Highway Traffic Noise Analysis

WIN 18129
Trafton Road Interchange Environmental Assessment

May 30, 2013
Prepared by:

Maine Department of Transportation
Bureau of Transportation Systems Planning
Office of Highway and Bridge Planning
16 State House Station
Augusta, ME 04333-0016

INTRODUCTION

This highway traffic noise analysis was prepared to determine the potential noise impacts associated with the construction of a new full-service I-95 interchange at Trafton Road in Waterville. The highway traffic noise levels were predicted for the existing condition (2011) and the future No-Build and Build Alternatives for the design year (2036).

The noise analysis was conducted in accordance with the following Federal Highway Administration (FHWA) and Maine Department of Transportation (MaineDOT) regulatory and policy guidelines:

- Title 23 Code of Federal Regulations Part 772 Procedures for Abatement of Highway Traffic Noise and Construction Noise. (23 CFR 772);
- FHWA Highway Traffic Noise: Analysis and Abatement Guidance, December 2011, and;
- MaineDOT Highway Traffic Noise Policy, July 18, 2012.

The purpose of a highway traffic noise analysis is to identify impacted land uses (homes, schools, business, etc) and determine the feasibility and reasonableness of abatement measures. The terms “feasibility” and “reasonableness” are terms commonly used in highway traffic noise analysis to determine, among other things, the effectiveness (in terms of noise reduction) and the acceptable cost for any noise abatement measure. All noise abatement measures are evaluated based on the feasibility and reasonableness criteria identified in MaineDOT’s noise policy.

1.0 NOISE ABATEMENT CRITERIA

The FHWA and MaineDOT Noise Abatement Criteria (NAC) were used to determine traffic noise impacts at all receptors within the study area. The NAC are FHWA-established noise levels for activities or land uses that identify traffic noise impacts during the loudest hour. As shown in Table 2-1, the criteria vary according to a property's activity category.

MaineDOT evaluates noise abatement measures when predicted future noise levels "approach" within 1 dBA or "exceed" the NAC; thus abatement measures will be evaluated for any residential homes (NAC Activity Category B) with predicted noise levels of 66 dBA or greater.

Table 2-1 Noise Abatement Criteria (NAC)

Activity Category	Leq(h) dBA	Description of Activity Category
A	57 Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 Exterior	Residential
C	67 Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52 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	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
E	----------	Undeveloped lands.

2.0 METHODOLOGY

Noise levels were established using a combination of traffic noise modeling and field measurements for the existing condition (2011) and design-year (2036) no-build and build conditions. The results of the noise analysis are presented in Section 3.

The prediction of traffic noise levels was performed using FHWA's Highway Traffic Noise Model Version 2.5 (TNM 2.5). TNM 2.5 predicts traffic noise levels between highways and nearby receptors taking the intervening ground's acoustical characteristics, topography, and rows of buildings into account.

The noise levels presented in this report are expressed in decibels (dB) on the A-weighted scale (dBA). This scale most closely approximates the response characteristics of the human ear to low level sound. All noise levels are reported as equivalent level, Leq(h), values which contain the same amount of acoustic energy as an actual time-varying A-weighted sound level over a period of 1 hour.

Traffic data for the study area was obtained from the Interchange justification Report and the Sidney Automated Traffic Recorder (ATR). Afternoon peak-hour traffic data was used to replicate loudest hour conditions for all receptors located near the proposed interchange.

Noise measurements were performed on the afternoon of May 28, 2013. These measured noise levels were used to validate the accuracy of TNM 2.5 calculations.

3.0 NOISE ANALYSIS

The traffic noise analysis was performed using TNM 2.5. The model was validated using field measurements from Type II Quest Sound Level Meters. The purpose of the noise analysis was to predict existing noise levels and determine noise levels for all receptors within the study area.

3.1 Receptors

A "receptor" is a technical term used to describe the location of any properties included in the noise analysis. In determining traffic noise impacts, primary consideration is given to exterior areas where frequent human use occurs such as patios, porches, swimming pools, playgrounds, etc. If no exterior areas are present, the interior NAC is used as the basis for determining noise impacts.

