vacant residential properties that had received building permits from applicable local governments. Noise-sensitive receptors are discussed in detail in the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009).

Noise sensitive receptors within the study limits of the Preferred Alternative consist mostly of the exterior areas of low density and medium density residential areas (Activity Category B). The distances from the Preferred Alternative to the 66 and 71 dBA noise contours, measured perpendicularly out from the edge-of-pavement of NC 12 and the new roadway approaching the proposed Mid-Currituck Bridge, are shown in Table 3.

Table 3. 66 and 71 dBA Noise Contours for 2035 with the Preferred Alternative

Proposed Improvement Segment	Distance (feet) to 66 dBA*	Distance (feet) to 71 dBA*
US 158 between NC 168 and Knapp Bridge	225	100
US 158 between Knapp Bridge and Mid-Currituck Bridge	200	100
Mid-Currituck Bridge between US 158 and Currituck Sound	Less than 25	Less than 25
NC 12 between Currituck Clubhouse Drive and Spindrift Trail	75	Less than 25
NC 12 between Mid-Currituck Bridge and Currituck Clubhouse Drive	50 to 110	Less than 25 to 50
NC 12 roadway approach to Mid-Currituck Bridge	110	50
NC 12 north of Mid-Currituck Bridge	50	Less than 25

*All distances measured perpendicularly out from the edge-of-pavement of the proposed roadway. A range is provided in one case because both two- and four-lane sections are included in the segment. The higher number applies to the four-lane portions.

2.3 Predicted Noise Levels

Predicted noise levels for the detailed study alternatives, including the Preferred Alternative, were calculated and compared to the No-Build Alternative and to the existing conditions noise levels at 1,877 noise-sensitive receptors adjacent to the proposed roadway improvements. The noise study area encompasses noise-sensitive receptors adjacent to the roadway on new alignment, areas where there are Preferred Alternative roadway improvements, and areas within the project limits where the roadway improvements included a change in traffic capacity or roadway alignment. The noise analysis included impacted noise-sensitive receptors adjacent to the roadway, as well as noise sensitive receptors beyond the threshold of the 66 and 71 dBA noise contours (non-impacted noise-sensitive receptors). Table 4 presents the predicted noise levels for the Preferred Alternative, and also compares the increase in the predicted noise levels to the predicted existing conditions. The predicted noise levels for the DEIS detailed study alternatives are discussed in the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009) in Section 2.6. The noise study area and locations of the representative receptors modeled along the Preferred Alternative are shown on the plan sheets in Appendix A. The noise study area was broad enough to capture adjoining non-impacted receptors in addition to impacted receptors. A receptor may represent one home or multiple homes. A receptor that is located a certain distance from the roadway, and representing a number of homes, may represent also a commercial or other outside land use nearby and at the same distance from the roadway. A summary of the predicted noise levels by receptor for the Preferred Alternative, as well as the FHWA Traffic Noise Model® (TNM) output files, are provided in Appendix B. (Note that the "Report Receiver [receptor] Name" column in Appendix B corresponds to the receptor numbers shown on the plan sheets in Appendix A.)

Additional information on the impacted receptors within the Noise Sensitive Areas (NSAs) that would be impacted by the Preferred Alternative is discussed below. A detailed description of each NSA, as well as additional information on the impacted receptors within each NSA as a result of the DEIS detailed study alternatives, is provided in the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009).

- **NSA 2** – One residence within NSA 2 is predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative.

  The Preferred Alternative (which includes Option A) at NSA 2 consist of a westbound and eastbound toll plaza, and a shift in the US 158 alignment. The US 158 interchange would connect to a two-lane bridge through Maple Swamp to the Mid-Currituck Bridge. As stated previously, six residences would be displaced with the Preferred Alternative, and there would be no remaining residences near the proposed interchange and toll plazas. The remaining two residences are at the southeast quadrant of the US 158 and Young Road intersection; they would be greater than 1,000 feet from the proposed westbound toll plaza and greater than 500 feet from the end of the proposed ramp from the toll plaza to the improved US 158.

Table 4. Predicted Traffic Noise Levels with the Preferred Alternative

NSA	TNM Receptor Numbers[1]	Number of Receptors Evaluated	Predicted Minimum – Maximum (dBA)[2]			Difference Existing vs. Preferred Alternative (dBA)[3]	Number of Receptors Impacted[4]
			Existing (2006)	No-Build (2035)	Preferred Alternative (2035)		
2[5]	US158S-1 to US158S-8	8	61 to 76	61 to 76	61 to 71	0	1
16	CurrituckCottages-1 to Currituck Cottages-3	3	60 to 65	60 to 65	62 to 65	0 to 4	0
17	OceanSands1-1 to OceanSands1-26	44	55 to 65	55 to 65	56 to 68	0 to 5	3
18	TheHammocks-1 to TheHammocks-20	56	51 to 64	51 to 64	52 to 65	-1 to 5	0
19	OceanSands2-1 to OceanSands2-22	40	54 to 64	54 to 64	55 to 64	-1 to 1	0
20	CurrituckClub-1 to CurrituckClub-12	13	48 to 59	48 to 59	48 to 58	-1 to 1	0
21	OceanSands3-1 to OceanSands3-13	37	54 to 65	54 to 65	55 to 64	-1 to 1	0
22	Apt1-1F to Apt3-3F	36	50 to 58	50 to 58	56 to 65	5 to 7	0
23	MonteryShores1-1 to Monteray Shores1-25	47	52 to 67	52 to 67	52 to 67	-1 to 5	3
24	MonteryShores2-1 to Monteray Shores2-13	14	48 to 64	48 to 64	57 to 72	1 to 9	2
25	MonteryShores3-1 to Monteray Shores3-23	47	50 to 61	50 to 61	51 to 67	-2 to 6	5
26	MonteryShores4-1 to Monteray Shores4-16	24	53 to 66	53 to 66	58 to 72	-1 to 6	8
27	CorollaBay-1 to CorollaBay-3	3	46 to 54	46 to 54	49 to 55	1 to 4	0
28[5]	MCBS-1 to MCBS-8	8	None	None	49 to 59	N/A	0
29[5]	MCBN-1 to MCBN-19	19	None	None	48 to 58	N/A	0
	Total						22

[1]The locations of the noise sensitive receptors modeled are shown on the plan sheets in Appendix A. The TNM receptor may represent one or several noise sensitive receptors. The number of noise sensitive receptors represented is indicated in the column "Number of Receptors Evaluated."

[2]The predicted noise levels by receptor are provided in Appendix B.

[3]The minimum and maximum numbers are rounded to the nearest decibel. The range provided for the difference in existing and the Preferred Alternative is for two actual receptors for the particular NSA, one with the lowest change and the other with the highest change in decibel. These receptors are not necessarily the same as receptors predicted to have the minimum or maximum dBA for the existing, No-Build, or Preferred Alternative, and may actually be in the middle of this range.

[4]The term "impacted" is defined as the receptors that are predicted to experience noise levels that approach or exceed the NAC as a result of the Preferred Alternative.

[5]The typical section and location of proposed improvements in these areas are identical for MCB2/A, MCB4/A, and the Preferred Alternative (which includes Option A). Hence, the roadway location and predicted noise level data at these NSAs are included in the appendices of the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009).

The segment of the improved US 158 adjacent to the remaining residences was considered the predominant traffic noise source and the only roadway included in the Preferred Alternative noise analysis for NSA 2.

One residence (receptor 8 on Figure A-36PA) is predicted to be exposed to noise levels that would approach or exceed the NAC. In accordance with NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011), noise abatement measures were considered, but a detailed analysis was not performed for this isolated impacted residence because a continuous noise barrier would not be reasonable.

- **NSA 16** – No residences within NSA 16 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 16, the Preferred Alternative includes a four-lane road south of the proposed roundabout at Currituck Clubhouse Drive that transitions to a two-lane road. Noise abatement measures are not required to be evaluated when the predicted noise levels do not approach or exceed the NAC.

- **NSA 17** –Three residences within NSA 17 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 17, the Preferred Alternative includes a roundabout at Currituck Clubhouse Drive and a four-lane roadway north and south of the proposed roundabout that transitions to a two-lane road. Noise abatement measures were evaluated and are discussed in Section 3.0.

- **NSA 18** – No residences within NSA 18 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 18, the Preferred Alternative involves the existing two-lane NC 12 roadway with the addition of a center turn lane at Seabird Way. Noise abatement measures are not required to be evaluated when the predicted noise levels do not approach or exceed the NAC.

- **NSA 19** – No residences within NSA 19 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 19, the Preferred Alternative includes the addition of a center turn lane at Seabird Way on the existing two-lane NC 12. Noise abatement measures are not required to be evaluated when the predicted noise levels do not approach or exceed the NAC.

- **NSA 20** – No residences within NSA 20 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 20, the Preferred Alternative includes the addition of a center turn lane at Driftwood Way on the existing two-lane NC 12. Noise abatement measures are not required to be evaluated when the predicted noise levels do not approach or exceed the NAC.

- **NSA 21** – No residences within NSA 21 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 20, the Preferred Alternative includes the addition of a center turn lane at Driftwood Way on the existing two-lane NC 12. Noise abatement measures are not required to be evaluated when the predicted noise levels do not approach or exceed the NAC.

- **NSA 22** – No residences within NSA 22 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 22, the Preferred Alternative includes a four-lane roadway between Crown Point and Dolphin Street. Noise abatement measures are not required to be evaluated when the predicted noise levels do not approach or exceed the NAC.

- **NSA 23** – Three residences within NSA 23 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 23, the Preferred Alternative includes a section of four-lane roadway with a transition to a two-lane roadway north of Dolphin Street. Noise abatement measures were evaluated and are discussed in Section 3.0.

- **NSA 24** – Two residences within NSA 24 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 24, the Preferred Alternative includes a four-lane roadway from north of North Harbor View Drive to the proposed roundabout at the Mid-Currituck Bridge terminus on NC 12. The two residences predicted to be impacted by the Preferred Alternative are separated from each other by access roads to NC 12. In accordance with NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011), noise abatement measures were considered, but a detailed analysis was not performed because the access roads to NC 12 between these residences would prevent the construction of a necessarily continuous and acoustically effective (i.e., feasible) noise barrier.

- **NSA 25** – Five residences within NSA 25 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 25, the Preferred Alternative includes a section of four-lane roadway with a transition to a two-lane roadway north of Dolphin Street. The residences predicted to be exposed to noise levels that would approach or exceed the NAC are adjacent to the roadway corridor, but are separated from each other by access roads to NC 12. In accordance with NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011), noise abatement measures were considered, but a detailed analysis was not performed because the access roads to NC 12 between these residences would prevent the construction of a necessarily continuous and acoustically effective (i.e., feasible) noise barrier.

- **NSA 26** – Eight residences within NSA 26 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 26, the Preferred Alternative includes a four-lane roadway from north of North Harbor View Drive to the proposed roundabout at the Mid-Currituck Bridge terminus on NC 12. Noise abatement measures were evaluated and are discussed in Section 3.0.

- **NSA 27** – No residences within NSA 27 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Within NSA 27, the Preferred Alternative includes a section of four-lane roadway north of the proposed roundabout at the Mid-Currituck Bridge terminus on NC 12 and a transition back to the existing two-lane NC 12. Noise abatement measures are not required to be evaluated when the predicted noise levels do not approach or exceed the NAC.

- **NSA 28** – No residences within NSA 28 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. The Preferred Alternative within NSA 28 would include a two-lane bridge approach roadway on fill and the bridge crossing Currituck Sound. Noise abatement measures are not required to be evaluated when the predicted noise levels do not approach or exceed the NAC.

- **NSA 29** – No residences within NSA 29 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. The Preferred Alternative within NSA 29 would include a two-lane bridge approach roadway on fill and the bridge crossing Currituck Sound. Noise abatement measures are not required to be evaluated when the predicted noise levels do not approach or exceed the NAC.

3.0 Evaluation of Noise Abatement Alternatives

NCDOT requires that when the noise levels attributed to a proposed roadway project approach or exceed the NAC, noise abatement measures must be considered. Also, when predicted future noise levels result in a substantial increase over existing noise levels in accordance with NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011), noise abatement must be considered. Because noise levels at locations along the study corridor were determined to approach or exceed the NAC for Activity Categories B, C, and E, the feasibility and reasonableness of noise abatement measures were evaluated. These measures included buffer zones, transportation systems management measures, alignment modifications, and noise barriers. Use of a buffer zone, transportation systems management measures, and alignment modifications were considered as potential mitigation measures in the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009) in Sections 3.1, 3.2, and 3.3, respectively. In all cases they were found not to be a reasonable option for this project. However, as shown in Table 4, the Preferred Alternative with its reduction in the amount of widening on NC 12 would substantially reduce noise impacts over the other detailed study alternatives. With the Preferred Alternative, noise is predicted to approach or exceed the NAC at 22 receptors on the Outer Banks, which is the lowest impact of any of the detailed study alternatives. The next lowest impact on the Outer Banks is MCB4/C2, which would impact 83 receptors.

The focus of this evaluation of noise abatement alternatives is on noise barriers. Noise barriers reduce noise levels by blocking the sound path between a roadway and noise-sensitive receptors. To be effective in reducing traffic-induced noise levels, a noise barrier must be relatively long, continuous (with no intermittent openings), sufficiently dense, and high enough to provide the necessary reduction in noise levels.

For a barrier to be considered feasible and reasonable, it must meet the following criteria:

- Provide a minimum insertion loss (IL) (noise reduction) of 5 dBA for at least one impacted receptor.

- Consider adverse impacts created by or upon property access, drainage, topography, utilities, safety, and maintenance requirements.

- Not exceed the maximum allowable base quantity of noise barriers per benefited receptor of 2,500 square feet. Additionally, an incremental increase of 35 square feet shall be added to the base quantity per the average increase in dBA between existing and predicted exterior noise levels of all impacted receptors within each noise sensitive area.

- Evaluate a noise reduction design goal of at least 7 dBA for all front row receptors. At least one benefited front row receptor must achieve this noise reduction design goal to indicate the noise abatement measure effectively reduces traffic noise.

- Solicit viewpoints of the property owners and residents of all benefited receptors.

This is a partial list of the criteria to be considered in determining feasibility and reasonableness. A complete listing of these criteria can be found in NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011) in Appendix C.

Noise barriers were determined to be the only potentially feasible and reasonable abatement measure for some portions of this project. Noise barriers were considered at areas along the project corridor where noise impacts were predicted as a result of the detailed study alternatives, including the Preferred Alternative. Where noise barriers were determined to be potentially feasible and reasonable, a detailed noise abatement analysis was completed using TNM. Each potential noise barrier was analyzed at varying heights ranging from 8 to 24 feet (if necessary), in height intervals of 2 feet, and for various lengths in order to determine the most optimal barrier design (i.e., the maximum noise reduction benefits for the least cost). The barrier height was evaluated in TNM for barrier designs that break the line-of-sight between receptors and the roadway noise source.

For the Preferred Alternative, noise barrier evaluations were completed for impacted receptors at NSA 17, NSA 23, NSA 24, NSA 25, and NSA 26. The preferred barrier height for each noise barrier evaluation is highlighted. This height was selected based on insertion loss, the maximum allowable base quantity of barriers per benefited receptors, and evaluation of the noise reduction design goal. It should be noted that some of the noise barriers shown on the plan sheets in Appendix A appear to be outside of the right-of-way because the proposed right-of-way is not shown; however, all of the evaluated noise barriers evaluated are within the existing or proposed right-of-way.

The determinations of feasible and reasonable noise barriers contained in this section are preliminary and subject to change based on final design, FHWA approval, building permits issued as of the Date of Public Knowledge, and the public involvement process.

3.1 NSA 17

Three residences within NSA 17 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. In accordance with NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011), a single noise barrier (Barrier 17B) was modeled adjacent to one impacted residence and 5 feet within the NC 12 right-of-way. Another set of noise barriers (Barriers 17C and 17D) was modeled adjacent to the other two impacted residences and 5 feet within the NC 12 right-of-way.

3.1.1 Barrier 17B

Barrier 17B (see Figure A-77PA) would be on the east side of NC 12, south of the proposed roundabout at Currituck Clubhouse Drive.

Barrier 17B would be in front of three-story townhomes. Barrier 17B would begin on a sandy hill north of Marlin Way and end adjacent to a 5-foot deep swale. Stormwater from home sites appears to drain by sheet flow both internally within the neighborhood and externally towards the NC 12 right-of-way (towards the swale). Drainage features may need to be built so that Barrier 17B would not block normal drainage patterns from properties to the east.

This area is included in a portion of the 100-year floodplain with average flood depths less than 1 foot. Barrier 17B would likely be an impediment to flood flow from severe storms, would interfere with the water's attempt to equalize and recede after the storm surge, and may prolong flooding at lower areas of homes. Based on best available data and observations, Barrier 17B would not likely be a feasible noise abatement measure at this location. However, the engineering feasibility of this barrier will be further evaluated during the design phase noise study.

The results of the barrier analysis indicate that at heights of 8 to 18 feet, the noise barrier would provide at least the minimum insertion loss of 5 dBA for the impacted residence. The impacted residence would receive an average insertion loss of 7 to 10 dBA, depending on barrier height. The minimum noise reduction design goal of 7 dBA for the impacted front row residence was met for all barrier heights from 8 to 18 feet.

The noise analysis determined an average increase in predicted exterior noise levels of 2 dBA for the impacted residence, which equates to an incremental increase and maximum allowable base quantity of 2,570 square feet. Noise barriers at heights of 8 to 24 feet would be considered reasonable based on this criterion. Based on NCDOT criteria, the optimum barrier height would be 16 feet. Table 5 summarizes the analysis for Barrier 17B.

