TRANSPORTATION

PROJECT REPORT

Appendix K

NOISE STUDY REPORT

D213002

**Interchange 23 to 24 Reconstruction
and Mobility Improvements
New York State Thruway Authority
Albany County**

September 2006

New York State Thruway Authority
George E. Pataki, Governor
John L. Buono, Chairman

NOISE STUDY REPORT

FOR

D213002
INTERCHANGE 23 TO 24 RECONSTRUCTION
AND MOBILITY IMPROVEMENTS
NEW YORK STATE THRUWAY AUTHORITY

ALBANY COUNTY

Prepared

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

I. INTRODUCTION

The purpose of this report is to assess the potential traffic and construction noise impacts resulting from the proposed reconstruction and mobility improvements between Interchange 23 and Interchange 24 along the New York State Thruway. A general description of the project can be found in Chapter 1, Introduction, and Section II.A, Project Identification, of the Draft Environmental Impact Statement (DEIS).

The procedures followed for this report conform to the New York State Noise Analysis Policy (NAP), which follows the Federal-Aid Policy Guide, Subchapter H, Part 772 (23 CFR 772), "Procedures for the Abatement of Highway Traffic Noise and Construction Noise." The NAP (dated August 1998) is found in Chapter 3 of the NYSDOT Environmental Procedures Manual.

This project is classified as a Type 1 project under 23 CFR 772. A "Type 1 project" is defined as a proposed project for the construction of a new highway or the physical alteration of an existing highway that significantly changes either the horizontal or vertical alignment or increases the number of through-traffic lanes.

II. NOISE FUNDAMENTALS

Three specific attributes are significant in the study of the amount and the nature of noise:

- The frequency distribution of the noise
- The intensity of the noise
- The time varying pattern of the noise

The overall sound we hear is composed of a summation of separate sound waves, each with a different frequency. Human hearing is more sensitive to sounds in the higher frequencies than to sounds in the lower frequencies. An electronic adjustment called the "A-scale weighting network" has been devised to measure noise in a way that closely resembles human hearing. Through the A-scale network, a noise level meter electronically adjusts some of the higher, middle, and lower frequencies when noise is measured, placing a greater emphasis on the middle to high frequencies. This overall sound, or frequency distribution, is what is measured in noise analysis.

The second property of sound or noise levels is the intensity, a measure of the magnitude of the sound pressure level (SPL) expressed in units called decibels (dB). When noise is measured with A-scale weighting, the magnitude of the sound is expressed as dBA. Common indoor and outdoor noise levels are shown in Table II-1.

The third property of noise is the time varying pattern of the intensity of the noise. The equivalent sound level, L_{eq}, has been developed to quantify the time varying pattern of noise. The L_{eq} descriptor is used to quantify the average energy content of sounds over a selected period of time, with the most common time period being one hour for noise studies. The L_{eq} descriptor has been used to quantify the noise levels in this analysis.

The FHWA publication, "Highway Traffic Noise Analysis and Abatement Policy and Guidance" (dated June 1995), describes several general relationships that affect sound generation and propagation. First, since decibels are logarithmic units, sound levels cannot be added using ordinary arithmetic means. For example, two trucks that each produce 90 dB of noise would combine to produce 93 dB, rather than 180 dB. Thus, a doubling of the noise source would only produce a 3 dB increase in the sound pressure level. Studies have shown that a 3 dB increase in the sound pressure level is barely perceptible to the human ear.

Secondly, an increase or decrease of 10 dB in the sound pressure level would be perceived by an observer as a doubling or halving of the sound. For example, a 70 dB sound would be perceived as twice as loud as a 60 dB sound.

Lastly, sound intensity decreases in proportion with the square of the distance from the source. In general, sound levels for a point source would decrease by 6 dB for each doubling of distance. Sound levels for a highway line source vary differently with distance, since sound pressure waves are propagated all along the line and overlap at the point of measurement. A long, closely-spaced continuous line of vehicles along a roadway would produce a 3 dB decrease in sound level for each doubling of distance. However, evidence has shown that where sound from a highway propagates close to "soft" ground, such as plowed farmland or grass, a dropoff rate of 4.5 dB per doubling of distance is more suitable for use in traffic noise analyses.