Various factors affect the "transmittal" of sound from a source to a receptor. These factors include vegetation, intervening structures, elevation of the source and/or the receptor, surrounding topography and the type of ground surface between the source and the receptor. The attenuation (reduction) of sound levels due to intervening structures occurs when a receptor's view (line-of-sight) is obstructed or partially obstructed by dense objects (i.e. rows of buildings, barriers, etc).

3.2 Highway Traffic Noise Model Validation

Traffic noise model validation is typically done as an initial step in traffic noise modeling to insure that predictions of existing and future traffic noise are reasonably accurate. Essentially, modeled results of existing traffic conditions are compared with measured noise levels at various receptor locations. Generally, if modeled noise levels are within ± 3 dBA of measured levels, no additional modifications to the traffic noise model are necessary.

Noise measurements were performed on the afternoon of May 28, 2013 for selected receptors throughout the study area. These measured noise levels were compared to modeled levels to validate the accuracy of TNM 2.5 predictions.

Table 3-1 Results of Traffic Noise Model Validation (dBA)

Receptor ID	Location	Property Description	Measured Noise Levels	Modeled Noise Levels	Difference
R1	255 Trafton Rd	Commercial (vacant)	56	59	-3
R2	263 Trafton Rd	Residential	---	56	---
R3	229 Trafton Rd	Residential	61	59	2
R4	599 8 Rod Rd	Residential	56	54	2
R5	102 Junction Rd	Residential	---	55	---
				Average Difference	2

As shown in Table 3.1, the average difference between modeled and measured results for all measurement locations was within ± 3 dBA of measured levels. These results indicate that the traffic noise model is predicting accurately for existing and future conditions.

3.3 Determination of Impacts

Traffic noise levels were predicted at 5 receptors within the study area for the existing condition (2011) and design-year (2036) no-build and build conditions. As shown in Table 3-2, the results of the traffic noise analysis demonstrate that traffic noise impacts are not expected at any receptors under all 3 modeled scenarios.

Table 3-2 Results of Traffic Noise Analysis (dBA)

Receptor ID	Impact Criteria	Existing 2011 Noise Levels	No-Build 2036 Noise Levels	Build 2036 Noise Levels	Impacts?
R1	71	59	61	64	No
R2	66	56	59	61	No
R3	66	59	62	64	No
R4	66	54	55	55	No
R5	66	55	56	56	No

4.0 CONCLUSION

Based on the results of the results of the traffic noise analysis in Section 3, highway traffic noise impacts are not expected and evaluation of abatement measures is not warranted.

Appendix A: Noise Monitoring Data

Highway Noise Monitoring Sheet

DATE: 5/28/13

PROJECT: Trafton Rd

JOB # 18129

SITE ID R1

Gannett Fleming, Inc.