3.1.2 Barriers 17C and 17D

Barriers 17C and 17D (see Figure A-76PA) are on the east side of NC 12, between Schooner Ridge and Sand Fiddler Trail and north of Sand Fiddler Trail, respectively.

Barriers 17C and 17D are in front of three-story single-family homes. Homes are buffered from NC 12 by a few trees and shrubs and approximately 100 feet of flat sand. Barrier 17C begins on a sandy depression north of Schooner Ridge and ends adjacent to a five-foot ridge in the vicinity of Sand Fiddler Trail. Barrier 17D would be constructed adjacent to homes on a ridge. Stormwater from home sites appears to drain by sheet flow both internally within the neighborhood and externally towards the NC 12 right-of-way (in the vicinity of the sandy depression area). Drainage features may need

Table 5. Noise Barrier Evaluation Matrix for Barrier 17B

Barrier Height (feet)	Residences with Insertion Loss of (dBA)						Number of Benefited Residences			Com-bined Barrier Length (feet)	Design Square Footage (square feet)	Design Square Footage per Benefited Receptor/ Allowable Square Footage[2]	Reasonable Yes/No
	5	6	7	8	9	10 or >	Impacted	Not Impacted[1]	Total				
8	0	1	1	0	0	0	1	1	2	284	2,272	1,136 / 2,570	Yes
10	0	0	1	1	0	0	1	1	2	284	2,840	1,420 / 2,570	Yes
12	0	0	0	1	1	0	1	1	2	284	3,408	1,704 / 2,570	Yes
14	0	0	0	1	1	0	1	1	2	284	3,976	1,988 / 2,570	Yes
16	0	0	0	0	2	0	1	1	2	284	4,544	2,272 / 2,570	Yes
18	0	0	0	0	1	1	1	1	2	284	5,112	2,556 / 2,570	Yes
20	0	0	0	0	1	1	1	1	2	284	5,680	2,840 / 2,570	No

[1]Residences determined to be not impacted by the project (traffic noise levels less than 66 dBA) but benefited by the noise barrier.

[2]The reasonableness calculation for determining the maximum allowable square footage of noise barriers (i.e., the base quantity) per benefited receptor is described in the introduction to Section 3.0.

to be built so that Barrier 17C (and perhaps Barrier 17D) would not block normal drainage patterns from properties to the east.

This area is included in a portion of the floodplain classified as including the 100-year flood with average depths less than 1 foot. Barrier 17C (and perhaps Barrier 17D) would likely be an impediment to flood flow from severe storms, would interfere with the water's attempt to equalize and recede after the storm surge, and may prolong flooding at lower areas of homes. Based on best available data and observations, Barriers 17C and 17D are not feasible noise abatement measures at this location. However, the engineering feasibility of these barriers will be further evaluated during the design phase noise study.

The results of the barrier analysis indicate that at heights of 8 to 24 feet, the noise barriers would provide at least the minimum insertion loss of 5 dBA to both of the two impacted residences. The impacted residences would receive an average insertion loss of 7 to 13 dBA, depending on barrier height. The minimum noise reduction design goal of 7 dBA was met for at least one front row receptor for each barrier height.

The noise analysis determined an average increase in predicted exterior noise levels of 5 dBA for the impacted residences, which equates to an incremental increase and maximum allowable base quantity of 2,675 square feet. Noise barriers at heights of 8 to

24 feet would be considered reasonable based on this criterion. Based on NCDOT criteria, the optimum noise barrier height would be 16 feet. Table 6 summarizes the barrier analysis for Barriers 17C and 17D.

Table 6. Noise Barrier Evaluation Matrix for Barriers 17C and 17D

Barrier Height (feet)	Residences with Insertion Loss of (dBA)						Number of Benefited Residences			Com-bined Barrier Length (feet)	Design Square Footage	Design Square Footage per Benefited Receptor/ Allowable Square Footage[2]	Reasonable Yes/No
	5	6	7	8	9	10 or >	Impacted	Not Impacted[1]	Total				
8	1	5	0	0	0	0	2	4	6	1,334	10,672	1,779 / 2,675	Yes
10	5	6	0	0	0	0	2	9	11	1,334	13,340	1,213 / 2,675	Yes
12	0	7	0	1	5	0	2	11	13	1,334	16,008	1,231 / 2,675	Yes
14	0	1	6	1	0	5	2	11	13	1,334	18,676	1,437 / 2,675	Yes
16	0	0	1	6	1	5	2	11	13	1,334	21,344	1,642 / 2,675	Yes
18	0	0	1	6	1	5	2	11	13	1,334	24,012	1,847 / 2,675	Yes
20	0	0	1	0	6	6	2	11	13	1,334	26,680	2,052 / 2,675	Yes
22	0	0	1	0	6	6	2	11	13	1,334	29,348	2,258 / 2,675	Yes
24	0	0	1	0	2	10	2	11	13	1,334	32,016	2,463 / 2,675	Yes

[1]Residences determined to be not impacted by the project (traffic noise levels less than 66 dBA) but benefited by the noise barrier.

[2]The reasonableness calculation for determining the maximum allowable square footage of noise barriers (i.e., the base quantity) per benefited receptor is described in the introduction to Section 3.0.

3.2 NSA 23

Three residences within NSA 23 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. Barrier 23A was modeled adjacent to one impacted residence and 5 feet within the NC 12 right-of-way. In accordance with NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011), a noise barrier (Barrier 23C) was modeled adjacent to two of the residences and 5 feet within the NC 12 right-of-way. This receptor was not considered to be isolated because there are residences behind it that could potentially benefit from a noise barrier. Barrier 23B is

discussed in the 2009 noise technical report and is not relevant to the Preferred Alternative because of Preferred Alternative refinements.

3.2.1 Barrier 23A

Barrier 23A (see Figure A-81PA) is on the west side of NC 12, 200 feet north of the southern Monteray Drive intersection.

Barrier 23A is in front of three-story single-family homes that are inside a subdivision. On the east side of NC 12 are three-story single-family homes that are part of a separate subdivision. The homes on either side of NC 12 are buffered by a few trees and a thin strip of sand. Barrier 23A would be constructed on the sandy buffer behind an existing multi-purpose concrete path. The foundation of homes adjacent to Barrier 23A appears to be elevated higher than the roadway and right-of-way; however, some portion of the properties slopes toward NC 12. Stormwater from home sites appears to drain internally within the neighborhood through drainage structures. Sheet flow drainage may occur on the portion of properties that slopes toward NC 12; drainage features may need to be built to avoid blocking normal drainage patterns from properties from the west side of NC 12. This area is included in a portion of the floodplain classified as including the 100-year flood with average depths less than 1 foot. Barrier 23A would likely be an impediment to flood flow from severe storms, and would interfere with the water's attempt to equalize and recede after the storm surge. Based on best available data and observations, Barrier 23A is not a feasible noise abatement measure at this location.

The results of the barrier analysis indicate that at heights of 8 to 10 feet, Barrier 23A would provide the minimum insertion loss of at least 5 dBA at the impacted residence. The impacted residence would receive an insertion loss of 6 to 7 dBA, depending on barrier height. The minimum noise reduction design goal of 7 dBA was met for at least one front row receptor for a barrier height of 10 feet.

The noise analysis determined an average increase in predicted exterior noise levels of 4 dBA for the impacted residence, which equates to an incremental increase and maximum allowable base quantity of 2,640 square feet. The noise barrier would not meet the reasonableness criterion at any height. Table 7 summarizes the barrier analysis for Barrier 23A.

3.2.2 Barrier 23C

Barrier 23C (see Figure A-84PA) is on the west side of NC 12 south of Bonita Street.

Barrier 23C would be located in front of three-story single-family homes. Barrier 23C would be constructed on the sandy buffer behind an existing multi-use paved path. The foundation of homes adjacent to Barrier 23C appears to be at the same elevation as the

Table 7. Noise Barrier Evaluation Matrix for Barrier 23A

Barrier Height (feet)	Residences with Insertion Loss of (dBA)						Number of Benefited Residences			Com-bined Barrier Length (feet)	Design Square Footage	Design Square Footage per Benefited Receptor/ Allowable Square Footage[2]	Reasonable Yes/No
	5	6	7	8	9	10 or >	Impacted	Not Impacted[1]	Total				
8	0	1	0	0	0	0	1	0	1	392	3,136	3,136 / 2,640	No
10	0	0	1	0	0	0	1	0	1	294	2,940	2,940 / 2,640	No

[1]Residences determined to be not impacted by the project (traffic noise levels less than 66 dBA) but benefited by the noise barrier.
[2]The reasonableness calculation for determining the maximum allowable square footage of noise barriers (i.e., the base quantity) per benefited receptor is described in the introduction to Section 3.0.

roadway and right-of-way; however, some portion of the properties slopes toward NC 12. Stormwater from home sites appears to drain internally within the neighborhood and externally towards the NC 12 right-of-way. Sheet flow drainage may occur on the portion of properties that slopes toward NC 12; drainage features may need to be built to avoid blocking normal drainage patterns from properties from the west side of NC 12. This area is included in the 100-year floodplain with average water depths less than 1 foot. Barrier 23C would likely be an impediment to flood flow from severe storms, and would interfere with the water's attempt to equalize and recede after the storm surge. Based on best available data and observations, Barrier 23C would not likely be a feasible noise abatement measure at this location.

The results of the noise barrier analysis indicate that at heights of 8 to 16 feet, Barrier 23C would provide at least the minimum insertion loss of 5 dBA for both of the impacted residences. The impacted residences would receive an average insertion loss of 9 to 12 dBA depending on barrier height. The minimum noise reduction design goal of 7 dBA insertion loss for at least one impacted front row residence was achieved for barrier heights from 8 to 16 feet.

The noise analysis determined that the predicted exterior noise levels of the impacted residences would increase by less than a decibel, so the maximum allowable base quantity for the noise abatement to be considered reasonable is 2,500 square feet per benefited receptor. Noise barriers at heights of 8 to 16 feet would be considered reasonable based on this criterion. Based on NCDOT criteria, the optimum barrier height has been determined to be 12 feet. Table 8 summarizes the analysis for Barrier 23C.

Table 8. Noise Barrier Evaluation Matrix for Barrier 23C

Barrier Height (feet)	Residences with Insertion Loss of (dBA)						Number of Benefited Residences			Com-bined Barrier Length (feet)	Design Square Footage (square feet)	Design Square Footage per Benefited Receptor/ Allowable Square Footage[2]	Reasonable Yes/No
	5	6	7	8	9	10 or >	Impacted	Not Impacted[1]	Total				
8	0	0	0	1	1	0	2	0	2	291	2,328	1,164 / 2,500	Yes
10	0	0	0	0	1	1	2	0	2	291	2,910	1,455 / 2,500	Yes
12	0	0	0	0	0	2	2	0	2	291	3,492	1,746 / 2,500	Yes
14	0	0	0	0	0	2	2	0	2	291	4,074	2,037 / 2,500	Yes
16	0	0	0	0	0	2	2	0	2	291	4,656	2,328 / 2,500	Yes
18	0	0	0	0	0	2	2	0	2	291	5,238	2,619 / 2,500	No

[1]Residences determined to be not impacted by the project (traffic noise levels less than 66 dBA) but benefited by the noise barrier.

[2]The reasonableness calculation for determining the maximum allowable square footage of noise barriers (i.e., the base quantity) per benefited receptor is described in the introduction to Section 3.0.

3.3 NSA 26

Eight residences within NSA 26 are predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. In accordance with NCDOT's *Traffic Noise Abatement Policy* (July 13, 2011), noise abatement measures were considered at these impacted residences. One set of noise barriers (Barriers 26A and 26B) was modeled adjacent to these impacted residences and 5 feet within the NC 12 right-of-way. The noise barriers were evaluated at heights up to 24 feet.

Barriers 26A and 26B (see Figures A-84PA and A-85PA) are on the east side of NC 12, between South Harbor View Drive and the northern North Harbor View Drive connection to NC 12.

Barriers 26A and 26B are in front of three-story single-family homes that are inside a subdivision (homes do not face NC 12). On the west side of NC 12 are two- and three-story single-family homes that are part of a separate subdivision. The homes on either side of NC 12 are buffered by large trees and shrubs. Barriers 26A and 26B would be constructed adjacent to homes that are on a 5- to 10-foot high ridge. The foundation of homes adjacent to Barriers 26A and 26B appears to slope away from NC 12. Stormwater from home sites appears to drain internally within the neighborhood through drainage structures. This area includes a portion of the floodplain classified as including the 100-year flood with average depths less than 1 foot. Barriers 26A and 26B would likely be an

impediment to flood flow from severe storms, and would interfere with the water's attempt to equalize and recede after the storm surge. Based on best available data and observations, Barriers 26A and 26B are not feasible noise abatement measures at this location. However, the engineering feasibility of these barriers will be further evaluated during the design phase noise study.

The results of the barrier analysis indicate that at heights of 8 to 24 feet, the noise barriers would provide the minimum insertion loss of at least 5 dBA to all eight of the impacted residences. The impacted residences would receive an average insertion loss of 7 to 14 dBA, depending on barrier height. The minimum noise reduction design goal of 7 dBA was met for at least one front row receptor for all barrier heights.

The noise analysis determined an average increase in predicted exterior noise levels of 4 dBA for the impacted residences, which equates to an incremental increase and maximum allowable base quantity of 2,640 square feet. Noise barriers at heights of 8 to 24 feet would be considered reasonable based on this criterion. Based on NCDOT criteria, the optimum barrier height would be 22 feet. Table 9 summarizes the barrier analysis for Barriers 26A and 26B.

Table 9. Noise Barrier Evaluation Matrix for Barrier 26A and 26B

Barrier Height (feet)	Residences with Insertion Loss of (dBA)						Number of Benefited Residences			Com-bined Barrier Length (feet)	Design Square Footage	Design Square Footage per Benefited Receptors/ Allowable Square Footage[2]	Reasonable Yes/No
	5	6	7	8	9	10 or >	Impacted	Not Impacted[1]	Total				
8	1	3	4	0	0	0	8	0	8	1,417	11,336	1,417 / 2,640	Yes
10	0	1	1	3	3	0	8	0	8	1,417	14,170	1,771 / 2,640	Yes
12	3	2	0	1	4	3	8	5	13	1,417	17,004	1,308 / 2,640	Yes
14	0	5	0	0	1	7	8	5	13	1,417	19,838	1,526 / 2,640	Yes
16	2	0	5	0	1	7	8	7	15	1,417	22,672	1,511 / 2,640	Yes
18	2	0	1	4	0	8	8	7	15	1,417	25,506	1,700 / 2,640	Yes
20	2	0	0	5	0	8	8	7	15	1,417	28,340	1,889 / 2,640	Yes
22	2	0	0	1	4	8	8	7	15	1,417	31,174	2,078 / 2,640	Yes
24	2	0	0	0	5	8	8	7	15	1,417	34,008	2,267 / 2,640	Yes

[1]Residences determined to be not impacted by the project (traffic noise levels less than 66 dBA) but benefited by the noise barrier.

[2]The reasonableness calculation for determining the maximum allowable square footage of noise barriers (i.e., the base quantity) per benefited receptor is described in the introduction to Section 3.0.

4.0 Construction Noise

The 2011 NCDOT *Traffic Noise Abatement Policy* specifies that NCDOT shall:

(a) Identify land uses or activities that may be affected by noise from construction of the project.

(b) Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall consider the benefits achieved and the overall adverse social, economic, and environmental effects and costs of the abatement measures.

(c) Consider construction techniques and scheduling to reduce construction noise impacts to nearby receptors and incorporate the needed abatement measures in the project plans and specifications.

Construction noise impacts are discussed in the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009). This discussion is expanded in this section to address the requirements of the 2011 NCDOT *Traffic Noise Abatement Policy*.

The major construction elements of this project are expected to be earth work, hauling, grading, bridge construction (especially pile driving), and paving. During daytime hours, general construction noise impacts, such as temporary speech interference for passersby and those individuals living or working near the project, can be expected, particularly from paving operations, from the earth moving equipment during grading operations, and from pile driving activities for the bridge crossings of Maple Swamp and Currituck Sound. During evening and nighttime hours, steady-state construction noise such as from paving operations may be audible and may cause impacts to activities such as sleep. Sporadic evening and nighttime construction equipment noise, such as from backup alarms and lift gate closures (i.e., "slamming" of dump truck gates), as well as very loud construction activities, such as pile-drivers and impact hammers, will be perceived as distinctly louder that the steady-state acoustic environment, and may cause impacts in noise-sensitive areas.

In general, residences in all NSAs adjacent to the proposed roadway improvements and bridge construction may experience construction noise as a result of earth work, pavement operations, and/or pile driving for bridge construction. Residences in NSAs 17, 24, 26, 27, 28, and 29 may experience construction noise, in particular the noise from pile-driving activities at the new bridge over Currituck Sound and/or pavement operations along the sections of NC 12 that are proposed to be widened, that could temporarily interfere with daily activities.

However, overall, construction noise impacts are expected to be minimal, since the construction noise would be relatively short in duration at any given location. In localized areas where construction impacts may occur, construction noise control measures can be evaluated for feasibility and cost-effectiveness during the final design noise study or during construction activities. Potential localized measures that can be evaluated for inclusion in the plans and specifications include, but are not limited to, equipment exhaust muffler requirements, haul-road locations, elimination of "tail gate banging," ambient-sensitive backup alarms, construction noise complaint mechanisms/ procedures, and community communication/outreach.

