

**Sakonnet River Bridge  
Rehabilitation or Replacement Project**

**DRAFT ENVIRONMENTAL  
IMPACT STATEMENT  
& SECTION 4(f) STATEMENT**

**Volume IIa**

**Traffic Noise Analysis**

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# **Draft Technical Memorandum Report Traffic Noise Analysis**

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## **Route 24 and 138 Sakonnet River Bridge Tiverton and Portsmouth, Rhode Island**

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**Prepared for:  
The Rhode Island Department of Transportation**

**Prepared by:  
The Louis Berger Group, Inc.  
East Orange, N.J.**



**January 2001**

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## **I. CHARACTERISTICS OF NOISE**

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# I. CHARACTERISTICS OF NOISE

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

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

The weighted-A decibel scale is used almost exclusively in vehicle noise measurements because the most emphasis is on the frequency range to which the human ear is most sensitive (1,000 to 6,000 Hertz). Sound levels measured using a weighted-A decibel scale are expressed as dBA. Throughout this analysis, all noise levels are expressed in dBA. Several examples of noise pressure levels in dBA are listed in Table 1.

Review of Table 1 indicates that most individuals in urbanized areas are exposed to fairly high noise levels. The degree of disturbance or annoyance of unwanted sound depends essentially on three things:

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

In considering the first of these factors, it is important to note that individuals have different sensitivity to noise. Loud noises bother some more than others and some patterns of noise also enter into people's judgement of whether or not a noise is offensive.

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

The third factor is related to the interference of noises with activities of individuals. In a 60 dBA environment, normal work activities requiring high levels of concentration may be interrupted by loud noises, while activities requiring manual effort may not be interrupted to the same degree. Attempts have been made to regulate airplane noise, factory noise, railroad noise, and highway traffic noise. In relation to highway traffic noise, methods of analysis and control have been developed by Federal Highway Administration (FHWA) and adopted by Rhode Island Department of Transportation (RIDOT).

**TABLE 1**  
**A-WEIGHTED (dBA) SOUND LEVELS OF TYPICAL NOISE ENVIRONMENTS**

<b>A-Weighted</b>	<b>Overall Level</b>	<b>Noise Environment</b>
120	Uncomfortably Loud (32 times as loud as 70 dBA)	Military jet takeoff at 50 ft
100	Very loud (8 times as loud as 70 dBA)	Jet flyover at 1,000 ft
80	Loud (2 times as loud as 70 dBA)	Propeller plane flyover at 1,000 ft Diesel truck 40 mph at 50 feet
70	Moderately loud	Freeway at 50 ft from pavement edge Vacuum cleaner (indoor)
60	Relatively quiet (1/2 as loud as 70 dBA)	Air condition unit at 100 ft Dishwasher at 10 ft (in door)
50	Quiet (1/4 as loud as 70 dBA)	Large transformers Small private office (in door)
40	Very quiet (1/8 as loud as 70 dBA)	Bird calls Lowest limit of urban ambient sound
10	Extremely quiet (1/64 as loud as 70 dBA)	Just audible
0	Threshold of hearing	

Source: Federal Agency Review of Selected Airport Noise Analysis Issues, 1992.

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## **II. EXISTING NOISE LEVEL**

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Existing A-weighted noise levels were monitored per FHWA Measurement of Highway-Related Noise, dated May, 1996, at each identified site to establish the baseline noise environment. A set of Bruel&Kjaer 2236 and 2231 Precision Sound Level Meters (SLM) were used in field measurement. Both meters meet or exceed the requirements set forth in the ANSI S1.4-1983 Standards for Type 1 quality and accuracy. Locations where measurements were collected are considered representative of existing noise levels for front-row receptors throughout the project area. Each site was monitored during the day-time hours to collect the existing noise levels. Acoustical calibrators (Bruel&Kjaer 4230 and 4231) were used to calibrate the noise equipment for each measurement period. The sound level meters (SLM) were operated on the A-weighting network and fast meter response. Measurements were not collected if the roadway pavement was wet, or if wind speed exceeded 10 miles per hour. A porous windscreen was used on the sound level meter during all measurement periods. All of the measurements were taken at ground level. For these measurements, the SLMs were mounted approximately five feet above the ground surface. This height is generally considered representative of people's ear level. Wherever possible, measurement sites were located in open areas away from buildings or other potentially reflective surfaces.