ADDRESS: 255 Trafton Rd
Waterville, ME

Meter Storage # _____

TYPE ☐ Residential ☑ Commercial ☐ Religion ☐ Educational ☐ Other _____

Measurement Data

Photograph #'s _____

SLM Calibration before 113.4 after 113.4

Weather: temperature 70° wind speed 5mph cloud cover clear

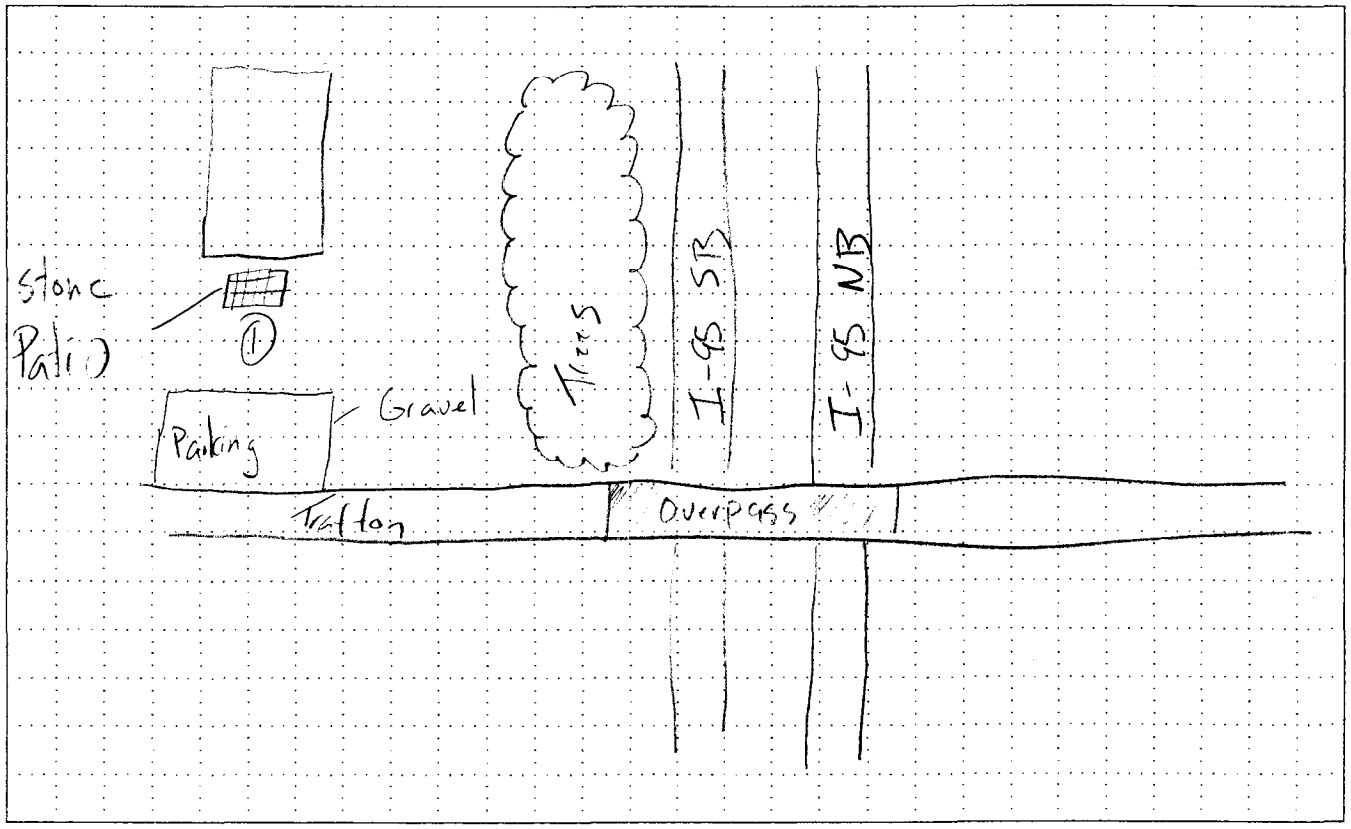
Time:	1st	start	2:48	stop	3:03	total	15 min			
	2nd	start	3:04	stop	3:19	total	15 min			
Data:	1st	Leq	52.8	Lmax	70.7	Lmin	45.2	SEL	82.5	
	2nd	Leq	55.8	Lmax	70.8	Lmin	44.3	SEL	85.2	

Traffic Data

Roadway#1			Roadway#2			Roadway#3			Roadway#4		
Direction			Direction			Direction			Direction		
	1st	2nd		1st	2nd		1st	2nd		1st	2nd
auto			auto			auto			auto		
med. trk.			med. trk.			med. trk.			med. trk.		
hvy trk.			hvy trk.			hvy trk.			hvy trk.		
bus			bus			bus			bus		
motorcycle			motorcycle			motorcycle			motorcycle		

NOTES: Commercial Property - Vacant?

SITE SKETCH



Highway Noise Monitoring Sheet

DATE: 5/[illegible]/03

PROJECT: Tratton

JOB # 18129

SITE ID R3

Gannett Fleming, Inc.