5.0 Public Coordination

The *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009) discusses how local officials can use the noise contour data to establish compatible development. The comments made by citizens during the selection of the detailed study alternatives also are included in the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009).

As documented and responded to in the *Stakeholder Involvement for Final Environmental Impact Statement Technical Report* (Parsons Brinckerhoff, 2011), the following comments related to noise were received from the public during the *Draft Environmental Impact Statement* (DEIS) review period:

- Widening NC 12, a Mid-Currituck Bridge, and the bridge's mainland approach would increase noise at existing communities.
- Bridge construction noise may result in nearby homes being uninhabitable.
- Widening NC 12 would eliminate the trees along the roadside that buffer the road noise; a heavily vegetated buffer should be along the new roadway.
- The DEIS does not indicate a specific decibel level, and nowhere does the discussion address in layman's terms what the project noise levels would be equivalent to at a given distance. (The commenter is referred to the more detailed noise technical memorandum in the response.)
- The impact assessment leaves the extent and effect of the mitigation measures for a future decision.
- No sound barrier walls should be constructed along NC 12, as they would adversely affect the lovely and natural look of the northern Outer Banks.

6.0 Conclusions and Recommendations for Further Study

A complete discussion of conclusions and recommendation for the DEIS detailed study alternatives is included in the *Traffic Noise Technical Report* (Parsons Brinckerhoff, 2009).

Twenty-two receptors are predicted to be exposed to noise levels that approach or exceed the NAC for Activity Category B as a result of the Preferred Alternative.

For the Preferred Alternative, detailed noise barrier evaluations were completed for residences at NSA 17, NSA 23, and NSA 26. Noise barriers were not evaluated for NSA 2, NSA 24, and NSA 25 because it was determined that it would not be feasible to construct effective noise barriers at those locations. Noise barriers also were not evaluated for NSA 16, NSA 18, NSA 19, NSA 20, NSA 21, NSA 22, and NSA 27 through NSA 29 because noise-sensitive receptors at those locations were not predicted to be exposed to noise levels that would approach or exceed the NAC as a result of the Preferred Alternative. The Preferred Alternative design did not include any modifications at NSA 1, or at NSA 3 through NSA 15, so a Preferred Alternative noise analysis was not necessary for these areas.

The results of the noise analysis update presented in this addendum were considered to determine if these results would affect the decision on the Preferred Alternative. The updated results did not substantially change the numbers of potentially impacted receptors, the barriers determined to be preliminarily feasible and reasonable, or the numbers of benefited receptors. Further, revisions made to the design of the Preferred Alternative (MCB4/A/C1) between the DEIS and the FEIS reduced the number of impacted receptors. In addition, noise impacts were a consideration, but not a major factor in the selection of the Preferred Alternative. The reasons for selecting the Preferred Alternative are presented in Section 2.6 of the FEIS, and the results of this updated noise study do not change those reasons. The Preferred Alternative would continue to have the least number of homes that would experience noise impacts.

Four noise barriers (Barriers 17B, 17C and 17D, 23C, and 26A and 26B) with a total length of 3,326 feet were identified as preliminarily feasible and reasonable for the Preferred Alternative. These barriers are predicted to benefit a total of 32 Category B receptors.

Table 10 shows the noise barriers that were found to be preliminarily feasible and reasonable based on the Preferred Alternative preliminary design. More details for each barrier can be found in the tables in Section 3.0, and the location of each barrier is shown on the figures in Appendix A. The barriers listed in Table 10 are the noise abatement measures that are likely to be installed for their corresponding adjacent noise sensitive areas. The figures in Appendix A also show the noise barriers that were preliminarily

Table 10. Details of Preliminary Noise Barriers for the Preferred Alternative

Noise Barrier(s)	Number of Benefited Residences			Optimum Barrier Height (feet)	Com-bined Barrier Length (feet)	Design Square Footage (square feet)	Design Square Footage per Benefited Receptor/ Allowable Square Footage[2]	Reasonable Yes/No
	Impacted	Benefited	Total					
17B	1	1	2	16	284	4,544	2,272 / 2,570	Yes
17C and 17D	2	11	13	16	1,334	21,344	1,642 / 2,675	Yes
23C	2	0	2	12	291	3,492	1,746 / 2,500	Yes
26A and 26B	8	7	15	22	1,417	31,174	2,078 / 2,640	Yes

determined not to be reasonable. These noise abatement measures are unlikely to be installed for their corresponding adjacent noise sensitive areas.

The term "likely" does not mean a firm commitment for each noise sensitive area identified. A Design Noise Report will be prepared during final design of the Record of Decision's (ROD) Selected Alternative. The ROD will include the following project commitment that is also included in the FEIS: "A Design Noise Study will be prepared to update the noise analysis based upon the most recent FHWA regulations and NCDOT noise policies and guidance, traffic forecasts, and the final design."

The Design Noise Study will include the final design of the ROD's Selected Alternative and a more detailed evaluation of the feasibility and reasonableness of noise abatement. Thus, the recommendations included in Table 10 may change. It is anticipated that both vertical and horizontal alignment adjustments will occur during final design of the Selected Alternative. In addition, more information will be available at the final design stage on drainage designs, utilities, and other elements that will be taken into account when evaluating feasibility and reasonableness.

The final decision on the installation of abatement measures will be made upon completion of the project design, completion of a public involvement process, concurrence with the NCDOT *Traffic Noise Abatement Policy*, and FHWA approval. NCTA is committed to the construction of feasible and reasonable noise abatement measures at the noise-impacted receptors identified for the Preferred Alternative in this Addendum, assuming it is identified as the Selected Alternative in the ROD, contingent upon the following conditions:

1. Detailed noise analysis updates during final design continue to support the opportunity to provide noise barriers at NSA 17, NSA 23, and NSA 26 for the ROD's Selected Alternative.

2. The outcome of hydraulic studies needed to determine the impact of proposed noise barriers on drainage and flood flows, whether the impact can be mitigated, and what would be required to mitigate it and the associated cost.

3. The appearance of the noise barriers in relation to the natural character of the Outer Banks along NC 12 is taken into account. From the perspective of those using vacation homes, any noise barrier would block not only views of the road, but also views of the adjoining landscape (e.g., views of Currituck Sound, ocean-front dunes, and vacation homes, depending on the location). In addition, noise barriers along NC 12 would block views of these same landscape features, depending on the location, for motorists using NC 12. Noise barriers also would similarly affect views of pedestrians and bicyclists using the multi-use paths that line NC 12 on the Outer Banks.

4. Viewpoints of the property owners and residents of all benefited receptors would be solicited during the final design process.

5. Safety and engineering aspects (i.e., feasibility) have been reviewed.

6. Coordination with local officials to identify any new building permits that have been issued between the date of this Addendum and the Date of Public Knowledge (i.e., the ROD). Any such new development would need to be assessed for noise impacts and given consideration for potential noise abatement measures during the final design process.

7.0 References

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Federal Highway Administration. January 1998. *FHWA Traffic Noise Model®, Version 1.0 Users Guide*. Report Number FHWA-PD-96-009, 192 pages. Available from McTrans Center, University of Florida, Gainesville, Florida.

Federal Highway Administration. February 2000. *FHWA Highway Noise Barrier Design Handbook*. Gregg G. Fleming, Harvey S. Knauer, Cynthia S. Y. Lee, and Soren Pedersen. Available: http://www.fhwa.dot.gov/environment/noise/design /index.htm.

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Federal Highway Administration. February 2003. "Traffic Noise Model (TNM) Version 2.5 and User Guide."

North Carolina Department of Transportation. July 13, 2011. "Traffic Noise Abatement Policy."

Parsons Brinckerhoff. 2009. *2035 Detailed Study Alternatives Traffic Forecast Report*. Prepared for the North Carolina Turnpike Authority.

Parsons Brinckerhoff. 2009. *Alternatives Screening Report*. Prepared for the North Carolina Turnpike Authority.

Parsons Brinckerhoff. 2009. *Traffic Noise Technical Report*. Prepared for the North Carolina Turnpike Authority.

Appendix A

Preferred Alternative Noise Study Data Plan Sheets

NSA 16

NSA 17

Noise Barrier
17B(PA)

Noise Barrier
17C & 17D (PA)

CURRITUCK CLUBHOUSE DRIVE

NC12

SCHOONER RIDGE ROAD

SALTSPRAY COURT

SAND FIDDLER TRAIL

MATCH LINE FIGURE A-77PA

LEGEND:

- 66 dBA Noise Contour
- 71 dBA Noise Contour
- (1) Noise Receptors
- (M1) Meter Measurement Points
- Property Boundary
- Vacant Property, No Permit
- Noise Barrier

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
NC 12
PREFERRED ALTERNATIVE
FIGURE A-76PA

MATCH LINE FIGURE A-76PA

MATCH LINE FIGURE A-78PA

NSA 18

NSA 18

NSA 19

NC12

LEGEND:

66 dBA Noise Contour

71 dBA Noise Contour

Noise Receptors

Meter Measurement Points

Property Boundary

Vacant Property, No Permit

Noise Barrier

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
NC 12
PREFERRED ALTERNATIVE
FIGURE A-77PA

LEGEND:

- 66 dBA Noise Contour
- 71 dBA Noise Contour
- (1) Noise Receptors
- (M1) Meter Measurement Points
- Property Boundary
- Vacant Property, No Permit
- Noise Barrier

NSA 18

NSA 19

NSA 20

NSA 21

NC12

SEABIRD WAY

MATCH LINE FIGURE A-77PA

MATCH LINE FIGURE A-79PA

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
NC 12
PREFERRED ALTERNATIVE
FIGURE A-78PA

LEGEND:

- 66 dBA Noise Contour
- 71 dBA Noise Contour
- (1) Noise Receptors
- (M1) Meter Measurement Points
- Property Boundary
- Vacant Property, No Permit
- Noise Barrier

NSA 20

NSA 21

NSA 22

HUNT CLUB DRIVE

NC12

DRIFTWOOD WAY

CROWN POINT CIRCLE

ORION'S WAY

ALBACORE STREET

TimBuck II Shops

0 200 400

MATCH LINE FIGURE A-78PA

MATCH LINE FIGURE A-81PA

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
NC 12
PREFERRED ALTERNATIVE
FIGURE A-79PA

MATCH LINE FIGURE A-79PA

MATCH LINE FIGURE A-83PA

NC12

MONTERAY PLAZA SHOPPING CENTER

NSA 22

NSA 23

NSA 25

Noise Barrier 23A (PA)

MONTERAY DRIVE

DRIFTING SANDS DR

DOLPHIN STREET

LEGEND:

- 66 dBA Noise Contour
- 71 dBA Noise Contour
- (1) Noise Receptors
- (M1) Meter Measurement Points
- Property Boundary
- Vacant Property, No Permit
- Noise Barrier

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
NC 12
PREFERRED ALTERNATIVE
FIGURE A-81PA

MATCH LINE FIGURE A-81PA

MATCH LINE FIGURE A-84PA

M7

NSA 23

NSA 25

DRIFTING SANDS DRIVE

MONTERAY DRIVE

NC12

NC12

MARLIN STREET

SAILFISH STREET

LEGEND:

66 dBA Noise Contour

71 dBA Noise Contour

(1) Noise Receptors

(M1) Meter Measurement Points

Property Boundary

Vacant Property, No Permit

Noise Barrier

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
NC 12
PREFERRED ALTERNATIVE
FIGURE A-83PA

LEGEND:

66 dBA Noise Contour

71 dBA Noise Contour

Noise Receptors

Meter Measurement Points

Property Boundary

Vacant Property, No Permit

Noise Barrier

NSA 23

NSA 24

NSA 25

NSA 26

MONTERAY DRIVE

S. HARBOR VIEW

BONITA STREET

NC12

Noise Barrier 23C (PA)

Noise Barrier 26A & 26B (PA)

MATCH LINE FIGURE A-83PA

MATCH LINE FIGURE A-85PA

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
NC 12
PREFERRED ALTERNATIVE
FIGURE A-84PA

LEGEND:

- 66 dBA Noise Contour
- 71 dBA Noise Contour
- (1) Noise Receptors
- (M1) Meter Measurement Points
- Property Boundary
- Vacant Property, No Permit
- Noise Barrier

NSA 24

NSA 27

M5

M6

NSA 26

Noise Barrier 26A & 26B (PA)

OCEAN FOREST COURT

N. HARBOR VIEW

MATCH LINE FIGURE A-84PA

MATCH LINE FIGURE A-86PA

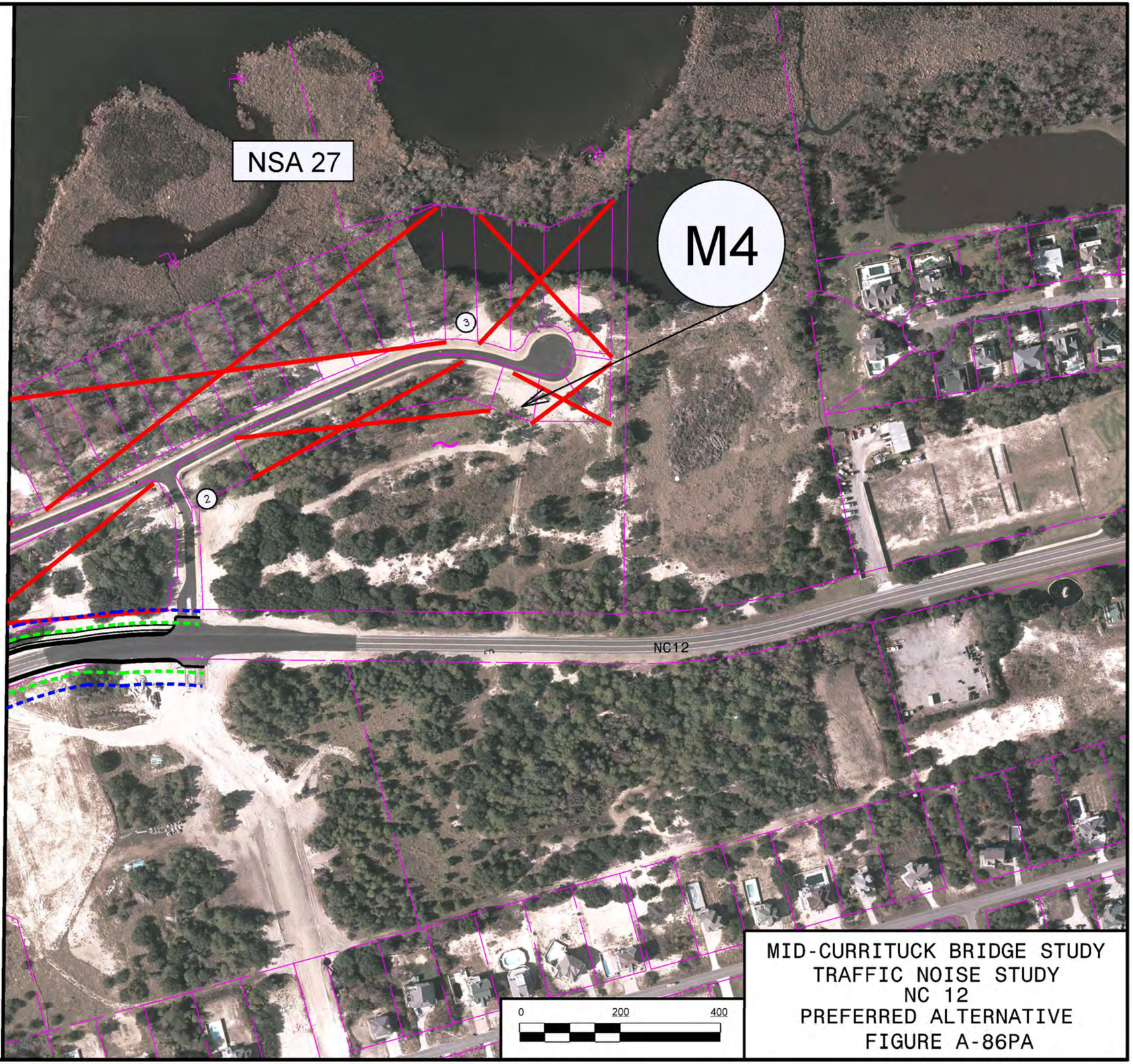
0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
NC 12
PREFERRED ALTERNATIVE
FIGURE A-85PA

LEGEND:

- 66 dBA Noise Contour
- 71 dBA Noise Contour
- (1) Noise Receptors
- (M1) Meter Measurement Points
- Property Boundary
- Vacant Property, No Permit
- Noise Barrier

MATCH LINE FIGURE A-85PA



MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
NC 12
PREFERRED ALTERNATIVE
FIGURE A-86PA

NSA 29

PLEASANT DR

LIGHTHOUSE VIEW

FOREMAN DR

NARROW SHORE RD

M2

M3

NARROW SHORE RD

NARROW SHORE RD

NSA 28

LEGEND:

66 dBA Noise Contour

71 dBA Noise Contour

(1) Noise Receptors

(M1) Meter Measurement Points

Property Boundary

Vacant Property, No Permit

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
MID-CURRITUCK BRIDGE
ALTERNATIVES MCB2-A/MCB4-A
FIGURE A-39A

US 158

AYDLETT RD.

1

2

3

4

5

US 158

NSA 2

MATCH LINE FIGURE A-36A

LEGEND:

66 dBA Noise Contour

71 dBA Noise Contour

(1) Noise Receptors

(M1) Meter Measurement Points

Property Boundary

Vacant Property, No Permit

Displaced Receptor Parcel

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
US158 MID-CURRITUCK
ALTERNATIVES MCB2-A/MCB4-A
FIGURE A-35A

MATCH LINE FIGURE A-35A

US 158

US 158

6

7

8

M1

YOUNG RD.