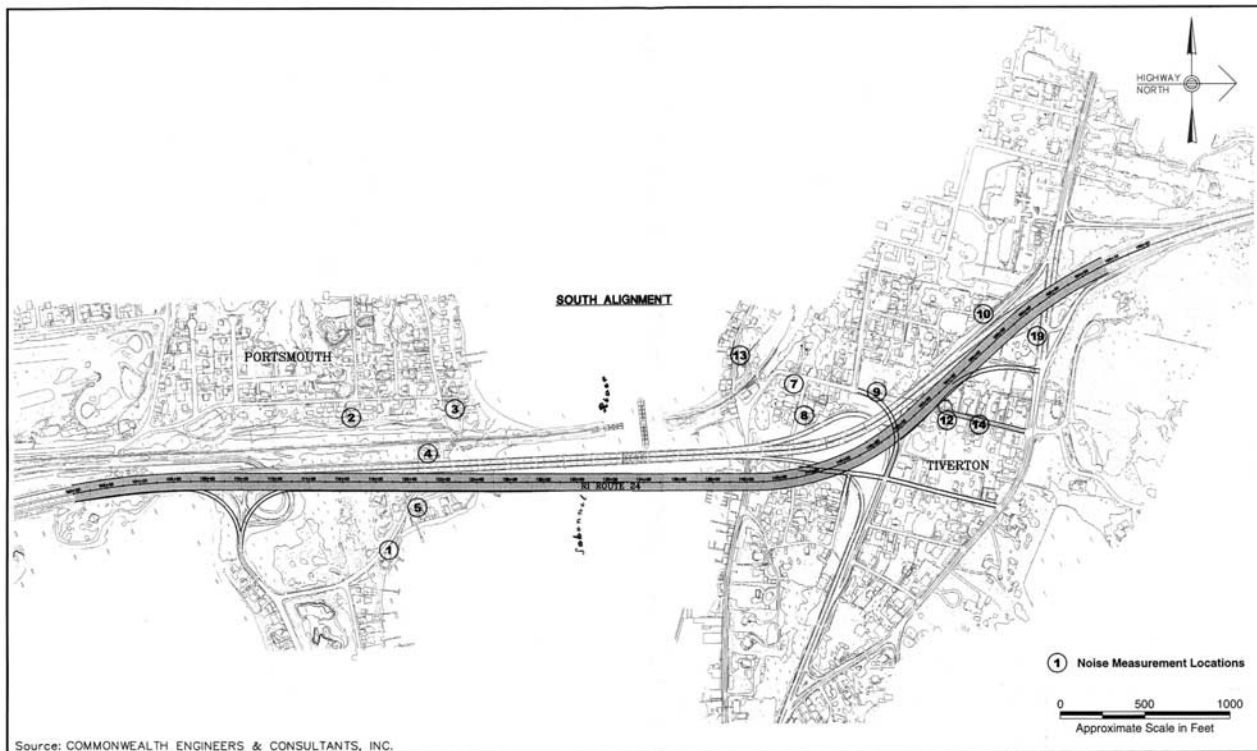
During measurements, important events and site conditions were noted and a sketch was drawn for each receptor location showing important and permanent features of the area to aid locating microphone positions at a later date. Simultaneous traffic counts were recorded during the measurement periods and were used to calibrate the noise prediction files used by TNM 1.1 model (see Chapter III. Section A).

### **A. IDENTIFICATION OF [LAND USE] ACTIVITY CATEGORIES FOR AREAS ALONG THE PROJECT CORRIDOR**

A review of the topographic maps and aerial photographs was conducted in consultation with land use study results throughout the project area. The existing developments (or a group of receptors as defined in federal regulations) likely to be affected by traffic volume and design changes on Route 24/138 and associated ramps were identified. These developments include single-family residences of no more than 500 feet from the roadway. As a result, 15 representative noise receptor locations were selected for this study.

### **B. EXISTING NOISE LEVELS FROM FIELD MEASUREMENT AND MODEL CALIBRATION**

Existing noise levels at 15 receptor locations were measured for short-term duration during the daytime hours on April 24 and 25, and June 13, 2000. The noise levels were measured during AM and PM peak traffic hours. The measured noise levels ranged from a low of 58 dBA at Location 13 to a high of 71 temporarily set at "pause" when there were abnormal incidents during the measurement period to avoid recording of the excessive noise levels from non-traffic related sources, i.e., airplanes, dogs, birds, etc. Noise measurement locations are presented in Figures 1, 2, and 3.



Source: COMMONWEALTH ENGINEERS & CONSULTANTS, INC.