ADDRESS: [illegible] Rd

Waterville, ME

Meter Storage # _____

TYPE ☑ Residential ☑ Commercial ☐ Religion ☐ Educational ☐ Other _____

Measurement Data

Photograph #'s _____

SLM Calibration before 113.4 after 113.4

Weather: temperature 65 wind speed S-8 cloud cover clear

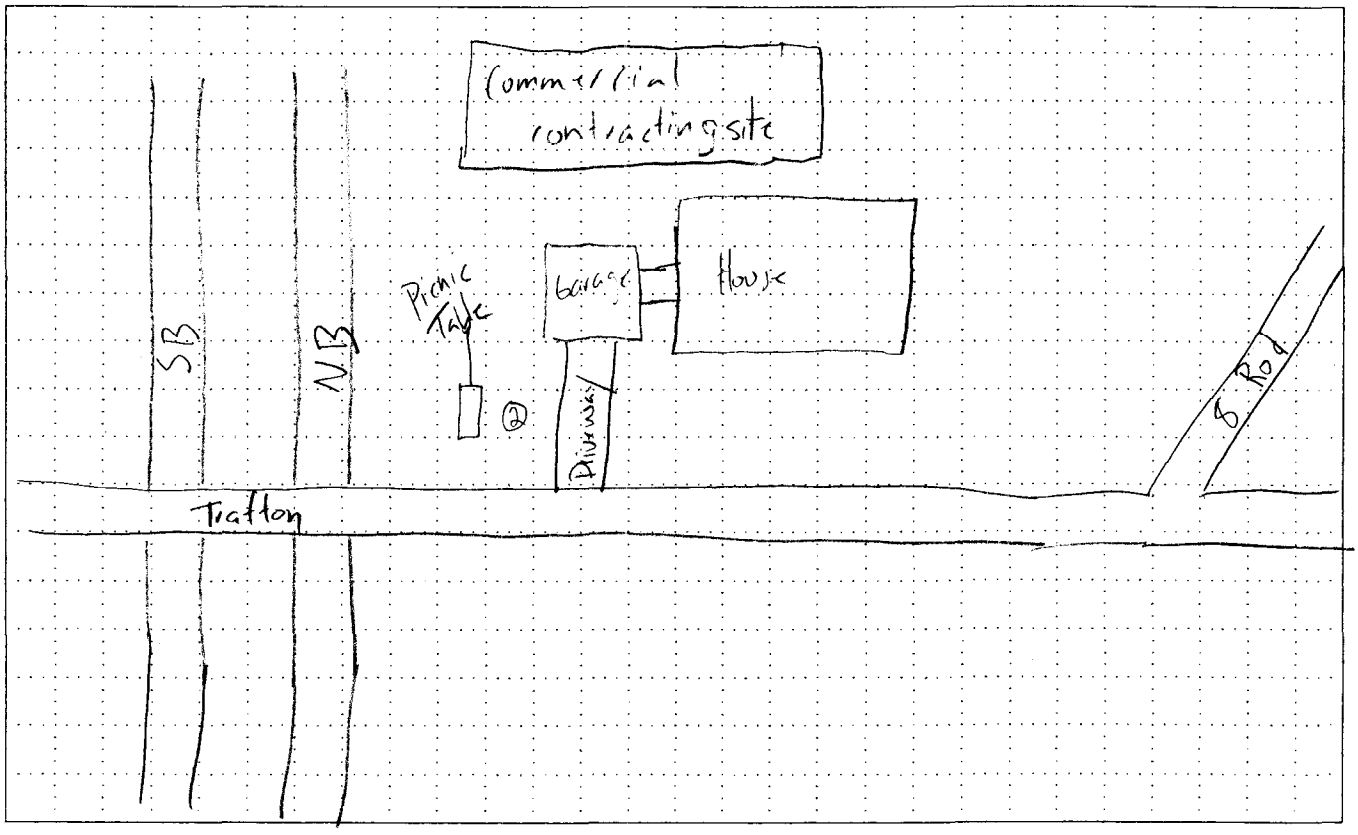
Time:	1st	start	3:34	stop	3:50	total	16 min		
	2nd	start	3:51	stop	4:06	total	15 min		
Data:	1st	Leq	60.7	Lmax	77.5	Lmin	51.9	SEL	
	2nd	Leq	61.1	Lmax	76.8	Lmin	53.0	SEL	90.5