NSA 2

LEGEND:

66 dBA Noise Contour

71 dBA Noise Contour

1 Noise Receptors

M1 Meter Measurement Points

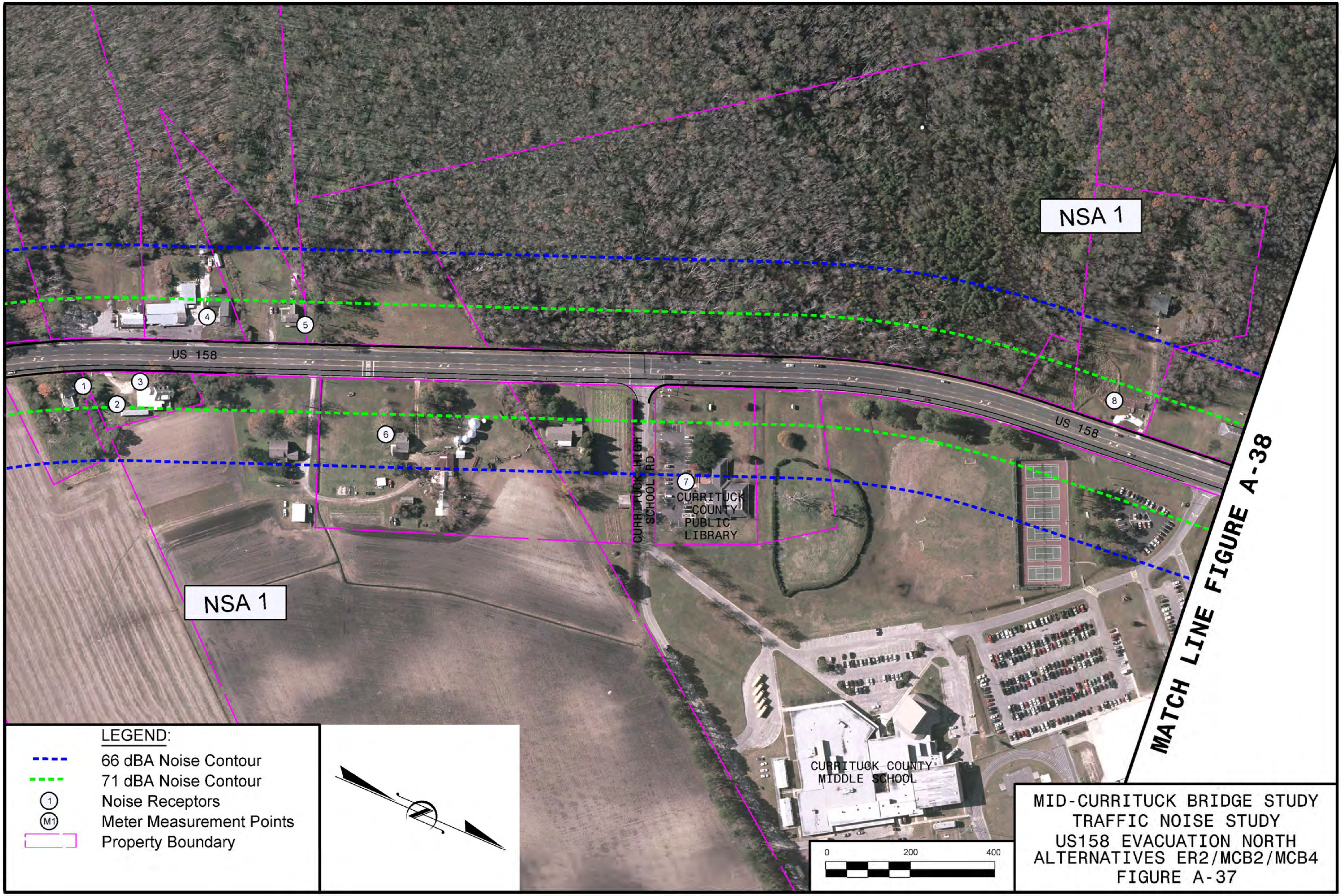
Property Boundary

Vacant Property, No Permit

Displaced Receptor Parcel

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
US158 MID-CURRITUCK
ALTERNATIVES MCB2-A/MCB4-A
FIGURE A-36A


NSA 1
NSA 1
US 158
US 158
CURRITUCK HIGH SCHOOL RD
CURRITUCK COUNTY PUBLIC LIBRARY
CURRITUCK COUNTY MIDDLE SCHOOL
MATCH LINE FIGURE A-38
LEGEND:
66 dBA Noise Contour
71 dBA Noise Contour
Noise Receptors
Meter Measurement Points
Property Boundary
0 200 400
MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
US158 EVACUATION NORTH
ALTERNATIVES ER2/MCB2/MCB4
FIGURE A-37

MATCH LINE FIGURE A-37

NSA 1

US 158

CURRITUCK HIGH SCHOOL RD

CURRITUCK COUNTY HIGH SCHOOL

M9

SAM WILKINS LN

US 158

NSA 1

9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

LEGEND:

66 dBA Noise Contour

71 dBA Noise Contour

(1) Noise Receptors

(M1) Meter Measurement Points

Property Boundary

0 200 400

MID-CURRITUCK BRIDGE STUDY
TRAFFIC NOISE STUDY
US158 EVACUATION NORTH
ALTERNATIVES ER2/MCB2/MCB4
FIGURE A-38

Appendix B

Preferred Alternative Predicted Noise Level Data

TNM 2.5® PREDICTED NOISE LEVEL DATA

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
16	**Curr. Cott.**	S.F. resid.	CurrituckCottages-1"	1	1st	65	0.4		
		S.F. resid.	CurrituckCottages-2"	1	1st	62	1.5		
		S.F. resid.	CurrituckCottages-3"	1	1st	64	3.7		

[1] A separate noise analysis at NSAs 2, 28, and 29 was not necessary for the Preferred Alternative. The predicted noise levels at these NSAs for the Preferred Alternative can be found in Appendix C.

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
17	Ocean Sands 1	S.F. resid.	OceanSands1-1	3	2nd	58	0.0		
		S.F. resid.	OceanSands1-2"	1	1st	63	0.0		
		S.F. resid.	OceanSands1-3"	1	1st	64	0.0		
		S.F. resid.	OceanSands1-4"	1	1st	60	0.1		
		S.F. resid.	OceanSands1-5"	2	1st	59	0.1		
		S.F. resid.	OceanSands1-6"	1	1st	63	0.5		
		S.F. resid.	OceanSands1-7"	2	1st	68	2.3	YES	2
		S.F. resid.	OceanSands1-8"	1	3rd	59	0.1		
		S.F. resid.	OceanSands1-9"	1	2nd	56	0.3		
		S.F. resid.	OceanSands1-10"	3	2nd	56	0.9		
		S.F. resid.	OceanSands1-11"	1	2nd	59	1.6		
		S.F. resid.	OceanSands1-12"	2	1st	61	3.0		
		S.F. resid.	OceanSands1-13"	1	1st	59	3.7		
		S.F. resid.	OceanSands1-14"	1	1st	59	3.8		
		S.F. resid.	OceanSands1-15"	3	1st	61	3.6		
		S.F. resid.	OceanSands1-16"	1	1st	60	2.9		
		S.F. resid.	OceanSands1-17"	6	1st	61	2.7		
		S.F. resid.	OceanSands1-18"	1	1st	65	4.1		
		S.F. resid.	OceanSands1-19"	1	1st	67	4.8	YES	1
		S.F. resid.	OceanSands1-20"	2	1st	65	4.5		
		S.F. resid.	OceanSands1-21"	1	1st	64	5.0		
		S.F. resid.	OceanSands1-22"	1	1st	66	5.1	YES	1
		S.F. resid.	OceanSands1-23"	1	1st	60	3.8		
		S.F. resid.	OceanSands1-24"	2	2nd	61	4.2		
		S.F. resid.	OceanSands1-25"	1	2nd	60	4.3		
		S.F. resid.	OceanSands1-26"	3	2nd	60	4.5		

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
18	**The Hammocks**	S.F. resid.	HighSand-1"	1	1st	59	-0.7		
		S.F. resid.	HighSand-2"	1	1st	55	0.2		
		S.F. resid.	HighSand-3"	1	2nd	52	0.2		
		S.F. resid.	TheHammocks-4	1	1st	57	0.7		
		S.F. resid.	TheHammocks-5"	5	1st	61	4.3		
		S.F. resid.	TheHammocks-6"	5	1st	65	3.1		
		S.F. resid.	TheHammocks-7"	1	1st	65	4.9		
		S.F. resid.	TheHammocks-8"	3	1st	61	-0.8		
		S.F. resid.	TheHammocks-9"	2	1st	64	0.0		
		S.F. resid.	TheHammocks-10"	2	1st	64	0.4		
		S.F. resid.	TheHammocks-11"	5	1st	62	5.4		
		S.F. resid.	TheHammocks-12"	5	1st	63	5.3		
		S.F. resid.	TheHammocks-13"	4	1st	62	3.4		
		S.F. resid.	TheHammocks-14"	2	2nd	53	1.2		
		S.F. resid.	TheHammocks-15"	1	2nd	54	-0.1		
		S.F. resid.	TheHammocks-16"	2	2nd	54	0.0		
		S.F. resid.	TheHammocks-17"	2	2nd	58	-0.4		
		S.F. resid.	TheHammocks-18"	6	2nd	56	1.7		
		S.F. resid.	TheHammocks-19"	2	2nd	54	3.5		
		S.F. resid.	TheHammocks-20"	5	2nd	56	4.4		

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
19	**Ocean Sands 2**	S.F. resid.	OceanSands2-1"	1	1st	62	0.1		
		S.F. resid.	OceanSands2-2"	3	1st	62	-0.1		
		S.F. resid.	OceanSands2-3"	1	1st	63	-0.4		
		S.F. resid.	OceanSands2-4"	1	1st	63	-0.4		
		S.F. resid.	OceanSands2-5"	2	1st	62	-0.2		
		S.F. resid.	OceanSands2-6"	2	1st	60	-0.2		
		S.F. resid.	OceanSands2-7"	2	1st	61	-0.8		
		S.F. resid.	OceanSands2-8"	1	1st	59	0.1		
		S.F. resid.	OceanSands2-9"	2	1st	64	0.3		
		S.F. resid.	OceanSands2-10"	1	1st	61	0.4		
		S.F. resid.	OceanSands2-11"	2	1st	63	0.0		
		S.F. resid.	OceanSands2-12"	2	1st	61	0.2		
		S.F. resid.	OceanSands2-13"	1	1st	64	-0.2		
		S.F. resid.	OceanSands2-14"	3	1st	61	0.8		
		S.F. resid.	OceanSands2-15"	3	1st	61	1.3		
		S.F. resid.	OceanSands2-16"	1	2nd	57	0.3		
		S.F. resid.	OceanSands2-17"	2	2nd	56	-0.2		
		S.F. resid.	OceanSands2-18"	2	2nd	55	0.6		
		S.F. resid.	OceanSands2-19"	1	2nd	57	0.1		
		S.F. resid.	OceanSands2-20"	3	2nd	57	1.2		
		S.F. resid.	OceanSands2-21"	2	2nd	57	0.8		
		S.F. resid.	OceanSands2-22"	2	2nd	55	0.9		

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
20	**Currituck Club**	S.F. resid.	CurrituckClub-1	1	1st	54	0.5		
		S.F. resid.	CurrituckClub-2"	1	1st	58	0.0		
		S.F. resid.	CurrituckClub-3"	1	1st	52	0.3		
		S.F. resid.	CurrituckClub-4"	2	2nd	54	0.5		
		S.F. resid.	CurrituckClub-5"	1	1st	54	0.7		
		S.F. resid.	CurrituckClub-6"	1	1st	52	0.5		
		S.F. resid.	CurrituckClub-7"	1	1st	53	0.1		
		S.F. resid.	CurrituckClub-8"	1	1st	58	-0.5		
		S.F. resid.	CurrituckClub-9"	1	2nd	50	0.5		
		S.F. resid.	CurrituckClub-10"	1	2nd	48	0.5		
		S.F. resid.	CurrituckClub-11"	1	2nd	50	0.6		
		S.F. resid.	CurrituckClub-12"	1	2nd	49	0.6		

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
21	**Ocean Sands 3**	S.F. resid.	OceanSands3-1"	4	1st	62	-0.1		
		S.F. resid.	OceanSands3-2"	5	1st	64	-0.3		
		S.F. resid.	OceanSands3-3"	5	1st	64	0.5		
		S.F. resid.	OceanSands3-4"	4	1st	64	0.7		
		S.F. resid.	OceanSands3-5"	3	1st	62	-0.4		
		S.F. resid.	OceanSands3-6"	3	1st	61	-0.5		
		S.F. resid.	OceanSands3-7"	1	2nd	55	0.3		
		S.F. resid.	OceanSands3-8"	2	2nd	55	0.0		
		S.F. resid.	OceanSands3-9"	2	2nd	55	1.0		
		S.F. resid.	OceanSands3-10"	2	2nd	56	1.4		
		S.F. resid.	OceanSands3-11"	1	2nd	55	0.9		
		S.F. resid.	OceanSands3-12"	4	2nd	55	0.3		
		S.F. resid.	OceanSands3-13"	1	2nd	55	0.1		

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
22	**Isolated Apts./Condos.**	Condominium	Apt1-1F	4	1st	57	7.0		
		Condominium	Apt2-1F"	4	2nd	64	6.3		
		Apartments	Apt3-1F"	4	2nd	56	5.0		
		Condominium	Apt1-2F"	4	1st	58	7.0		
		Condominium	Apt1-3F"	4	1st	58	7.1		
		Condominium	Apt2-2F"	4	2nd	65	6.7		
		Condominium	Apt2-3F"	4	2nd	65	6.6		
		Apartments	Apt3-2F"	4	2nd	60	5.4		
		Apartments	Apt3-3F"	4	2nd	62	5.5		

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
23	**Monteray Shores 1**	S.F. resid.	MonterayShores1-1	1	1st	62	4.8		
		S.F. resid.	MonterayShores1-2"	1	1st	67	4.0	YES	1
		S.F. resid.	MonterayShores1-3"	2	1st	59	2.0		
		S.F. resid.	MonterayShores1-4"	2	1st	65	0.0		
		S.F. resid.	MonterayShores1-5"	1	1st	61	-0.2		
		S.F. resid.	MonterayShores1-6"	1	2nd	56	0.5		
		S.F. resid.	MonterayShores1-7"	4	1st	53	1.0		
		S.F. resid.	MonterayShores1-8"	3	2nd	54	0.0		
		S.F. resid.	MonterayShores1-9"	3	2nd	55	-0.4		
		S.F. resid.	MonterayShores1-10"	1	1st	61	-1.1		
		S.F. resid.	MonterayShores1-11"	1	1st	63	-0.5		
		S.F. resid.	MonterayShores1-12"	2	1st	58	-1.1		
		S.F. resid.	MonterayShores1-13"	6	1st	53	-0.3		
		S.F. resid.	MonterayShores1-14"	1	2nd	58	-0.8		
		S.F. resid.	MonterayShores1-15"	1	1st	64	-0.3		
		S.F. resid.	MonterayShores1-16"	2	1st	59	-1.2		
		S.F. resid.	MonterayShores1-17"	1	1st	57	-0.7		
		S.F. resid.	MonterayShores1-18"	3	1st	63	0.2		
		S.F. resid.	MonterayShores1-19"	2	1st	67	0.3	YES	2
		S.F. resid.	MonterayShores1-20"	3	3rd	52	0.0		
		S.F. resid.	MonterayShores1-21"	1	2nd	53	-0.5		
		S.F. resid.	MonterayShores1-22"	1	2nd	53	-0.2		
		S.F. resid.	MonterayShores1-23"	1	2nd	55	0.3		
		S.F. resid.	MonterayShores1-24"	2	1st	57	0.0		
		S.F. resid.	MonterayShores1-25"	1	1st	55	0.2		

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
24	Monteray Shores 2	S.F. resid.	MonterayShores2-1	1	1st	58	0.6		
		S.F. resid.	MonterayShores2-2"	1	1st	60	0.6		
		S.F. resid.	MonterayShores2-3"	1	1st	61	1.9		
		S.F. resid.	MonterayShores2-4"	1	1st	62	3.7		
		S.F. resid.	MonterayShores2-5"	1	1st	65	4.6		
		S.F. resid.	MonterayShores2-6"	1	1st	63	5.6		
		S.F. resid.	MonterayShores2-7"	1	1st	72	7.6	YES	1
		S.F. resid.	MonterayShores2-8"	1	1st	67	5.2	YES	1
		S.F. resid.	MonterayShores2-9"	1	1st	61	6.2		
		S.F. resid.	MonterayShores2-10"	1	2nd	57	3.6		
		S.F. resid.	MonterayShores2-11"	2	2nd	58	4.6		
		S.F. resid.	MonterayShores2-12"	1	3rd	57	9.0		
		S.F. resid.	MonterayShores2-13"	1	2nd	58	8.4		