The Rhode Island  
Department of  
Transportation

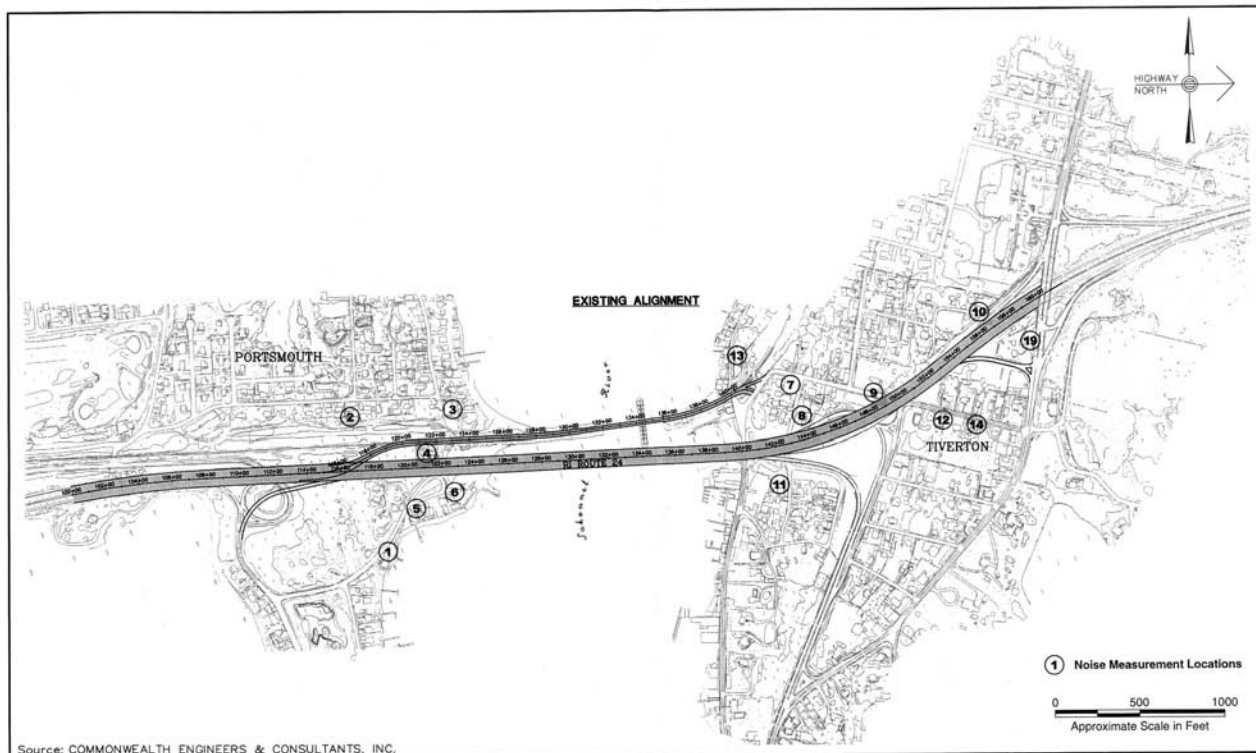
Route 24 and 138 Sakonnet River Bridge  
Tiverton and Portsmouth, Rhode Island

THE LOUIS BERGER GROUP, INC.

Noise Measurement Locations

JANUARY 2000

FIGURE 1



Source: COMMONWEALTH ENGINEERS & CONSULTANTS, INC.

The Rhode Island  
Department of  
Transportation

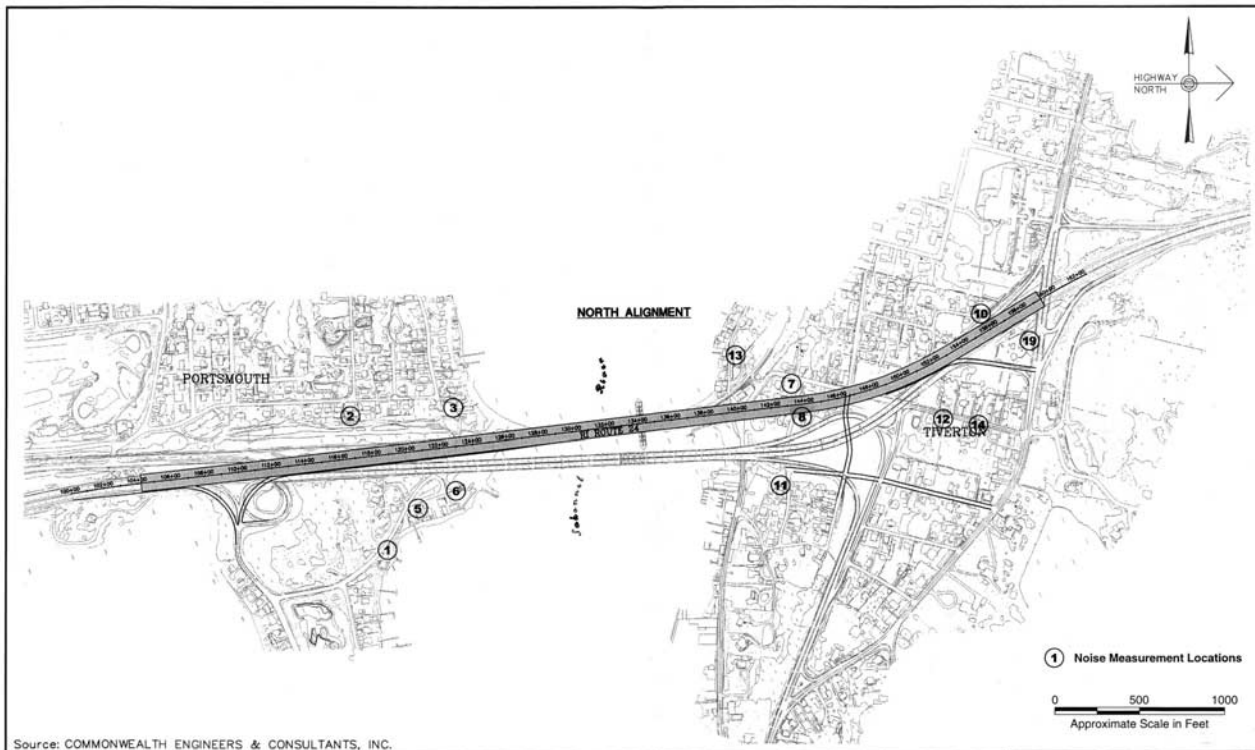
Route 24 and 138 Sakonnet River Bridge  
Tiverton and Portsmouth, Rhode Island