Traffic Data

Roadway#1 _____			Roadway#2 _____			Roadway#3 _____			Roadway#4 _____		
Direction _____			Direction _____			Direction _____			Direction _____		
	1st	2nd		1st	2nd		1st	2nd		1st	2nd
auto			auto			auto			auto		
med. trk.			med. trk.			med. trk.			med. trk.		
hvy trk.			hvy trk.			hvy trk.			hvy trk.		
bus			bus			bus			bus		
motorcycle			motorcycle			motorcycle			motorcycle		

NOTES: 1st reading interrupted talking w/ home owner + neighbor (F. Pelotte, 229 Tratton Tson)

SITE SKETCH



Highway Noise Monitoring Sheet

DATE: 5/29/12

PROJECT: Trafton

JOB # 18129

SITE ID R4

Gannett Fleming, Inc.

ADDRESS: 599 [illegible] Rd

Waterville, ME

Meter Storage # _____

TYPE ☑ Residential ☐ Commercial ☐ Religion ☐ Educational ☐ Other _____

Measurement Data

Photograph #'s _____

SLM Calibration before 113.4 after 113.4

Weather: temperature 65 wind speed 5-8 cloud cover clear

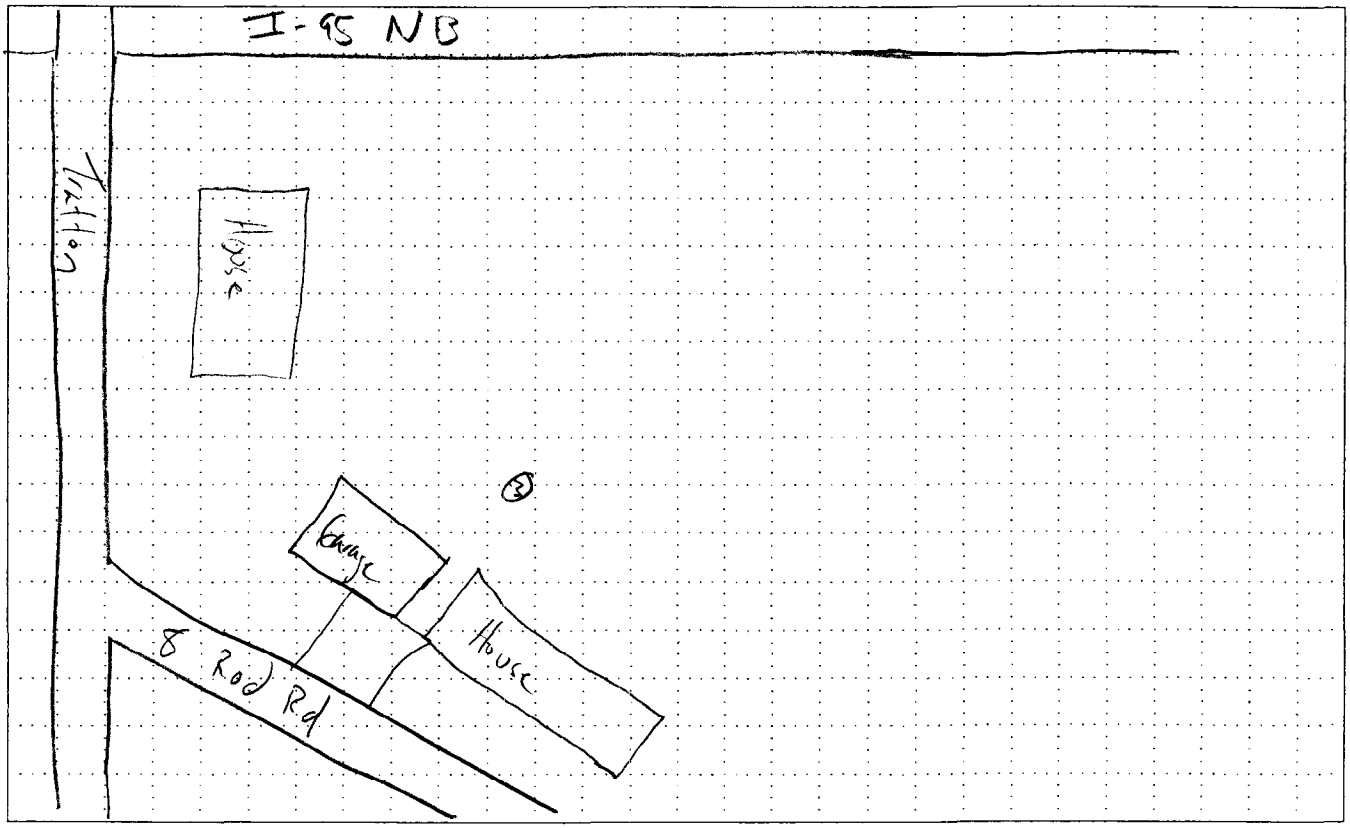
Time:	1st	start	4:14	stop	4:21	total	10			
	2nd	start	4:22	stop	4:32	total	10			
Data:	1st	Leq	56.7	Lmax	66.6	Lmin	49.7	SEL	84.1	
	2nd	Leq	56.4	Lmax	87.5	Lmin	44.6	SEL	84.3	