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
25	**Monteray Shores 3**	S.F. resid.	MonterayShores3-1	3	1st	67	6.1	YES	3
		S.F. resid.	MonterayShores3-2"	1	1st	61	3.2		
		S.F. resid.	MonterayShores3-3"	3	1st	59	-1.4		
		S.F. resid.	MonterayShores3-4"	1	1st	59	-1.7		
		S.F. resid.	MonterayShores3-5"	1	1st	58	-0.9		
		S.F. resid.	MonterayShores3-6"	5	1st	57	-0.9		
		S.F. resid.	MonterayShores3-7"	4	1st	59	-0.8		
		S.F. resid.	MonterayShores3-8"	1	1st	59	-1.1		
		S.F. resid.	MonterayShores3-9"	1	1st	58	-1.2		
		S.F. resid.	MonterayShores3-10"	2	1st	58	-1.4		
		S.F. resid.	MonterayShores3-11"	4	1st	57	-0.4		
		S.F. resid.	MonterayShores3-12"	2	1st	60	-0.3		
		S.F. resid.	MonterayShores3-13"	1	1st	59	-0.9		
		S.F. resid.	MonterayShores3-14"	2	1st	60	-1.1		
		S.F. resid.	MonterayShores3-15"	4	1st	58	0.4		
		S.F. resid.	MonterayShores3-16"	3	1st	60	0.1		
		S.F. resid.	MonterayShores3-17"	1	2nd	58	5.7		
		S.F. resid.	MonterayShores3-18"	1	2nd	51	0.7		
		S.F. resid.	MonterayShores3-19"	1	2nd	51	0.1		
		S.F. resid.	MonterayShores3-20"	1	2nd	51	-0.1		
		S.F. resid.	MonterayShores3-21"	1	2nd	51	0.3		
		S.F. resid.	MonterayShores3-22"	2	1st	60	5.2		
		S.F. resid.	MonterayShores3-23"	2	1st	66	5.6	YES	2

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
26	**Monteray Shores 4**	S.F. resid.	MonterayShores4-1"	1	1st	58	0.3		
		S.F. resid.	MonterayShores4-2"	1	1st	63	-0.2		
		S.F. resid.	MonterayShores4-3"	3	1st	60	-0.6		
		S.F. resid.	MonterayShores4-4"	2	1st	61	-0.8		
		S.F. resid.	MonterayShores4-5"	1	1st	64	2.5		
		S.F. resid.	MonterayShores4-6"	2	1st	68	3.1	YES	2
		S.F. resid.	MonterayShores4-7"	2	1st	68	4.0	YES	2
		S.F. resid.	MonterayShores4-8"	1	1st	67	4.8	YES	1
		S.F. resid.	MonterayShores4-9"	1	1st	69	5.3	YES	1
		S.F. resid.	MonterayShores4-10"	1	1st	70	5.5	YES	1
		S.F. resid.	MonterayShores4-11"	1	1st	72	6.1	YES	1
		S.F. resid.	MonterayShores4-12"	1	2nd	59	2.6		
		S.F. resid.	MonterayShores4-13"	1	2nd	60	6.0		
		S.F. resid.	MonterayShores4-14"	2	2nd	60	6.2		
		S.F. resid.	MonterayShores4-15"	2	2nd	60	5.2		
		S.F. resid.	MonterayShores4-16"	2	2nd	61	5.1		

NSA No.[1]	NSA Name[1]	Land Use Type	TNM Receiver Name	No. of Dwelling Units	Row	2035 Preferred Alternative			
						Predicted Noise (dBA)	Difference vs. Existing (dBA)	Exceeds NAC	No. of Affect
27	**Corolla Bay**	S.F. resid.	CorollaBay-1	1	2nd	55	4.0		
		S.F. resid.	CorollaBay-2"	1	1st	55	1.2		
		S.F. resid.	CorollaBay-3"	1	2nd	49	2.9		

TNM 2.5® PREDICTED NOISE LEVEL OUTPUT FILES

NSA 16, NSA 17, AND NSA 18

NCTA							17 February 2011					
J. Poling							TNM 2.5					
							Calculated with TNM 2.5					
RESULTS: SOUND LEVELS												
PROJECT/CONTRACT:		Mid-Currituck Bridge Study						Average pavement type shall be used unless				
RUN:		PrefAlt NC 12 OS1, CC, & Hammocks						a State highway agency substantiates the use				
BARRIER DESIGN:		INPUT HEIGHTS						of a different type with approval of FHWA.				
ATMOSPHERICS:		68 deg F, 50% RH										
Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
OceanSands1-1	206	1	0.0	58.2	66	58.2	10	----	58.2	0.0	8	-8.0
OceanSands1-2	207	1	0.0	62.9	66	62.9	10	----	62.9	0.0	8	-8.0
OceanSands1-3	208	1	0.0	63.5	66	63.5	10	----	63.5	0.0	8	-8.0
OceanSands1-4	209	1	0.0	60.2	66	60.2	10	----	60.2	0.0	8	-8.0
OceanSands1-5	210	1	0.0	59.2	66	59.2	10	----	59.2	0.0	8	-8.0
OceanSands1-6	211	1	0.0	63.3	66	63.3	10	----	63.3	0.0	8	-8.0
OceanSands1-7	212	1	0.0	67.6	66	67.6	10	Snd Lvl	67.6	0.0	8	-8.0
OceanSands1-8	213	1	0.0	59.3	66	59.3	10	----	59.3	0.0	8	-8.0
OceanSands1-9	214	1	0.0	55.8	66	55.8	10	----	55.8	0.0	8	-8.0
OceanSands1-10	215	1	0.0	56.0	66	56.0	10	----	56.0	0.0	8	-8.0
OceanSands1-11	216	1	0.0	59.2	66	59.2	10	----	59.2	0.0	8	-8.0
OceanSands1-12	217	1	0.0	61.4	66	61.4	10	----	61.4	0.0	8	-8.0
OceanSands1-13	218	1	0.0	59.0	66	59.0	10	----	59.0	0.0	8	-8.0
OceanSands1-14	219	1	0.0	59.3	66	59.3	10	----	59.3	0.0	8	-8.0
OceanSands1-15	220	1	0.0	60.5	66	60.5	10	----	60.5	0.0	8	-8.0
OceanSands1-16	221	1	0.0	60.4	66	60.4	10	----	60.4	0.0	8	-8.0
OceanSands1-17	222	1	0.0	61.0	66	61.0	10	----	61.0	0.0	8	-8.0
OceanSands1-18	223	1	0.0	65.3	66	65.3	10	----	65.3	0.0	8	-8.0
OceanSands1-19	224	1	0.0	66.6	66	66.6	10	Snd Lvl	66.6	0.0	8	-8.0
OceanSands1-20	225	1	0.0	64.7	66	64.7	10	----	64.7	0.0	8	-8.0
OceanSands1-21	226	1	0.0	64.0	66	64.0	10	----	64.0	0.0	8	-8.0
OceanSands1-22	227	1	0.0	65.7	66	65.7	10	----	65.7	0.0	8	-8.0
OceanSands1-23	228	1	0.0	59.8	66	59.8	10	----	59.8	0.0	8	-8.0
OceanSands1-24	229	1	0.0	61.2	66	61.2	10	----	61.2	0.0	8	-8.0

OceanSands1-25	230	1	0.0	59.7	66	59.7	10	----	59.7	0.0	8	-8.0
OceanSands1-26	231	1	0.0	59.7	66	59.7	10	----	59.7	0.0	8	-8.0
HighSand-1	233	1	0.0	58.6	66	58.6	10	----	58.6	0.0	8	-8.0
HighSand-2	234	1	0.0	54.6	66	54.6	10	----	54.6	0.0	8	-8.0
HighSand-3	235	1	0.0	51.8	66	51.8	10	----	51.8	0.0	8	-8.0
CurrituckCottages-1	237	1	0.0	65.4	66	65.4	10	----	65.4	0.0	8	-8.0
CurrituckCottages-2	238	1	0.0	61.8	66	61.8	10	----	61.8	0.0	8	-8.0
CurrituckCottages-3	239	1	0.0	64.4	66	64.4	10	----	64.4	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	32	0.0	0.0	0.0
All Impacted	2	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

NSA 18 (continued) and NSA 19

NCTA 17 February 2011
J. Poling TNM 2.5
Calculated with TNM 2.5
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt OceanSands2 & TheHammocks
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Noise Reduction Goal	Noise Reduction Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
TheHammocks-4	237	1	0.0	57.2	66	57.2	10	----	57.2	0.0	8	-8.0
TheHammocks-5	238	1	0.0	61.0	66	61.0	10	----	61.0	0.0	8	-8.0
TheHammocks-6	239	1	0.0	64.8	66	64.8	10	----	64.8	0.0	8	-8.0
TheHammocks-7	240	1	0.0	64.5	66	64.5	10	----	64.5	0.0	8	-8.0
TheHammocks-8	241	1	0.0	61.2	66	61.2	10	----	61.2	0.0	8	-8.0
TheHammocks-9	242	1	0.0	64.2	66	64.2	10	----	64.2	0.0	8	-8.0
TheHammocks-10	243	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
TheHammocks-11	244	1	0.0	61.6	66	61.6	10	----	61.6	0.0	8	-8.0
TheHammocks-12	245	1	0.0	63.4	66	63.4	10	----	63.4	0.0	8	-8.0
TheHammocks-13	246	1	0.0	61.5	66	61.5	10	----	61.5	0.0	8	-8.0
TheHammocks-14	247	1	0.0	53.4	66	53.4	10	----	53.4	0.0	8	-8.0
TheHammocks-15	248	1	0.0	53.6	66	53.6	10	----	53.6	0.0	8	-8.0
TheHammocks-16	249	1	0.0	54.1	66	54.1	10	----	54.1	0.0	8	-8.0
TheHammocks-17	250	1	0.0	57.6	66	57.6	10	----	57.6	0.0	8	-8.0
TheHammocks-18	251	1	0.0	55.9	66	55.9	10	----	55.9	0.0	8	-8.0
TheHammocks-19	252	1	0.0	54.4	66	54.4	10	----	54.4	0.0	8	-8.0
TheHammocks-20	253	1	0.0	56.4	66	56.4	10	----	56.4	0.0	8	-8.0
OceanSands2-1	254	1	0.0	62.1	66	62.1	10	----	62.1	0.0	8	-8.0
OceanSands2-2	255	1	0.0	62.2	66	62.2	10	----	62.2	0.0	8	-8.0
OceanSands2-3	256	1	0.0	62.6	66	62.6	10	----	62.6	0.0	8	-8.0
OceanSands2-4	257	1	0.0	63.3	66	63.3	10	----	63.3	0.0	8	-8.0
OceanSands2-5	258	1	0.0	61.7	66	61.7	10	----	61.7	0.0	8	-8.0
OceanSands2-6	259	1	0.0	60.1	66	60.1	10	----	60.1	0.0	8	-8.0
OceanSands2-7	260	1	0.0	61.3	66	61.3	10	----	61.3	0.0	8	-8.0

OceanSands2-8	261	1	0.0	59.0	66	59.0	10	----	59.0	0.0	8	-8.0
OceanSands2-9	262	1	0.0	64.0	66	64.0	10	----	64.0	0.0	8	-8.0
OceanSands2-10	263	1	0.0	60.5	66	60.5	10	----	60.5	0.0	8	-8.0
OceanSands2-11	264	1	0.0	62.9	66	62.9	10	----	62.9	0.0	8	-8.0
OceanSands2-12	265	1	0.0	61.0	66	61.0	10	----	61.0	0.0	8	-8.0
OceanSands2-13	266	1	0.0	64.0	66	64.0	10	----	64.0	0.0	8	-8.0
OceanSands2-14	267	1	0.0	61.3	66	61.3	10	----	61.3	0.0	8	-8.0
OceanSands2-15	268	1	0.0	61.0	66	61.0	10	----	61.0	0.0	8	-8.0
OceanSands2-16	269	1	0.0	56.8	66	56.8	10	----	56.8	0.0	8	-8.0
OceanSands2-17	270	1	0.0	56.3	66	56.3	10	----	56.3	0.0	8	-8.0
OceanSands2-18	271	1	0.0	55.2	66	55.2	10	----	55.2	0.0	8	-8.0
OceanSands2-19	272	1	0.0	57.1	66	57.1	10	----	57.1	0.0	8	-8.0
OceanSands2-20	273	1	0.0	57.4	66	57.4	10	----	57.4	0.0	8	-8.0
OceanSands2-21	274	1	0.0	57.2	66	57.2	10	----	57.2	0.0	8	-8.0
OceanSands2-22	275	1	0.0	54.5	66	54.5	10	----	54.5	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	39	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

NSA 20 AND NSA 21

NCTA							17 February 2011					
J. Poling							TNM 2.5					
							Calculated with TNM 2.5					
RESULTS: SOUND LEVELS												
PROJECT/CONTRACT:		Mid-Currituck Bridge Study										
RUN:		Pref Alt OceanSands3 & CurrituckClub										
BARRIER DESIGN:		INPUT HEIGHTS						Average pavement type shall be used unless				
								a State highway agency substantiates the use				
ATMOSPHERICS:		68 deg F, 50% RH						of a different type with approval of FHWA.				
Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
CurrituckClub-1	225	1	0.0	53.7	66	53.7	10	----	53.7	0.0	8	-8.0
CurrituckClub-2	226	1	0.0	58.4	66	58.4	10	----	58.4	0.0	8	-8.0
CurrituckClub-3	227	1	0.0	52.1	66	52.1	10	----	52.1	0.0	8	-8.0
CurrituckClub-4	228	1	0.0	53.5	66	53.5	10	----	53.5	0.0	8	-8.0
CurrituckClub-5	229	1	0.0	53.8	66	53.8	10	----	53.8	0.0	8	-8.0
CurrituckClub-6	230	1	0.0	51.6	66	51.6	10	----	51.6	0.0	8	-8.0
CurrituckClub-7	231	1	0.0	52.7	66	52.7	10	----	52.7	0.0	8	-8.0
CurrituckClub-8	232	1	0.0	58.1	66	58.1	10	----	58.1	0.0	8	-8.0
CurrituckClub-9	233	1	0.0	50.2	66	50.2	10	----	50.2	0.0	8	-8.0
CurrituckClub-10	234	1	0.0	48.2	66	48.2	10	----	48.2	0.0	8	-8.0
CurrituckClub-11	235	1	0.0	49.7	66	49.7	10	----	49.7	0.0	8	-8.0
CurrituckClub-12	236	1	0.0	48.8	66	48.8	10	----	48.8	0.0	8	-8.0
OceanSands3-1	238	1	0.0	62.1	66	62.1	10	----	62.1	0.0	8	-8.0
OceanSands3-2	239	1	0.0	64.4	66	64.4	10	----	64.4	0.0	8	-8.0
OceanSands3-3	240	1	0.0	64.0	66	64.0	10	----	64.0	0.0	8	-8.0
OceanSands3-4	241	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
OceanSands3-5	242	1	0.0	62.4	66	62.4	10	----	62.4	0.0	8	-8.0
OceanSands3-6	243	1	0.0	60.8	66	60.8	10	----	60.8	0.0	8	-8.0
OceanSands3-7	244	1	0.0	54.6	66	54.6	10	----	54.6	0.0	8	-8.0
OceanSands3-8	245	1	0.0	54.6	66	54.6	10	----	54.6	0.0	8	-8.0
OceanSands3-9	246	1	0.0	54.8	66	54.8	10	----	54.8	0.0	8	-8.0
OceanSands3-10	247	1	0.0	56.2	66	56.2	10	----	56.2	0.0	8	-8.0
OceanSands3-11	248	1	0.0	54.9	66	54.9	10	----	54.9	0.0	8	-8.0
OceanSands3-12	249	1	0.0	54.7	66	54.7	10	----	54.7	0.0	8	-8.0

OceanSands3-13	250	1	0.0	55.4	66	55.4	10	----	55.4	0.0	8	-8.0

Dwelling Units		**# DUs**	**Noise Reduction**		
			Min	**Avg**	**Max**
			dB	**dB**	**dB**
All Selected		25	0.0	0.0	0.0
All Impacted		0	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

NSA 22

NCTA							17 February 2011					
J. Poling							TNM 2.5					
							Calculated with TNM 2.5					
RESULTS: SOUND LEVELS												
PROJECT/CONTRACT:		Mid-Currituck Bridge Study										
RUN:		Preferred Alternative NSA 22 - Isolated										
BARRIER DESIGN:		INPUT HEIGHTS						Average pavement type shall be used unless				
								a State highway agency substantiates the use				
ATMOSPHERICS:		68 deg F, 50% RH						of a different type with approval of FHWA.				
Receiver												
Name	No.	#DUs	Existing	No Barrier		Increase over existing		Type	With Barrier			
			LAeq1h	LAeq1h					Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Apt1-1F	1	1	0.0	57.4	66	57.4	10	----	57.4	0.0	8	-8.0
Apt2-1F	2	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
Apt3-1F	3	1	0.0	55.9	66	55.9	10	----	55.9	0.0	8	-8.0
Apt1-2F	4	1	0.0	57.7	66	57.7	10	----	57.7	0.0	8	-8.0
Apt1-3F	5	1	0.0	57.8	66	57.8	10	----	57.8	0.0	8	-8.0
Apt2-2F	6	1	0.0	64.5	66	64.5	10	----	64.5	0.0	8	-8.0
Apt2-3F	7	1	0.0	64.9	66	64.9	10	----	64.9	0.0	8	-8.0
Apt3-2F	8	1	0.0	59.9	66	59.9	10	----	59.9	0.0	8	-8.0
Apt3-3F	9	1	0.0	62.4	66	62.4	10	----	62.4	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	9	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