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Noise Measurement Locations

JANUARY 2000

FIGURE 2



Source: COMMONWEALTH ENGINEERS & CONSULTANTS, INC.

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Transportation

Route 24 and 138 Sakonnet River Bridge  
Tiverton and Portsmouth, Rhode Island

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Noise Measurement Locations

JANUARY 2000

FIGURE 3

Traffic volumes recorded during the noise measurement period were utilized to calibrate the TNM model (see Chapter III, Section A). Measured and calibrated noise levels are presented in Table 2. As can be seen from this table, the differences between the measured and modeled noise levels are within 3 dBA. The high noise level measured at location 4 is attributed to the excessive noise pass through the bridge deck when vehicles (especially trucks) travel over it. Under the Build alternatives, the noise would be reduced substantially by construction of a new bridge, which would have a type of deck with low noise transmission. As part of the model calibration process, the modeled existing and future No-build noise levels at location 4 are adjusted to account for the excessive noise passing through the bridge deck. Adjustments are not necessary for modeled future Build noise levels at this location, since the TNM assume substantial amount of shielding of the noise levels at receptors under the bridge by the new bridge deck. This assumption truly represents the future Build conditions of this project. Adjustments to the modeled existing and future noise levels at other locations are not necessary. Therefore, the TNM noise modeling files setup for this project are considered as calibrated. Detailed description and noise measurement results for each location are presented as follows:

Location 1 was located near the property line of a residence at 94 River Avenue, and represented the single-family residences along both sides of River Avenue. The Route 24/138 mainline is on structure in this area. Route 24/138 mainline is approximately 400 feet north of the receptor. The measured noise level Leq was 64 dBA. Traffic on Route 24 mainline was the major noise source during the measurement period.

Location 2 was located at the property line of a single-family residence at 97 Massasoit Avenue. The Route 24/138 mainline is on structure in this area. The site was approximately 300 feet from Route 24/138 mainline. A noise level Leq of 63 dBA was measured during peak traffic hours. Traffic on Route 24 mainline was the major noise source during the measurement period.

Location 3 was located at the property line of a single-family residence at the end of Narragansett Boulevard. The Route 24/138 mainline is on structure in this area. The site was approximately 300 feet from Route 24/138 mainline. A noise level Leq of 60 dBA was measured during peak traffic hours. Traffic on Route 24 mainline was the major noise source during the measurement period.

Location 4 was located near a single-family house at 203 River Avenue, immediately north of the Sakonnet River Bridge. The Route 24/138 mainline is on structure in this area. The site was approximately 20 feet from the edge of the bridge. A noise level Leq of 71 dBA was measured during peak traffic hours. Traffic on the bridge was the major noise source during the measurement period. The high noise levels measured at location 4 are attributed to the excessive noise from the vibration of the existing bridge deck when vehicles (especially trucks) pass over it.

Location 5 was located near a single-family residence at 65 River Avenue. The site was approximately 120 feet from Route 24/138 mainline. The Route 24/138 mainline is on structure in this area. A noise level Leq of 63 dBA was measured during peak traffic hours. Traffic on Route 24/138 was the major noise source during the measurement period.

Location 6 was located at 30 River Road on the south side of Route 24/138 mainline. The Route 24/138 mainline is on structure in this area. The site was approximately 80 feet from Route 24/138 mainline. A noise level Leq of 63 dBA was measured during peak traffic hours. Traffic on Route 24/138 was the major noise source during the measurement period.