Traffic Data

Roadway#1 _____			Roadway#2 _____			Roadway#3 _____			Roadway#4 _____		
Direction _____			Direction _____			Direction _____			Direction _____		
	1st	2nd		1st	2nd		1st	2nd		1st	2nd
auto			auto			auto			auto		
med. trk.			med. trk.			med. trk.			med. trk.		
hvy trk.			hvy trk.			hvy trk.			hvy trk.		
bus			bus			bus			bus		
motorcycle			motorcycle			motorcycle			motorcycle		

NOTES: _____

SITE SKETCH



Appendix B: TNM Sound Levels

MaineDOT
Nate Howard

29 May 2013
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: WIN 18129
RUN: Trafton Road EA 2011 Base
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	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R1	1	1	0.0	58.8	71	58.8	15	----	58.8	0.0	7	-7.0
R2	2	1	0.0	56.3	66	56.3	15	----	56.3	0.0	7	-7.0
R3	3	1	0.0	58.8	66	58.8	15	----	58.8	0.0	7	-7.0
R4	4	1	0.0	54.1	66	54.1	15	----	54.1	0.0	7	-7.0
R5	5	1	0.0	55.4	66	55.4	15	----	55.4	0.0	7	-7.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	5	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

MaineDOT
Nate Howard

30 May 2013
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: WIN 18129
RUN: Trafton Road EA 2036 No Build
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	No Barrier LAeq1h Crit'n	Increase over existing Calculated	Increase over existing 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
R1	1	1	0.0	60.7	71	60.7	15	----	60.7	0.0	7	-7.0
R2	2	1	0.0	58.7	66	58.7	15	----	58.7	0.0	7	-7.0
R3	3	1	0.0	61.5	66	61.5	15	----	61.5	0.0	7	-7.0
R4	4	1	0.0	54.6	66	54.6	15	----	54.6	0.0	7	-7.0
R5	5	1	0.0	55.8	66	55.8	15	----	55.8	0.0	7	-7.0

Dwelling Units	# DUs	Noise Reduction Min	Noise Reduction Avg	Noise Reduction Max
		dB	dB	dB
All Selected	5	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

MaineDOT
Nate Howard

29 May 2013
TNM 2.5
Calculated with TNM 2.5

RESULTS: SOUND LEVELS
PROJECT/CONTRACT: WIN 18129
RUN: Trafton Road EA 2036 Build
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	Goal	Calculated minus Goal
			dBA	dBA	dBA	dB	dB		dBA	dB	dB	dB
R1	1	1	0.0	63.9	71	63.9	15	----	63.9	0.0	7	-7.0
R2	2	1	0.0	60.6	66	60.6	15	----	60.6	0.0	7	-7.0
R3	3	1	0.0	64.3	66	64.3	15	----	64.3	0.0	7	-7.0
R4	4	1	0.0	54.9	66	54.9	15	----	54.9	0.0	7	-7.0
R5	5	1	0.0	55.8	66	55.8	15	----	55.8	0.0	7	-7.0

Dwelling Units	# DUs	Noise Reduction Min	Avg	Max
		dB	dB	dB
All Selected	5	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