NSA 23

NCTA 17 February 2011
J. Poling TNM 2.5
Calculated with TNM 2.5
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt NSA 23 MonteryShores1
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MonteryShores1-1	225	1	0.0	61.9	66	61.9	10	----	61.9	0.0	8	-8.0
MonteryShores1-2	226	1	0.0	67.0	66	67.0	10	Snd Lvl	67.0	0.0	8	-8.0
MonteryShores1-3	227	1	0.0	59.2	66	59.2	10	----	59.2	0.0	8	-8.0
MonteryShores1-4	228	1	0.0	64.8	66	64.8	10	----	64.8	0.0	8	-8.0
MonteryShores1-5	229	1	0.0	60.6	66	60.6	10	----	60.6	0.0	8	-8.0
MonteryShores1-6	230	1	0.0	56.1	66	56.1	10	----	56.1	0.0	8	-8.0
MonteryShores1-7	231	1	0.0	52.8	66	52.8	10	----	52.8	0.0	8	-8.0
MonteryShores1-8	232	1	0.0	54.0	66	54.0	10	----	54.0	0.0	8	-8.0
MonteryShores1-9	233	1	0.0	54.9	66	54.9	10	----	54.9	0.0	8	-8.0
MonteryShores1-10	234	1	0.0	60.9	66	60.9	10	----	60.9	0.0	8	-8.0
MonteryShores1-11	235	1	0.0	62.7	66	62.7	10	----	62.7	0.0	8	-8.0
MonteryShores1-12	236	1	0.0	58.4	66	58.4	10	----	58.4	0.0	8	-8.0
MonteryShores1-13	237	1	0.0	52.8	66	52.8	10	----	52.8	0.0	8	-8.0
MonteryShores1-14	238	1	0.0	58.1	66	58.1	10	----	58.1	0.0	8	-8.0
MonteryShores1-15	240	1	0.0	64.4	66	64.4	10	----	64.4	0.0	8	-8.0
MonteryShores1-16	241	1	0.0	58.5	66	58.5	10	----	58.5	0.0	8	-8.0
MonteryShores1-17	242	1	0.0	57.4	66	57.4	10	----	57.4	0.0	8	-8.0
MonteryShores1-18	243	1	0.0	63.3	66	63.3	10	----	63.3	0.0	8	-8.0
MonteryShores1-19	244	1	0.0	67.4	66	67.4	10	Snd Lvl	67.4	0.0	8	-8.0
MonteryShores1-20	246	1	0.0	52.1	66	52.1	10	----	52.1	0.0	8	-8.0
MonteryShores1-21	248	1	0.0	52.5	66	52.5	10	----	52.5	0.0	8	-8.0
MonteryShores1-22	249	1	0.0	52.9	66	52.9	10	----	52.9	0.0	8	-8.0
MonteryShores1-23	250	1	0.0	55.3	66	55.3	10	----	55.3	0.0	8	-8.0
MonteryShores1-24	251	1	0.0	57.4	66	57.4	10	----	57.4	0.0	8	-8.0

MonteryShores1-25	252	1	0.0	55.1	66	55.1	10	----	55.1	0.0	8	-8.0

Dwelling Units		**# DUs**	**Noise Reduction**		
			Min	**Avg**	**Max**
			dB	**dB**	**dB**
All Selected		25	0.0	0.0	0.0
All Impacted		2	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

NSA 24 AND NSA 26

NCTA 17 February 2011
J. Poling TNM 2.5
Calculated with TNM 2.5
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt NSAs 24&26 MonteraySh2&4
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MonteryShores2-1	1	1	0.0	58.1	66	58.1	10	----	58.1	0.0	8	-8.0
MonteryShores2-2	2	1	0.0	60.0	66	60.0	10	----	60.0	0.0	8	-8.0
MonteryShores2-3	3	1	0.0	60.5	66	60.5	10	----	60.5	0.0	8	-8.0
MonteryShores2-4	4	1	0.0	62.3	66	62.3	10	----	62.3	0.0	8	-8.0
MonteryShores2-5	5	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
MonteryShores2-6	6	1	0.0	63.0	66	63.0	10	----	63.0	0.0	8	-8.0
MonteryShores2-7	7	1	0.0	71.8	66	71.8	10	Snd Lvl	71.8	0.0	8	-8.0
MonteryShores2-8	8	1	0.0	66.7	66	66.7	10	Snd Lvl	66.7	0.0	8	-8.0
MonteryShores2-9	9	1	0.0	60.8	66	60.8	10	----	60.8	0.0	8	-8.0
MonteryShores2-10	10	1	0.0	57.3	66	57.3	10	----	57.3	0.0	8	-8.0
MonteryShores2-11	11	1	0.0	58.2	66	58.2	10	----	58.2	0.0	8	-8.0
MonteryShores2-12	12	1	0.0	57.3	66	57.3	10	----	57.3	0.0	8	-8.0
MonteryShores2-13	13	1	0.0	58.3	66	58.3	10	----	58.3	0.0	8	-8.0
MonteryShores4-1	14	1	0.0	58.3	66	58.3	10	----	58.3	0.0	8	-8.0
MonteryShores4-2	15	1	0.0	62.8	66	62.8	10	----	62.8	0.0	8	-8.0
MonteryShores4-3	16	1	0.0	60.4	66	60.4	10	----	60.4	0.0	8	-8.0
MonteryShores4-4	18	1	0.0	61.1	66	61.1	10	----	61.1	0.0	8	-8.0
MonteryShores4-5	19	1	0.0	64.3	66	64.3	10	----	64.3	0.0	8	-8.0
MonteryShores4-6	20	1	0.0	67.9	66	67.9	10	Snd Lvl	67.9	0.0	8	-8.0
MonteryShores4-7	21	1	0.0	67.7	66	67.7	10	Snd Lvl	67.7	0.0	8	-8.0
MonteryShores4-8	22	1	0.0	66.5	66	66.5	10	Snd Lvl	66.5	0.0	8	-8.0
MonteryShores4-9	23	1	0.0	68.5	66	68.5	10	Snd Lvl	68.5	0.0	8	-8.0
MonteryShores4-10	24	1	0.0	69.6	66	69.6	10	Snd Lvl	69.6	0.0	8	-8.0
MonteryShores4-11	25	1	0.0	71.8	66	71.8	10	Snd Lvl	71.8	0.0	8	-8.0

MonterayShores4-12	26	1	0.0	58.5	66	58.5	10	----	58.5	0.0	8	-8.0
MonterayShores4-13	27	1	0.0	60.4	66	60.4	10	----	60.4	0.0	8	-8.0
MonterayShores4-14	28	1	0.0	59.6	66	59.6	10	----	59.6	0.0	8	-8.0
MonterayShores4-15	29	1	0.0	60.3	66	60.3	10	----	60.3	0.0	8	-8.0
MonterayShores4-16	30	1	0.0	61.1	66	61.1	10	----	61.1	0.0	8	-8.0

Dwelling Units		**# DUs**	**Noise Reduction**		
			Min	**Avg**	**Max**
			dB	**dB**	**dB**
All Selected		29	0.0	0.0	0.0
All Impacted		8	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

NSA 25

NCTA
J. Poling
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt NSA 25 MonterayShores3
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

17 February 2011
TNM 2.5
Calculated with TNM 2.5
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc		Calculated	Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MonterayShores3-1	227	1	0.0	67.4	66	67.4	10	Snd Lvl	67.4	0.0	8	-8.0
MonterayShores3-2	228	1	0.0	61.2	66	61.2	10	----	61.2	0.0	8	-8.0
MonterayShores3-3	229	1	0.0	59.1	66	59.1	10	----	59.1	0.0	8	-8.0
MonterayShores3-4	230	1	0.0	59.4	66	59.4	10	----	59.4	0.0	8	-8.0
MonterayShores3-5	231	1	0.0	57.7	66	57.7	10	----	57.7	0.0	8	-8.0
MonterayShores3-6	232	1	0.0	57.1	66	57.1	10	----	57.1	0.0	8	-8.0
MonterayShores3-7	233	1	0.0	58.9	66	58.9	10	----	58.9	0.0	8	-8.0
MonterayShores3-8	234	1	0.0	59.3	66	59.3	10	----	59.3	0.0	8	-8.0
MonterayShores3-9	235	1	0.0	58.2	66	58.2	10	----	58.2	0.0	8	-8.0
MonterayShores3-10	236	1	0.0	58.2	66	58.2	10	----	58.2	0.0	8	-8.0
MonterayShores3-11	237	1	0.0	57.1	66	57.1	10	----	57.1	0.0	8	-8.0
MonterayShores3-12	238	1	0.0	60.1	66	60.1	10	----	60.1	0.0	8	-8.0
MonterayShores3-13	240	1	0.0	58.8	66	58.8	10	----	58.8	0.0	8	-8.0
MonterayShores3-14	241	1	0.0	59.8	66	59.8	10	----	59.8	0.0	8	-8.0
MonterayShores3-15	242	1	0.0	57.5	66	57.5	10	----	57.5	0.0	8	-8.0
MonterayShores3-16	243	1	0.0	59.8	66	59.8	10	----	59.8	0.0	8	-8.0
MonterayShores3-17	244	1	0.0	57.9	66	57.9	10	----	57.9	0.0	8	-8.0
MonterayShores3-18	246	1	0.0	50.9	66	50.9	10	----	50.9	0.0	8	-8.0
MonterayShores3-19	248	1	0.0	50.5	66	50.5	10	----	50.5	0.0	8	-8.0
MonterayShores3-20	249	1	0.0	50.8	66	50.8	10	----	50.8	0.0	8	-8.0
MonterayShores3-21	250	1	0.0	51.1	66	51.1	10	----	51.1	0.0	8	-8.0
MonterayShores3-22	251	1	0.0	60.3	66	60.3	10	----	60.3	0.0	8	-8.0
MonterayShores3-23	252	1	0.0	66.2	66	66.2	10	Snd Lvl	66.2	0.0	8	-8.0

Dwelling Units		# DUs	Noise Reduction		
			Min	Avg	Max
			dB	dB	dB
All Selected		23	0.0	0.0	0.0
All Impacted		2	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

NSA 27

NCTA							17 February 2011					
J. Poling							TNM 2.5					
							Calculated with TNM 2.5					
RESULTS: SOUND LEVELS												
PROJECT/CONTRACT:		Mid-Currituck Bridge Study										
RUN:		Preferred Alternative NSA 27 Corolla Bay										
BARRIER DESIGN:		INPUT HEIGHTS						Average pavement type shall be used unless				
								a State highway agency substantiates the use				
ATMOSPHERICS:		68 deg F, 50% RH						of a different type with approval of FHWA.				
Receiver												
Name	No.	#DUs	Existing	No Barrier					With Barrier			
			LAeq1h	LAeq1h		Increase over existing		Type	Calculated	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n	Impact	LAeq1h	Calculated	Goal	Calculated
							Sub'l Inc					minus
												Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
CorollaBay-1	1	1	0.0	55.1	66	55.1	10	----	55.1	0.0	8	-8.0
CorollaBay-2	2	1	0.0	54.8	66	54.8	10	----	54.8	0.0	8	-8.0
CorollaBay-3	14	1	0.0	49.2	66	49.2	10	----	49.2	0.0	8	-8.0
IsolatedApts	15	1	0.0	49.5	66	49.5	10	----	49.5	0.0	8	-8.0
SetbackHomes-1	16	1	0.0	55.6	66	55.6	10	----	55.6	0.0	8	-8.0
SetbackHomes-2	18	1	0.0	47.9	66	47.9	10	----	47.9	0.0	8	-8.0
CorollaBay-4	27	1	0.0	59.4	66	59.4	10	----	59.4	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	7	0.0	0.0	0.0
All Impacted	0	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

66 dBA AND 71 dBA NOISE CONTOUR MODELS

NCTA 17 February 2011
J. Poling TNM 2.5
Calculated with TNM 2.5
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt OceanSands1contour
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
OceanSands1-1	206	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-2	207	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-3	208	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-4	209	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-5	210	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-6	211	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-7	212	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-8	213	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-9	214	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-10	215	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-11	216	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-12	217	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-13	218	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-14	219	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-15	220	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-16	221	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-17	222	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-18	223	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-19	224	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-20	225	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-21	226	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-22	227	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-23	228	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-24	229	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0

OceanSands1-25	230	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands1-26	231	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
HighSand-1	233	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
HighSand-2	234	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
HighSand-3	235	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
CurrituckCottages-1	237	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
CurrituckCottages-2	238	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
CurrituckCottages-3	239	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
NB con1 - 25	242	1	0.0	68.8	66	68.8	10	Snd Lvl	68.8	0.0	8	-8.0
NB con1 - 50	243	1	0.0	65.7	66	65.7	10	----	65.7	0.0	8	-8.0
NB con1 -75	244	1	0.0	62.8	66	62.8	10	----	62.8	0.0	8	-8.0
NC con1 - 100	245	1	0.0	61.0	66	61.0	10	----	61.0	0.0	8	-8.0
NB con1 - 125	246	1	0.0	59.5	66	59.5	10	----	59.5	0.0	8	-8.0
NB con1 - 150	247	1	0.0	58.3	66	58.3	10	----	58.3	0.0	8	-8.0
NB con1 - 175	248	1	0.0	57.4	66	57.4	10	----	57.4	0.0	8	-8.0
NB con1 - 200	249	1	0.0	56.6	66	56.6	10	----	56.6	0.0	8	-8.0
NB con2 - 25	251	1	0.0	72.1	66	72.1	10	Snd Lvl	72.1	0.0	8	-8.0
NB con2 - 50	252	1	0.0	68.3	66	68.3	10	Snd Lvl	68.3	0.0	8	-8.0
NB con2 - 75	253	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
NB con2 - 100	254	1	0.0	63.1	66	63.1	10	----	63.1	0.0	8	-8.0
NB con2 - 125	255	1	0.0	61.4	66	61.4	10	----	61.4	0.0	8	-8.0
NB con2 - 150	256	1	0.0	60.0	66	60.0	10	----	60.0	0.0	8	-8.0
NB con2 - 175	257	1	0.0	58.9	66	58.9	10	----	58.9	0.0	8	-8.0
NB con2 - 200	258	1	0.0	58.0	66	58.0	10	----	58.0	0.0	8	-8.0
NB con3 - 25	260	1	0.0	72.4	66	72.4	10	Snd Lvl	72.4	0.0	8	-8.0
NB con3 - 50	261	1	0.0	69.0	66	69.0	10	Snd Lvl	69.0	0.0	8	-8.0
NB con3 - 75	262	1	0.0	66.4	66	66.4	10	Snd Lvl	66.4	0.0	8	-8.0
NB con3 - 100	263	1	0.0	64.5	66	64.5	10	----	64.5	0.0	8	-8.0
NB con3 - 125	264	1	0.0	63.2	66	63.2	10	----	63.2	0.0	8	-8.0
NB con3 - 150	265	1	0.0	61.9	66	61.9	10	----	61.9	0.0	8	-8.0
NB con3 - 175	266	1	0.0	60.6	66	60.6	10	----	60.6	0.0	8	-8.0
NB con3 - 200	267	1	0.0	59.6	66	59.6	10	----	59.6	0.0	8	-8.0
NB con4 - 25	268	1	0.0	69.4	66	69.4	10	Snd Lvl	69.4	0.0	8	-8.0
NB con4 - 50	269	1	0.0	67.1	66	67.1	10	Snd Lvl	67.1	0.0	8	-8.0
NB con4 - 75	270	1	0.0	65.3	66	65.3	10	----	65.3	0.0	8	-8.0
NB con4 - 100	271	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
NB con4 - 125	272	1	0.0	62.6	66	62.6	10	----	62.6	0.0	8	-8.0
NB con4 - 150	273	1	0.0	61.4	66	61.4	10	----	61.4	0.0	8	-8.0
NB con4 - 175	274	1	0.0	60.3	66	60.3	10	----	60.3	0.0	8	-8.0
NB con4 - 200	275	1	0.0	59.4	66	59.4	10	----	59.4	0.0	8	-8.0
NB con5 - 25	277	1	0.0	72.5	66	72.5	10	Snd Lvl	72.5	0.0	8	-8.0

NB con5 - 50	278	1	0.0	69.5	66	69.5	10	Snd Lvl	69.5	0.0	8	-8.0
NB con5 - 75	279	1	0.0	67.0	66	67.0	10	Snd Lvl	67.0	0.0	8	-8.0
NB con5 - 100	280	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
NB con5 - 125	281	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
NB con5 - 150	282	1	0.0	62.1	66	62.1	10	----	62.1	0.0	8	-8.0
NB con5 - 175	283	1	0.0	60.8	66	60.8	10	----	60.8	0.0	8	-8.0
NB con5 - 200	284	1	0.0	59.9	66	59.9	10	----	59.9	0.0	8	-8.0
NB con6 - 50	286	1	0.0	69.2	66	69.2	10	Snd Lvl	69.2	0.0	8	-8.0
NB con6 - 75	287	1	0.0	67.0	66	67.0	10	Snd Lvl	67.0	0.0	8	-8.0
NB con6 - 100	288	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
NB con6 - 125	289	1	0.0	63.7	66	63.7	10	----	63.7	0.0	8	-8.0
NB con6 - 150	290	1	0.0	62.2	66	62.2	10	----	62.2	0.0	8	-8.0
NB con6 - 175	291	1	0.0	60.9	66	60.9	10	----	60.9	0.0	8	-8.0
NB con6 - 200	292	1	0.0	59.8	66	59.8	10	----	59.8	0.0	8	-8.0
NB con6 - 25	294	1	0.0	72.4	66	72.4	10	Snd Lvl	72.4	0.0	8	-8.0
con7 - 0	296	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
con7 - 25	297	1	0.0	67.2	66	67.2	10	Snd Lvl	67.2	0.0	8	-8.0
con7 - 50	298	1	0.0	64.9	66	64.9	10	----	64.9	0.0	8	-8.0
con7 - 75	299	1	0.0	63.1	66	63.1	10	----	63.1	0.0	8	-8.0
con7 - 100	300	1	0.0	61.6	66	61.6	10	----	61.6	0.0	8	-8.0
con7 - 125	301	1	0.0	60.3	66	60.3	10	----	60.3	0.0	8	-8.0
con7 - 150	302	1	0.0	59.3	66	59.3	10	----	59.3	0.0	8	-8.0
con7 - 175	303	1	0.0	58.4	66	58.4	10	----	58.4	0.0	8	-8.0
con7 - 200	304	1	0.0	57.6	66	57.6	10	----	57.6	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	89	0.0	0.0	0.0
All Impacted	15	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