**TABLE 2  
EXISTING (MEASURED) NOISE LEVELS AND MODEL CALIBRATION**

Location	Address	Land Use According to FHWA NAC	Existing Measured Leq, dBA	Calibrated Leq, dBA	Difference Leq, dBA
1	Residence, 94 River Avenue	B	64	61	-3
2	Residence, 97 Massasoit Avenue	B	63	61	-2
3	Residence, End of Narragansett Blvd.	B	60	59	-1
4	Residence, 203 River Avenue	B	71	69	-2
5	Residence, 65 River Avenue	B	63	60	-3
6	Residence, 30 River Avenue	B	63	61	-2
7	Residence, 145 Evens Avenue	B	61	61	0
8	Residence, 10 Tucker Drive	B	61	59	-2
9	Residence, 8 Evens Avenue	B	64	61	-3
10	Residence, 43 Pocasset	B	62	64	2
11	Residence, 18 Tucker Drive	B	61	60	-1
12	Residence, 49 Evens Avenue	B	66	65	-1
13	Residence, 229 Riverside Road	B	58	55	-3
14	Residence, 31 Evens Avenue	B	59	62	3
19	Residence, 1285 Main Road	B	65	67	2

Source: The Louis Berger Group, Inc., January 2001.

Location 7 was located at 145 Evens Avenue and to the north of the Route 24/138. The site was approximately 200 feet from Route 24/138 mainline. The Route 24/138 mainline is on structure in this area. A noise level Leq of 61 dBA was measured during peak traffic hours. Traffic on Route 24/138 mainline was the major noise source during the measurement period.

Location 8 was located at 10 Tucker Lane adjacent to southbound Route 24/138. The Route 24/138 mainline is on structure in this area. The site was approximately 80 feet from Route 24/138 mainline. A

noise level Leq of 61 dBA was measured during peak traffic hours. Traffic on Route 24/138 mainline and existing on-ramp was the major noise source during the measurement period.

Location 9 was located at a single-family residence (8 Evens Avenue) adjacent to southbound Route 24/138. The Route 24/138 mainline is on structure in this area. The site was approximately 80 feet from the southbound on-ramp and Route 24/138 mainline, respectively. The Route 24/138 mainline is on structure. A noise level Leq of 64 dBA was measured during peak traffic hours. Traffic on Route 24/138 mainline was the major noise source during the measurement period.

Location 10 was located at 43 Pocasset north of Route 24/138 mainline and southbound on-ramp. The Route 24/138 mainline is in cut in this area. The site was approximately 50 feet from edge of the on-ramp. The edge of the cut provided substantial amount of shielding of noise levels. A noise level Leq of 62 dBA was measured during peak traffic hours. Traffic on Route 24/138 mainline was the major noise source during the measurement period.

Location 11 was located at 18 Tucker Drive south of Route 24/138 mainline. The Route 24/138 mainline is on structure in this area. The site was approximately 100 feet from the northbound off-ramp and Route 24/138 mainline. A noise level Leq of 61 dBA was measured during peak traffic hours. Traffic on Route 24/138 mainline and the off-ramp was the major noise source during the measurement period.

Location 12 was located near a single-family residence at 48 Evens Avenue adjacent to northbound Route 24/138. The site was approximately 150 feet from Route 24/138 mainline. A noise level Leq of 66 dBA was measured during peak traffic hours. Traffic on Evens Road was the major noise source during the measurement period.

Location 13 was located at 229 Riverside Road north of the Route 24/138. The Route 24/138 mainline is on structure approximately 30 feet above ground in this area. The site was approximately 500 feet from Route 24/138 mainline. A noise level Leq of 58 dBA was measured during peak traffic hours. Traffic on Route 24/138 mainline was the major noise source during the measurement period.

Location 14 was located near a single-family residence at 31 Evens Avenue adjacent to northbound Route 24/138. The site was approximately 400 feet from Route 24/138 mainline. A noise level Leq of 59 dBA was measured during peak traffic hours. Traffic on Route 24/138 was the major noise source during the measurement period.

Location 19 was located at 1285 Main Road south of the Route 24/138. The Route 24/138 mainline is in cut in this area. The site was approximately 80 feet from Route 24/138 mainline. A noise level Leq of 65 dBA was measured during peak traffic hours. Traffic on Main Road was the major noise source during the measurement period.

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### **III. NOISE IMPACT AND MITIGATION ASSESSMENT**

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### III. NOISE IMPACT AND MITIGATION ASSESSMENT

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#### A. FHWA NOISE ABATEMENT CRITERIA AND RIDOT POLICY

Traffic noise impact analysis and determination of abatement measures were conducted according to procedures set forth in the FHWA Procedures for Abatement of Highway Traffic Noise and Construction Noise, 23 CFR Part 772, reissued FHWA Policy and Guidance document dated June, 1995, and RIDOT Noise Abatement Policy dated September 15, 1997. The FHWA Noise Abatement Criteria (NAC) in 23 CFR Part 772, and RIDOT's substantial noise level increase over existing criteria were used to evaluate any potential impact. The FHWA NAC is presented in Table 3.