NCTA 17 February 2011
J. Poling TNM 2.5
Calculated with TNM 2.5
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt OceanSands2 contour
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
TheHammocks-4	237	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-5	238	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-6	239	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-7	240	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-8	241	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-9	242	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-10	243	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-11	244	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-12	245	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-13	246	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-14	247	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-15	248	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-16	249	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-17	250	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-18	251	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-19	252	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
TheHammocks-20	253	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-1	254	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-2	255	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-3	256	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-4	257	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-5	258	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-6	259	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-7	260	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0

OceanSands2-8	261	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-9	262	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-10	263	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-11	264	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-12	265	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-13	266	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-14	267	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-15	268	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-16	269	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-17	270	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-18	271	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-19	272	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-20	273	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-21	274	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
OceanSands2-22	275	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
Con1 - 25	277	1	0.0	69.5	66	69.5	10	Snd Lvl	69.5	0.0	8	-8.0
Con1 - 50	278	1	0.0	66.0	66	66.0	10	Snd Lvl	66.0	0.0	8	-8.0
Con1 - 75	279	1	0.0	63.1	66	63.1	10	----	63.1	0.0	8	-8.0
Con1 - 100	280	1	0.0	61.3	66	61.3	10	----	61.3	0.0	8	-8.0
Con1 - 125	281	1	0.0	59.8	66	59.8	10	----	59.8	0.0	8	-8.0
Con1 - 150	282	1	0.0	58.5	66	58.5	10	----	58.5	0.0	8	-8.0
Con1 - 175	283	1	0.0	57.0	66	57.0	10	----	57.0	0.0	8	-8.0
Con1 - 200	284	1	0.0	55.9	66	55.9	10	----	55.9	0.0	8	-8.0
Con2 - 25	285	1	0.0	69.1	66	69.1	10	Snd Lvl	69.1	0.0	8	-8.0
Con2 - 50	286	1	0.0	65.6	66	65.6	10	----	65.6	0.0	8	-8.0
Con2 - 75	287	1	0.0	63.2	66	63.2	10	----	63.2	0.0	8	-8.0
Con2 - 100	288	1	0.0	61.5	66	61.5	10	----	61.5	0.0	8	-8.0
Con2 - 125	289	1	0.0	60.1	66	60.1	10	----	60.1	0.0	8	-8.0
Con2 - 150	290	1	0.0	58.7	66	58.7	10	----	58.7	0.0	8	-8.0
Con2 - 175	291	1	0.0	57.3	66	57.3	10	----	57.3	0.0	8	-8.0
Con2 - 200	292	1	0.0	56.1	66	56.1	10	----	56.1	0.0	8	-8.0

Dwelling Units	**# DUs**	**Noise Reduction**		
		Min	**Avg**	**Max**
		dB	**dB**	**dB**
All Selected	55	0.0	0.0	0.0
All Impacted	3	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

NCTA 17 February 2011
J. Poling TNM 2.5
Calculated with TNM 2.5
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt MonteraySh2&4 contours
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MonterayShores2-1	1	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-2	2	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-3	3	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-4	4	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-5	5	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-6	6	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-7	7	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-8	8	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-9	9	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-10	10	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-11	11	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-12	12	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores2-13	13	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-1	14	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-2	15	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-3	16	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-4	18	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-5	19	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-6	20	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-7	21	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-8	22	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-9	23	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-10	24	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonterayShores4-11	25	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0

MonteryShores4-12	26	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonteryShores4-13	27	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonteryShores4-14	28	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonteryShores4-15	29	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
MonteryShores4-16	30	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
con1 - 25	32	1	0.0	71.2	66	71.2	10	Snd Lvl	71.2	0.0	8	-8.0
con1 - 50	33	1	0.0	67.9	66	67.9	10	Snd Lvl	67.9	0.0	8	-8.0
con1 - 75	34	1	0.0	65.2	66	65.2	10	----	65.2	0.0	8	-8.0
con1 - 100	35	1	0.0	63.5	66	63.5	10	----	63.5	0.0	8	-8.0
con1 - 125	36	1	0.0	62.1	66	62.1	10	----	62.1	0.0	8	-8.0
con1 - 150	37	1	0.0	61.1	66	61.1	10	----	61.1	0.0	8	-8.0
con1 - 175	38	1	0.0	60.1	66	60.1	10	----	60.1	0.0	8	-8.0
con1 - 200	39	1	0.0	59.3	66	59.3	10	----	59.3	0.0	8	-8.0
con2 - 25	40	1	0.0	71.5	66	71.5	10	Snd Lvl	71.5	0.0	8	-8.0
con2 - 50	41	1	0.0	68.4	66	68.4	10	Snd Lvl	68.4	0.0	8	-8.0
con2 - 75	42	1	0.0	65.8	66	65.8	10	----	65.8	0.0	8	-8.0
con2 - 100	43	1	0.0	64.2	66	64.2	10	----	64.2	0.0	8	-8.0
con2 - 125	44	1	0.0	62.9	66	62.9	10	----	62.9	0.0	8	-8.0
con2 - 150	45	1	0.0	61.8	66	61.8	10	----	61.8	0.0	8	-8.0
con2 - 175	46	1	0.0	60.8	66	60.8	10	----	60.8	0.0	8	-8.0
con2 - 200	47	1	0.0	59.9	66	59.9	10	----	59.9	0.0	8	-8.0
con3 - 25	48	1	0.0	71.5	66	71.5	10	Snd Lvl	71.5	0.0	8	-8.0
con3 - 50	49	1	0.0	68.7	66	68.7	10	Snd Lvl	68.7	0.0	8	-8.0
con3 - 75	50	1	0.0	66.7	66	66.7	10	Snd Lvl	66.7	0.0	8	-8.0
con3 - 100	51	1	0.0	65.3	66	65.3	10	----	65.3	0.0	8	-8.0
con3 - 125	52	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
con3 - 150	53	1	0.0	62.9	66	62.9	10	----	62.9	0.0	8	-8.0
con3 - 175	54	1	0.0	61.9	66	61.9	10	----	61.9	0.0	8	-8.0
con3 - 200	55	1	0.0	61.3	66	61.3	10	----	61.3	0.0	8	-8.0
con4 - 25	56	1	0.0	72.6	66	72.6	10	Snd Lvl	72.6	0.0	8	-8.0
con4 - 50	57	1	0.0	69.9	66	69.9	10	Snd Lvl	69.9	0.0	8	-8.0
con4 - 75	58	1	0.0	67.7	66	67.7	10	Snd Lvl	67.7	0.0	8	-8.0
con4 - 100	59	1	0.0	66.1	66	66.1	10	Snd Lvl	66.1	0.0	8	-8.0
con4 - 125	60	1	0.0	64.6	66	64.6	10	----	64.6	0.0	8	-8.0
con4 - 150	61	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0
con4 - 175	62	1	0.0	62.4	66	62.4	10	----	62.4	0.0	8	-8.0
con4 - 200	63	1	0.0	61.6	66	61.6	10	----	61.6	0.0	8	-8.0
con5 - 25	64	1	0.0	72.9	66	72.9	10	Snd Lvl	72.9	0.0	8	-8.0
con5 - 50	65	1	0.0	70.0	66	70.0	10	Snd Lvl	70.0	0.0	8	-8.0
con5 - 75	66	1	0.0	67.6	66	67.6	10	Snd Lvl	67.6	0.0	8	-8.0
con5 - 100	67	1	0.0	65.7	66	65.7	10	----	65.7	0.0	8	-8.0

con5 - 125	68	1	0.0	64.2	66	64.2	10	----	64.2	0.0	8	-8.0
con5 - 150	69	1	0.0	62.6	66	62.6	10	----	62.6	0.0	8	-8.0
con5 - 175	70	1	0.0	61.4	66	61.4	10	----	61.4	0.0	8	-8.0
con5 - 200	71	1	0.0	60.2	66	60.2	10	----	60.2	0.0	8	-8.0
con6 - 25	73	1	0.0	66.4	66	66.4	10	Snd Lvl	66.4	0.0	8	-8.0
con6 - 50	74	1	0.0	64.4	66	64.4	10	----	64.4	0.0	8	-8.0
con6 - 75	75	1	0.0	62.8	66	62.8	10	----	62.8	0.0	8	-8.0
con6 - 100	76	1	0.0	61.5	66	61.5	10	----	61.5	0.0	8	-8.0
con6 - 125	77	1	0.0	60.5	66	60.5	10	----	60.5	0.0	8	-8.0
con6 - 150	78	1	0.0	59.7	66	59.7	10	----	59.7	0.0	8	-8.0
con6 - 175	79	1	0.0	59.0	66	59.0	10	----	59.0	0.0	8	-8.0
con6 - 200	80	1	0.0	58.3	66	58.3	10	----	58.3	0.0	8	-8.0
con7 - 25	81	1	0.0	69.4	66	69.4	10	Snd Lvl	69.4	0.0	8	-8.0
con7 - 50	82	1	0.0	67.8	66	67.8	10	Snd Lvl	67.8	0.0	8	-8.0
con7 - 75	83	1	0.0	66.3	66	66.3	10	Snd Lvl	66.3	0.0	8	-8.0
con7 - 100	84	1	0.0	64.9	66	64.9	10	----	64.9	0.0	8	-8.0
con7 - 125	85	1	0.0	63.9	66	63.9	10	----	63.9	0.0	8	-8.0
con7 - 150	86	1	0.0	63.0	66	63.0	10	----	63.0	0.0	8	-8.0
con7 - 175	87	1	0.0	62.1	66	62.1	10	----	62.1	0.0	8	-8.0
con7 - 200	88	1	0.0	61.4	66	61.4	10	----	61.4	0.0	8	-8.0
con8 - 25	89	1	0.0	69.4	66	69.4	10	Snd Lvl	69.4	0.0	8	-8.0
con8 - 50	90	1	0.0	67.8	66	67.8	10	Snd Lvl	67.8	0.0	8	-8.0
con8 - 75	91	1	0.0	66.2	66	66.2	10	Snd Lvl	66.2	0.0	8	-8.0
con8 - 100	92	1	0.0	64.8	66	64.8	10	----	64.8	0.0	8	-8.0
con8 - 125	93	1	0.0	63.8	66	63.8	10	----	63.8	0.0	8	-8.0
con8 - 150	94	1	0.0	62.7	66	62.7	10	----	62.7	0.0	8	-8.0
con8 - 175	95	1	0.0	61.9	66	61.9	10	----	61.9	0.0	8	-8.0
con8 - 200	96	1	0.0	61.2	66	61.2	10	----	61.2	0.0	8	-8.0
con9 - 0	98	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
con9 - 25	99	1	0.0	67.5	66	67.5	10	Snd Lvl	67.5	0.0	8	-8.0
con9 - 50	100	1	0.0	64.6	66	64.6	10	----	64.6	0.0	8	-8.0
con9 - 75	101	1	0.0	62.5	66	62.5	10	----	62.5	0.0	8	-8.0
con9 - 100	102	1	0.0	60.9	66	60.9	10	----	60.9	0.0	8	-8.0
con9 - 125	103	1	0.0	60.0	66	60.0	10	----	60.0	0.0	8	-8.0
con9 - 150	104	1	0.0	59.4	66	59.4	10	----	59.4	0.0	8	-8.0
con9 - 175	105	1	0.0	58.7	66	58.7	10	----	58.7	0.0	8	-8.0
con9 - 200	106	1	0.0	58.2	66	58.2	10	----	58.2	0.0	8	-8.0
con10 - 25	108	1	0.0	68.5	66	68.5	10	Snd Lvl	68.5	0.0	8	-8.0
con10 - 50	109	1	0.0	66.6	66	66.6	10	Snd Lvl	66.6	0.0	8	-8.0
con10 - 75	110	1	0.0	64.9	66	64.9	10	----	64.9	0.0	8	-8.0
con10 - 100	111	1	0.0	63.6	66	63.6	10	----	63.6	0.0	8	-8.0

con10 - 125	112	1	0.0	62.6	66	62.6	10	----	62.6	0.0	8	-8.0
con10 - 150	113	1	0.0	61.6	66	61.6	10	----	61.6	0.0	8	-8.0
con10 - 175	114	1	0.0	60.8	66	60.8	10	----	60.8	0.0	8	-8.0
con10 - 200	115	1	0.0	60.0	66	60.0	10	----	60.0	0.0	8	-8.0

Dwelling Units		**# DUs**	**Noise Reduction**		
			Min	**Avg**	**Max**
			dB	**dB**	**dB**
All Selected		110	0.0	0.0	0.0
All Impacted		24	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

NCTA 17 February 2011
J. Poling TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt Isolated Apts. contour
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier Calculated LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc			Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
Apt1-1F	1	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
Apt2-1F	2	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
Apt3-1F	3	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
Apt1-2F	4	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
Apt1-3F	5	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
Apt2-2F	6	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
Apt2-3F	7	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
Apt3-2F	8	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
Apt3-3F	9	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
con1 - 0	11	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
con1 - 25	12	1	0.0	72.8	66	72.8	10	Snd Lvl	72.8	0.0	8	-8.0
con1 - 50	13	1	0.0	69.6	66	69.6	10	Snd Lvl	69.6	0.0	8	-8.0
con1 - 75	14	1	0.0	67.2	66	67.2	10	Snd Lvl	67.2	0.0	8	-8.0
con1 - 100	15	1	0.0	65.4	66	65.4	10	----	65.4	0.0	8	-8.0
con1 - 125	16	1	0.0	64.0	66	64.0	10	----	64.0	0.0	8	-8.0
con1 - 150	17	1	0.0	62.6	66	62.6	10	----	62.6	0.0	8	-8.0
con1 - 175	18	1	0.0	61.6	66	61.6	10	----	61.6	0.0	8	-8.0
con2 - 0	19	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
con2 - 25	20	1	0.0	72.8	66	72.8	10	Snd Lvl	72.8	0.0	8	-8.0
con2 - 50	21	1	0.0	70.0	66	70.0	10	Snd Lvl	70.0	0.0	8	-8.0
con2 - 75	22	1	0.0	67.7	66	67.7	10	Snd Lvl	67.7	0.0	8	-8.0
con2 - 100	23	1	0.0	66.0	66	66.0	10	Snd Lvl	66.0	0.0	8	-8.0
con2 - 125	24	1	0.0	64.6	66	64.6	10	----	64.6	0.0	8	-8.0
con2 - 150	25	1	0.0	63.2	66	63.2	10	----	63.2	0.0	8	-8.0

con2 - 175	26	1	0.0	62.1	66	62.1	10	----	62.1	0.0	8	-8.0

Dwelling Units		**# DUs**	**Noise Reduction**		
			Min	**Avg**	**Max**
			dB	**dB**	**dB**
All Selected		25	0.0	0.0	0.0
All Impacted		7	0.0	0.0	0.0
All that meet NR Goal		0	0.0	0.0	0.0

NCTA
J. Poling
RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt CorollaBay contour
BARRIER DESIGN: INPUT HEIGHTS
ATMOSPHERICS: 68 deg F, 50% RH

17 February 2011
TNM 2.5
Calculated with TNM 2.5
Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#DUs	Existing LAeq1h	No Barrier LAeq1h		Increase over existing		Type Impact	With Barrier LAeq1h	Noise Reduction		
				Calculated	Crit'n	Calculated	Crit'n Sub'l Inc		Calculated		Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
CorollaBay-1	1	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
CorollaBay-2	2	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
CorollaBay-3	14	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
IsolatedApts	15	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
SetbackHomes-1	16	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
SetbackHomes-2	18	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
CorollaBay-4	27	1	0.0	0.0	66	0.0	10	inactive	0.0	0.0	8	0.0
con - 25	32	1	0.0	68.4	66	68.4	10	Snd Lvl	68.4	0.0	8	-8.0
con - 50	33	1	0.0	65.0	66	65.0	10	----	65.0	0.0	8	-8.0
con - 75	34	1	0.0	62.4	66	62.4	10	----	62.4	0.0	8	-8.0
con - 100	35	1	0.0	60.5	66	60.5	10	----	60.5	0.0	8	-8.0
con - 125	36	1	0.0	59.3	66	59.3	10	----	59.3	0.0	8	-8.0
con - 150	37	1	0.0	58.3	66	58.3	10	----	58.3	0.0	8	-8.0
con - 175	38	1	0.0	57.5	66	57.5	10	----	57.5	0.0	8	-8.0
con - 200	39	1	0.0	56.8	66	56.8	10	----	56.8	0.0	8	-8.0

Dwelling Units	# DUs	Noise Reduction		
		Min	Avg	Max
		dB	dB	dB
All Selected	15	0.0	0.0	0.0
All Impacted	1	0.0	0.0	0.0
All that meet NR Goal	0	0.0	0.0	0.0

TNM 2.5® NOISE BARRIER OUTPUT FILES

NCTA
J. Poling

19-Sep-11
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt NC 12 NSA - OceanSands1
BARRIER DESIGN: Bar17B 16 ft

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#Dus	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
OceanSands1-6	211	1	0	63.4	66	63.4	10	----	61.4	2	8	-6
OceanSands1-7A*	242	1	0	64.9	66	64.9	10	----	56.4	8.5	8	0.5
OceanSands1-7B*	241	1	0	67.6	66	67.6	10	Snd Lvl	58.2	9.4	8	1.4
OceanSands1-11	216	1	0	59.3	66	59.3	10	----	57.2	2.1	8	-5.9

Dwelling Units	# Dus	Noise Reduction Min dB	Avg dB	Max dB
All Selected	4	2	5.5	9.4
All Impacted	1	9.4	9.4	9.4
All that meet NR Goal	2	8.5	8.9	9.4

* Originally single receptor OceanSands1-7

NCTA
J. Poling

19-Sep-11
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: PrefAlt NC 12 NSA - OceanSands1
BARRIER DESIGN: Bar17C&D 16 ft

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#Dus	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Increase over existing Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
OceanSands1-17	222	1	0	61	66	61	10	----	56.8	4.2	8	-3.8
OceanSands1-18	223	1	0	65.4	66	65.4	10	----	55.9	9.5	8	1.5
OceanSands1-19	224	1	0	66.7	66	66.7	10	Snd Lvl	55.7	11	8	3
OceanSands1-20	225	1	0	64.7	66	64.7	10	----	53.8	10.9	8	2.9
OceanSands1-21	226	1	0	64.1	66	64.1	10	----	53.3	10.8	8	2.8
OceanSands1-22	227	1	0	65.8	66	65.8	10	----	54.7	11.1	8	3.1
OceanSands1-23	228	1	0	59.8	66	59.8	10	----	52.8	7	8	-1
OceanSands1-24	229	1	0	61.4	66	61.4	10	----	53.2	8.2	8	0.2
OceanSands1-25	230	1	0	59.7	66	59.7	10	----	51.5	8.2	8	0.2
OceanSands1-26	231	1	0	59.7	66	59.7	10	----	51.5	8.2	8	0.2

Dwelling Units	# Dus	Noise Reduction Min dB	Noise Reduction Avg dB	Noise Reduction Max dB
All Selected	10	4.2	8.9	11.1
All Impacted	1	11	11	11
All that meet NR Goal	8	8.2	9.7	11.1

NCTA
J. Poling

19-Sep-11
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: NC12 NSA-MonteryShores1
BARRIER DESIGN: Bar23C 12 ft

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

ATMOSPHERICS: 68 deg F, 50% RH

Receiver Name	No.	#Dus	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MonteryShores1-19A*	255	1	0	66.2	66	66.2	10	Snd Lvl	56.3	9.9	8	1.9
MonteryShores1-19B*	254	1	0	67.4	66	67.4	10	Snd Lvl	55.2	12.2	8	4.2
MonteryShores1-25	252	1	0	55.1	66	55.1	10	----	52.6	2.5	8	-5.5

Dwelling Units	# Dus	Noise Reduction Min dB	Avg dB	Max dB
All Selected	3	2.5	8.2	12.2
All Impacted	2	9.9	11	12.2
All that meet NR Goal	2	9.9	11	12.2

* Originally single receptor MonteryShores1-19

NCTA
J. Poling

19-Sep-11
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: Mid-Currituck Bridge Study
RUN: NC12 NSA-MonteraySh2&4
BARRIER DESIGN: Bar26A&B 22 ft

ATMOSPHERICS: 68 deg F, 50% RH

Average pavement type shall be used unless a State highway agency substantiates the use of a different type with approval of FHWA.

Receiver Name	No.	#Dus	Existing LAeq1h	No Barrier LAeq1h Calculated	Crit'n	Increase over existing Calculated	Crit'n Sub'l Inc	Type Impact	With Barrier Calculated LAeq1h	Noise Reduction Calculated	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
MonteryShores4-6	20	1	0	68	66	68	10	Snd Lvl	52.1	15.9	8	7.9
MonteryShores4-7	21	1	0	67.7	66	67.7	10	Snd Lvl	54	13.7	8	5.7
MonteryShores4-8	22	1	0	66.6	66	66.6	10	Snd Lvl	54.6	12	8	4
MonteryShores4-9	23	1	0	68.4	66	68.4	10	Snd Lvl	55.4	13	8	5
MonteryShores4-10	24	1	0	69.7	66	69.7	10	Snd Lvl	54.7	15	8	7
MonteryShores4-11	25	1	0	71.9	66	71.9	10	Snd Lvl	60.5	11.4	8	3.4
MonteryShores4-12	26	1	0	58.5	66	58.5	10	----	54.1	4.4	8	-3.6
MonteryShores4-13	27	1	0	60.3	66	60.3	10	----	51.6	8.7	8	0.7
MonteryShores4-14	28	1	0	59.7	66	59.7	10	----	50.5	9.2	8	1.2
MonteryShores4-15	29	1	0	60.4	66	60.4	10	----	50.9	9.5	8	1.5
MonteryShores4-16	30	1	0	61.2	66	61.2	10	----	55.5	5.7	8	-2.3

Dwelling Units	# Dus	Noise Reduction Min dB	Avg dB	Max dB
All Selected	11	4.4	10.8	15.9
All Impacted	6	11.4	13.5	15.9
All that meet NR Goal	9	8.7	12	15.9

Appendix C

NCDOT Traffic Noise Abatement Policy (July 13, 2011)

NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

TRAFFIC NOISE ABATEMENT POLICY

Effective Date: July 13, 2011

Noise Policy Committee:

Jay Bennett, PE..... Roadway Design Unit
Drew Joyner, PE.....Human Environment Unit
Daniel Keel, PE.....NCDOT Operations
Mike Mills, PE.....NCDOT Division 7
Gregory A. Smith, PE.....Human Environment Unit

Technical Resource Team:

Missy Dickens Pair, PE.....Project Development & Environmental Analysis Branch
Ed Lewis.....Human Environment Unit
Joe Rauseo.....Human Environment Unit
Tracy Roberts, AICP.....North Carolina Turnpike Authority
Steve Walker.....Human Environment Unit

Sponsors:

Rob Ayers.....Federal Highway Administration
Felix Davila, PE.....Federal Highway Administration
Mike Fox.....Board of Transportation
Nina Szlosberg-Landis.....Board of Transportation

APPROVED BY:

3/9/2011
Date of Approval

John F. Sullivan, III, PE
Division Administrator
Federal Highway Administration

2/28/2011
Date of Approval

Gene Conti
Secretary of Transportation

2/22/11
Date of Approval

Robert A. Collier, Jr.
Chairman
Board of Transportation

Person Responsible for Policy:

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INTRODUCTION

This document contains the North Carolina Department of Transportation (hereinafter NCDOT) policy on highway traffic noise and construction noise and describes the implementation of the requirements of the Federal Highway Administration (hereinafter FHWA) Noise Standard at 23 Code of Federal Regulations (CFR) Part 772 as they relate to federal and state funded highway construction in North Carolina. This policy was developed by the NCDOT and reviewed and approved by the FHWA.

The North Carolina Department of Transportation Traffic Noise Analysis and Abatement Guidance Manual and 23 CFR 772 are intended to be companion documents to this policy.

PURPOSE

This policy describes the NCDOT process that is used in determining traffic noise impacts and abatement measures and the equitable and cost-effective expenditure of public funds for traffic noise abatement. Where the FHWA has given highway agencies flexibility in implementing the 23 CFR 772 standards, this policy describes the NCDOT approach to implementation.

APPLICABILITY

This policy applies to all "Type I" federal, state or federal-aid highway projects in the State of North Carolina, including federal projects that are administered by local public agencies. NCDOT does not participate in nor fund Type II (retrofit) projects along existing state transportation facilities. Noise analyses are not required for Type III projects. Each of these project types are defined below. This policy shall be applied uniformly and consistently to all Type I federal projects throughout the state.

Type I Project

(a) The construction of a highway on new location; or,

(b) The physical alteration of an existing highway where there is either:
   (i) Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source and the closest receptor between the existing condition to the future build condition; or,
   (ii) Substantial Vertical Alteration. A project that removes shielding, therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor; or,

(c) The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a HOV lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane; or,

(d) The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane; or,

(e) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange; or,

(f) Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane; or,

(g) The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot or toll plaza.

(h) If a project is determined to be a Type I project under this definition then the entire project area as defined in the environmental document is a Type I project.

Type II Project.

A Federal or Federal-aid highway project for noise abatement on an existing highway. For a Type II project to be eligible for Federal-aid funding, the highway agency must develop and implement a Type II program in accordance with section 772.7(e).

Type III Project

A Federal or Federal-aid highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis.

The highway traffic noise prediction requirements, noise analyses, noise abatement criteria, and requirements for informing local officials in 23 CFR 772 and this policy constitute the noise standards mandated by 23 U.S.C. 109(1). All highway projects which are developed in conformance with this policy shall be deemed to be in accordance with the FHWA noise standards.

Projects let for construction on or after July 13, 2011 shall be reviewed under the criteria of this policy; however, the original date of public knowledge shall remain unchanged.

DATE OF PUBLIC KNOWLEDGE

The Date of Public Knowledge of the location and potential noise impacts of a proposed highway project is the approval date of the final environmental document, e.g., Categorical Exclusion (CE), State or Federal Finding of No Significant Impact (FONSI) or State or Federal Record of Decision (ROD).

After this date, the federal and state governments are no longer responsible for providing noise abatement measures for new development within the noise impact area of the proposed highway project. It is the responsibility of local governments and private landowners to ensure that noise-compatible designs are used for development permitted after the Date of Public Knowledge.

This policy applies only to developed land and to undeveloped land for which development is permitted before the project Date of Public Knowledge. The criteria (trigger date) for determining when undeveloped land is permitted for development is the approval date of a building permit for an individual lot or site.

TRAFFIC NOISE PREDICTION

All traffic noise analyses performed by or for NCDOT must utilize the most current version of the FHWA Traffic Noise Model (TNM®) or any other model determined by the FHWA to be consistent with the methodology of the TNM® model, pursuant to 23 CFR 772.9.

Average pavement type shall be used in the FHWA TNM® for future noise level prediction.

Noise contour lines may be used for project alternative screening or for land use planning, but shall not be used for determining highway traffic noise impacts.

Traffic characteristics that would yield the loudest hourly equivalent traffic noise levels for the design year shall be used in predicting noise levels and assessing noise impacts.

Traffic noise prediction must adhere to all methodologies detailed in the NCDOT Traffic Noise Analysis and Abatement Guidance Manual.

NOISE IMPACT DETERMINATION

Traffic noise abatement for NCDOT highway projects is warranted and must be considered when traffic noise impacts are created by either of the following two conditions:

(a) The predicted traffic noise levels for the Design Year approach (reach one decibel less than) or exceed the Noise Abatement Criteria (NAC) contained in 23 CFR 772 and in Table 1, found on page 4 of this policy, OR

(b) The predicted traffic noise levels for the Design Year substantially exceed existing noise levels as defined in Table 2, found on page 5 of this policy.

A receptor is a discrete or representative location of a noise sensitive area(s) for any of the land uses listed in Table 1. For multifamily dwellings, each residence shall be counted as one receptor when determining impacted and benefited receptors.

Primary consideration shall be given to exterior areas where frequent human use occurs in the determination of traffic noise impacts.

A traffic noise analysis shall be completed for each project alternative under detailed study and for each Activity Category listed in Table 1 that is present in the study area.

Table 1

Noise Abatement Criteria

Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))

Activity Category	Activity Criteria[1] Leq(h)[2]	Evaluation Location	Activity Description
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 is essential if the area is to continue to serve its intended purpose.
B[3]	67	Exterior	Residential
C[3]	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare 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, Section4(f) sites, schools, television studios, trails, and trail crossings
D	52	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	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

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

2 The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

3 Includes undeveloped lands permitted for this activity category.

Table 2	
Substantial Noise Level Increase Hourly Equivalent A-Weighted Sound Level (decibels (dB(A))	
Existing Noise Level[1] (Leq(h))	**Predicted Design Year Noise Level Increase[2] (Leq(h))**
50 or less	15 or more
51	14 or more
52	13 or more
53	12 or more
54	11 or more
55 or more	10 or more

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

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

ANALYSIS OF NOISE ABATEMENT MEASURES

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

Feasibility

The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.

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

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

Reasonableness

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

(a) Viewpoints of the property owners and residents of all benefited receptors shall be solicited. One owner ballot and one resident ballot shall be solicited for each benefited receptor. Points per ballot shall be distributed in the following weighted manner:

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

Consideration of the noise abatement measure will continue unless a simple majority of all distributed points are returned that indicates the balloted voters do not want the abatement measure.

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

(c) A noise reduction design goal of at least 7 dB(A) must be evaluated for all front row receptors. At least one benefited front row receptor must achieve the noise reduction design goal of 7 dB(A) to indicate the noise abatement measure effectively reduces traffic noise.

Other Considerations

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

(a) Noise abatement measures that are feasible and reasonable,

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

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

(d) Whether it is "likely" or "unlikely" that noise abatement measures will be installed for each noise sensitive area identified. "Likely" does not mean a firm commitment. The final decision on the installation of the abatement measures shall be made upon

completion of the project design, the public involvement process, concurrence with the NCDOT Policy, and FHWA approval.

Acceptable Noise Abatement Measures

The following noise abatement measures may be considered for incorporation into a project to reduce traffic noise impacts.

(a) Construction of noise barriers

(b) Traffic management measures

(c) Alteration of horizontal and vertical alignments

(d) Establishment of buffer zones

(e) Noise insulation of Activity Category D land use facilities listed in Table 1 on Page 4 of this policy.

Third Party Participation

(a) Third party funding of noise abatement measures cannot be used to make up the difference between the reasonable base quantity allowance and the actual quantity of noise abatement. Third party funding is allowed only by public entities, and can only be used to pay for additional features such as landscaping and aesthetic treatments for noise barriers that meet cost-effectiveness criteria.

(b) Traditional highway construction resources pay for required noise abatement measures. Should a local government request that materials be used that are more costly than those proposed by NCDOT, the requesting entity must assume 100% of the actual additional construction cost.

(c) If a local government insists on the provision of a noise abatement measure deemed not reasonable by NCDOT, an abatement measure may be installed provided the local government assumes 100% of the costs and obtains an encroachment permit from NCDOT to perform the work. These costs include, but are not limited to, preliminary engineering, actual construction and maintenance. In addition, local governments must ensure that NCDOT's material, design and construction specifications are met. The local government must also assume 100% of the liability associated with the measure and hold harmless the NCDOT.

(d) For (b) and (c) above, the settlement agreement shall be signed before third party noise abatement design begins and payment shall be made to NCDOT before project construction begins.

Quantity Averaging

NCDOT will utilize abatement measure quantity averaging among all noise sensitive areas within the same Activity Category in Table 1 that are exposed to a common noise environment, i.e., similar noise sources and levels, traffic volumes, traffic mix, speed and topographic features, if:

(a) No single common noise environment exceeds two times the base quantity reasonableness criteria (e.g., two times 2,500 square feet, or two times 7,000 cubic yards); and,

(b) Collectively, all common noise environments being averaged do not exceed the base quantity reasonableness criteria.

PUBLIC INVOLVEMENT

Communication with the community regarding noise impacts and possible noise abatement shall occur at the start of the noise study process and continue throughout the development of the project. NCDOT will communicate with citizens to present information on the nature of highway traffic noise and discuss the effects of noise abatement measures in attenuating traffic noise and the types of noise abatement measures that may be considered. The concerns of the community shall be a major consideration in reaching a decision on the abatement measures to be provided.

COORDINATION WITH LOCAL OFFICIALS

NCDOT will provide all traffic noise analyses to local government officials within whose jurisdiction a highway project is proposed as early in the project planning process as possible to protect future development from becoming incompatible with traffic noise levels. Specifically, environmental documents and design noise reports will contain information identifying areas that may be impacted by traffic noise, predicted noise level contour information, the best estimation of future noise levels for developed and undeveloped lands or properties in the immediate vicinity of the project and other appropriate design information. If requested, NCDOT will assist local officials with coordination and distribution of this information to residents, property owners and developers. NCDOT will provide assistance to local jurisdictions in the development of local noise controls, when requested. NCDOT will advocate the planning, design and construction of noise-compatible development and encourage its practice among planners, building officials, developers and others.

All noise-sensitive areas and any known noise abatement measures will be presented and discussed at the Design Public Hearing and Design Public Meetings.

CONSTRUCTION NOISE

To minimize the impacts of construction noise on the public, NCDOT shall:

(a) Identify land uses or activities that may be affected by noise from construction of the project.

(b) Determine the measures that are needed in the plans and specifications to minimize or eliminate adverse construction noise impacts to the community. This determination shall consider the benefits achieved and the overall adverse social, economic, and environmental effects and costs of the abatement measures.

(c) Consider construction techniques and scheduling to reduce construction noise impacts to nearby receptors and incorporate the needed abatement measures in the project plans and specifications.

FEDERAL PARTICIPATION

The costs of noise abatement measures may be included in federal-aid participating project costs with the federal share being the same as that for the system on which the project is located when:

(a) Traffic noise impacts have been identified; and

(b) Abatement measures have been determined to be feasible and reasonable pursuant to 23 CFR 772 and this policy.

REVIEW OF POLICY

This policy shall be reviewed by the NCDOT Board of Transportation at least every five years.