**TABLE 3**  
**FHWA NOISE ABATEMENT CRITERIA (NAC)**  
**Hourly A-weighted Sound Level in decibels (dBA)**

<b>ACTIVITY CATEGORY</b>	<b>NOISE ABATEMENT CRITERIA Leq dBA</b>	<b>DESCRIPTION OF ACTIVITY CATEGORY</b>
A (Exterior)	57	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 (Exterior)	67	Picnic areas, recreation areas, playgrounds, active sports areas, and parks that are not included in Category A; and residences, motels, hotels, public meeting rooms, schools, churches, libraries and hospitals.
C (Exterior)	72	Developed lands, properties or activities not included in Categories A or B above.
D	-	Undeveloped lands.
E (Interior)	52	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

Source: Title 23 Code of Federal Regulations, Part 772.

Noise mitigation measures is considered when:

Leq (h) noise levels approach within one dBA of or exceed the FHWA NAC (i.e., 66 dBA for Category B receptors).

There is a 10 dBA or more of increase in predicted noise levels over the existing noise levels if the existing noise levels are equal or greater than 45 dBA.

There is 15 dBA or more of increase in predicted noise levels over the existing noise levels if the existing noise levels are equal or greater than 40 dBA.

There is an increase between 10 and 15 dBA in predicted noise levels over the existing noise levels if the existing noise levels are greater than 40 but less than 45 dBA.

FHWA Traffic Noise Model 1.1 (TNM) program was utilized to model the noise levels for the existing worst-case, future year 2020 No-Build and Build Alternatives based on the topographic information and projected traffic volume, speed, and vehicle composition on Route 24/138, other local roads, and associated ramps. TNM is the computer program developed by FHWA for traffic noise prediction and analysis. It calculates traffic generated noise levels at the nearby receptor locations based upon the state-of-art acoustical algorithms, computing procedures, and build-in source emission database. The TNM also provides user-friendly graphic interface for data editing and input.

In general, the traffic noise modeling is composed of a large number of variables that describe various types of vehicles operating at different speeds through a continuously changing highway configuration and surrounding terrain. Due to the complexity of the project and the project area, the following assumptions have been made to simplify the prediction of highway traffic noise:

- All vehicles have been divided into three categories: cars, medium trucks, and heavy trucks. Each of those categories has been assigned a Reference Energy Mean Emission Level (REMEL) based on the TNM database collected from field traffic noise measurements.
- No wind or temperature effects have been considered in the computer modeling. However, wind and temperature can have substantial impact on propagation of sound over distances above 300 feet (i.e., noise levels at receptors located upwind are substantially (20 dBA) lower than noise levels at receptors located downwind).
- Ground cover along the sound propagation path has been modeled, with various surface types (i.e., pavement, water, lawn, etc.).

In particular, future noise levels are predicted for the worst-case scenario. Traffic conditions on the project study corridor are assumed at peak-traffic hours, which would generate the greatest noise emissions compared to other conditions. Therefore, predicted future Build noise levels would generally be higher than existing and No-Build noise levels in the project area.

## **B. EXISTING AND FUTURE NO-BUILD ALTERNATIVE**

Noise levels at receptor locations 1 through 14 and 19 for existing 1999 and future 2020 No-Build Alternative were modeled using FHWA TNM and traffic data projected in the traffic study for this project.

Noise levels for 1999 existing worst-case, as presented in Table 4, range between 56 and 68 dBA and would approach or exceed the NAC of 67 dBA at Locations 4, 12 and 19, while noise levels for 2020 No-Build Alternative, also as presented in Table 4, range from 56 to 69 dBA and would approach or exceed the NAC of 67 dBA at Locations 4, 12 and 19.

## **C. BUILD ALTERNATIVES**

Year 2020 traffic noise levels for the proposed Build Alternatives were modeled utilizing FHWA TNM 1.1. The modeling analysis results are presented in Table 4.

Build Alternative South would build a new bridge south of the existing alignment. Noise levels for Alternative South would increase between -2 and 6 dBA from existing condition. Future noise levels would range between 57 dBA at Location 13 and 74 dBA at Location 19. Noise levels at Locations 12 and 19 (represent three and two single-family residences, respectively) would approach or exceed FHWA NAC of 67 dBA.

Build Alternative Existing would build a new bridge along the existing alignment. Noise levels for this Alternative would increase between -7 and 2 dBA from existing condition. The build noise level at Location 4 would decrease 7 dBA from existing condition due to the construction of new bridge, which would substantially reduce the noise transmitted from the bridge deck. Future noise levels would range between 56 dBA at Location 8 and 69 dBA at Location 19. Noise levels at Locations 12 and 19 (represent three and two single-family residences, respectively) would approach or exceed FHWA NAC of 67 dBA.

Build Alternative North would build a new bridge to the north of the existing alignment. As a result, noise levels would increase between -2 and 2 dBA from existing condition. Future noise levels would range between 54 dBA at Location 8 and 69 dBA at Location 19. Noise levels at Locations 12 and 19 (represent three and two single-family residences, respectively) would approach or exceed FHWA NAC of 67 dBA.

## **D. MITIGATION**

Mitigation of noise levels may occur at the noise source, along the path of the noise, or at receiver locations. Mitigation of noise levels occurs in nature to varying degrees as sound propagates from the source over terrain surfaces (scattering and ground attenuation), as the distance between the source and receiver increases (dispersion), and when intervening natural terrain features intersect the path of the noise source to the receiver (diffraction).

Within practical limits, these same principles would be applied to the mitigation of noise levels from traffic operations. Mitigation of the noise source is achieved by regulatory limits on vehicle emissions by mufflers and exhaust systems. A variety of mitigation measures, as specified in 23 CFR Part 772, can also be considered either at the roadway, along the path of the noise, or, in limited situations, at the receiver.

**TABLE 4  
PEAK-HOUR NOISE LEVELS (LEQ, DBA)**

Receptor Location	Modeled Existing Noise Level Leq, dBA	2020 Future No-Build Noise Level Leq, dBA	2020 Future Build Noise Level Leq, dBA (Design Alt. South)	Increase of Future Build over Existing Leq, dBA	2020 Future Build Noise Level Leq, dBA (Design Alt. Existing)	Increase of Future Build over Existing Leq, dBA	2020 Future Build Noise Level Leq, dBA (Design Alt. North)	Increase of Future Build over Existing Leq, dBA	Number of Impacted Residences (Alt. South/Alt. Middle/Alt. North)
1	62	62	62	0	62	0	60	-2	0/0/0
2	63	64	64	1	63	0	65	2	0/0/0
3	62	63	64	2	63	1	64	2	0/0/0
4	67	68	65	-2	60	-7	Taken		0/0/0
5	62	63	63	1	63	1	62	-1	0/0/0
6	60	61	Taken		60	0	60	0	0/0/0
7	61	62	62	1	62	1	60	-1	0/0/0
8	56	56	60	4	56	0	54	-2	0/0/0
9	62	64	63	1	63	1	Taken		0/0/0
10	65	65	64	-1	65	0	65	0	0/0/0
11	58	59	Taken		58	0	60	2	0/0/0
12	66	67	70	4	68	2	66	0	3/3/3
13	57	58	57	0	59	2	55	-2	0/0/0
14	63	64	65	2	63	0	63	-2	0/0/0
19	68	69	74	6	69	1	69	1	2/2/2

Source: The Louis Berger Group, Inc., 2000.

Traffic management measures, which alter vehicle type, speed, volume, and/or time of operations can be effective noise abatement measures if they don't conflict with roadway capacity and safety requirements. For this project, traffic management measures are not considered to be appropriate noise abatement strategies. It should be noted, however, that some traffic management techniques have been included as part of the overall Proposed Action, but not to a level where it would have any impact on noise levels. Therefore, this mitigation measure does not serve to reduce noise levels, and is not considered further for this project.

Highway alignment alterations, such as shifting the roadway away from sensitive receptors or depressing the roadway into the ground, can potentially reduce noise impacts. However, the selection of alternative alignments and profiles for noise abatement purposes must consider the balance between noise impacts and other engineering and environmental parameters. For this project, the highway alignment, as proposed, is considered to be the optimum configuration when all of these various parameters are considered. In addition, removing of two access ramps to and from Central Avenue would reduce noise impacts at adjacent sensitive receptors. Therefore, this mitigation alternative is not considered further.

Acquisition of real property or interest therein to serve as a buffer zone is impractical and infeasible for this project, given the close proximity of noise-sensitive receptors to the highway right-of-way. Therefore, this mitigation measure is not considered feasible.

Noise insulation of public buildings, such as schools, provides an additional type of mitigation. However, this mitigation measure is not applicable for the project, since there would not be any schools and public buildings impacted.

The most common type of designed mitigation is the construction of physical barriers, typically in the form of noise walls (noise barriers) and/or earth berms between the roadway (noise source) and the receiver locations. According to RIDOT's *Noise Abatement Policy*, a 5-dBA reduction in highway traffic noise levels at the first row of receptors is a "must" for noise barrier design. Mitigation is designed to achieve at least 10-dBA noise reduction at first row receptors if possible. Barrier costs were estimated using a factor of \$20.00 per square foot of barrier panel. Any dwelling unit that receives 5 dBA or more of noise level reduction would be considered as having protected from the construction of such a barrier. A barrier is considered reasonable if its Cost Effectiveness Index (CEI) is less than \$2,500/dBA(IL)/protected residential unit.

Future Build noise levels at receptor locations 12 and 19 would be mostly attribute to local traffic on Evens and Main Roads. Construction of noise barrier along these local roads would not be feasible due to safety and right-of-way constraints. Construction of barriers along Route 24/138 mainline and ramps would not be cost effective, since these barriers would not reduce the noise level contributions from local streets. Therefore, noise barriers would not be considered as feasible and reasonable for this project.

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## **IV. CONSTRUCTION NOISE**

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## IV. CONSTRUCTION NOISE

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Construction noise, usually limited to daylight hours, differs from normal vehicular traffic noise, which continues throughout the day- and nighttime hours. Construction noise is of a fixed duration and ceases at the completion of the construction phase. Additionally, construction-related noise is responsible for a variety of impulsive, discontinuous noise sources, such as jackhammer and/or vibratory rollers. Traffic noise, although varying in level, is more continuous as a noise source. Temporary increase in noise levels will occur during the time period that construction takes place. Noise levels due to construction, although temporary, can impact areas adjacent to the proposed project.

Impacts due to construction noise are dependent upon the following criteria:

- Time and duration of construction activities;
- Equipment types; and
- Equipment usage cycle.

Typical construction phases for the proposed project may involve the following construction activities:

- Demolition: Removal of structures within the right of way.
- Clearing and Grubbing: Existing landscaping, along with unwanted earth and rock.
- General Earthwork: Site topography will be altered in order to prepare the area for the roadway design. Earth moving operations will be required to prepare the roadbed. Trenches will be excavated for drainage materials.
- Foundations: Preparation for, and construction of, foundation support systems for both bridge and other primary foundation structures.
- Paving Operations: Preparation of the base layer, such as roadbed compaction and the laying of subdrata material as well as surface paving operations.
- Finishing: Cleanup and landscaping.
- Equipment such as bulldozers, scrapers, backhoe, graders, loaders, cranes, trucks, compressors, vibratory compactors, generators, and pile driving operations are typically utilized during construction, and would be subject to RIDOT Construction Noise Specifications.

Mitigation measures will be incorporated into the contract documents to lessen potential construction noise impacts. The following mitigation strategies will be employed to the extent possible to limit the potential impact of noise:

- Source Control

All exhaust systems in good working order, also using properly designed engine enclosures, and intake silencers.

- Regular equipment maintenance.
- Site Control
  - Placement of stationary equipment as far away from sensitive receptors as possible (i.e., pumps, compressors, aggregate crushers, AC plants, operators, etc.).
  - Choice of disposal sites and haul routes thereto.
  - Employing shielding where possible.
- Time and Activity Constraints
  - Schedule of operations to coincide with periods when people would least likely be affected.
  - Limiting working hours and workdays to least noise sensitive times.
- Community Awareness
  - Public notification of construction operations.
  - Methods to handle complaints.

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## **V. REFERENCES**

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- Barry, T.M., and J.A. Regan. *FHWA Highway Traffic Noise Prediction Model*, Washington, D.C., U.S. DOT, FHWA, Office of Research, Office of Environmental Policy, 1978.
- Bolt, Beranek and Newman. *Fundamentals and Abatement of Highway Traffic Noise*, Washington, D.C., U.S. DOT, FHWA, 1973.
- Bolt, Beranek and Newman. *Highway Noise; Generation and Control Report #173*, Washington, D.C., NCHRP, 1976.
- Chen, C. *Investigation of the Relationship between the Traffic Condition and the Worst-Case Noise Hour on Roadway, January, 1998*.
- Federal Highway Administration. *Traffic Noise Model Technical Manual, Final Report*. FHWA-PD-96-010 February 1998
- Federal Highway Administration. *23 Code of Federal Regulations, Part 772. Procedures for Abatement of Highway Traffic Noise and Construction Noise*.
- Federal Highway Administration. *Measurement of Highway-Related Noise*, FHWA-DP-96-046, May, 1996.
- Federal Highway Administration. *Highway Traffic Noise Analysis and Abatement, Policy and Guidance*, June, 1995.
- Fleming, G. *Final Report: Parallel Barrier Effectiveness Under Free-Flowing Traffic Conditions*, FHWA-RD-92-068, April 1992.
- Highway Capacity Manual Special Report #209*. Ed. Highway Research Board, Washington, D.C., 1994.
- Noise Abatement; Policy Alternatives for Transportation, Volume VIII*. Board Committee on Appraisal of Societal Consequences of Transportation Noise Abatement, Washington, D.C., National Academy of Sciences, 1977.
- Rhode Island State Department of Transportation. *Noise Abatement Policy. September 15, 1997*.
- Schomer, P.D. and B. Homans. *Construction Noise: Specification, Control, Measurement, and Mitigation Technical Report E-53*, Washington, D.C., Construction Engineering Research Laboratory, 1975.