Table II-1
Common Noise Levels

Common Outdoor Noise Levels	Noise Level (dBA)			Common Indoor Noise Levels
	---	110	---	Rock Band
Jet Flyover at 1000 Ft.				
	---	100	---	
				Inside Subway Train (New York)
Gas Lawn Mower at 3 Ft.				
	---	90	---	Food Blender at 3 Ft.
Diesel Truck at 50 Ft.				
				Garbage Disposal at 3 Ft.
Noisy Urban (Daytime)	---	80	---	Shouting at 3 Ft.
				Vacuum Cleaner at 10 Ft.
Gas Lawn Mower at 100 ft.	---	70	---	
Commercial Area				Normal Speech at 3 Ft.
Heavy Traffic at 300 ft.	---	60	---	Large Business Office
				Dishwasher Next Room
Quiet Urban (Daytime)	---	50	---	
				Small Theatre (Background)
Quiet Urban (Nighttime)	---	40	---	Library
Quiet Suburban (Nighttime)				
	---	30	---	Bedroom at Night
				Concert Hall (Background)
Quiet Rural (Nighttime)				
	---	20	---	Broadcast and Recording Studio
	---	10	---	
				Threshold of Hearing
	---	0	---	

III. NOISE ANALYSIS METHODOLOGY

The methods used in determining noise impacts for this project are in accordance with the provisions and procedures of the policies stated in the NAP and the Federal-Aid Policy Guide, Subchapter H, Part 772 (23 CFR 772), "Procedures for the Abatement of Highway Traffic Noise and Construction Noise." The following methods are used to determine existing noise levels, predict future noise levels, and assess impacts on the project's noise environment:

- Existing land uses are established for the project area.
- Existing noise levels are determined by obtaining noise measurements at sites in the vicinity of the proposed project.
- The proposed highway systems for the build alternative as well as the existing system are modeled utilizing the FHWA Traffic Noise Model (TNM) Traffic Noise Prediction Program. The noise levels predicted for the existing conditions are compared to the actual field measurements in order to verify the accuracy of the inputs for the noise model.
- Predicted noise levels are compared to the existing noise levels to determine the extent of the noise impact (if any) caused by each alternative.
- Where an impact is expected to occur, noise abatement measures are examined and evaluated.

IV. LAND USE

Existing activities or land uses, which may be affected by noise from the proposed highway project, were identified and are shown on Figures 1A, 1B, and 1C. The appropriate activity category based on 23 CFR 772 was assigned to each type of land use along with the corresponding FHWA noise abatement criterion (NAC). According to the NAP, a NAC is a noise level for a particular activity that when approached or exceeded requires the consideration of abatement measures. The level represents the upper limit of acceptable highway traffic noise and is a compromise between noise levels that are desirable and those that are achievable.

Land uses adjacent to the project corridor include residential, commercial and minor areas of undeveloped land. The following residential subdivisions and apartment complexes are located to the west of the project corridor:

- Noonan Lane (south of Interchange 23)
- Woodlake Apartments (north of Schoolhouse Road)
- Residential subdivision on Vaughn Drive/Dewberry Drive (south of Schoolhouse Road)
- Indian Hills (residential subdivision south of Russell Road)
- Winding Brook Manor Apartments (between Route 85 and New Scotland Avenue)

Residential neighborhoods to the west of the project corridor also exist south of Schoolhouse Road, south of Krumkill Road, and south of New Scotland Avenue. The residences in these areas primarily consist of single-family dwellings.

The following residential subdivisions, apartment complexes, and senior housing facilities are located to the east of the project corridor:

- Strawberry Lane Condominiums (south of Schoolhouse Road)
- Woodscape (residential subdivision with mixed single-family houses and townhouses between Schoolhouse Road and Russell Road)

- Residential subdivision on Pinewood Avenue/Eastland Circle (north of Russell Road)
- Residential neighborhood on Hemlock Lane (north of New Scotland Avenue)
- Saint Sophia & Holy Wisdom Apartments (senior housing between Whitehall Road and NYS Thruway)
- Whitehall Court (Equal Housing Opportunity apartment complex between Whitehall Road and NYS Thruway)
- Whitehall Station (residential subdivision between Whitehall Road and NYS Thruway)

Numerous residential streets exist between New Scotland Avenue and Delaware Avenue in the City of Albany. The residences on these streets mainly consist of single-family dwellings. Mixed single- and multi-family dwellings exist immediately south of Delaware Avenue.

Educational facilities adjacent to the project area include Albany School of Humanities (an elementary school) at 108 Whitehall Road and a new middle school (currently under construction) on Kelton Court. Religious facilities adjacent to the project area include Saint Sophia Greek Orthodox Church at 440 Whitehall Road, Congregation B'nai Shalom at 420 Whitehall Road, Congregation Beth Abraham-Jacob at 380 Whitehall Road, and the Albany Jewish Community Center (AJCC) at 340 Whitehall Road. Pre-school is offered at Congregation Beth Abraham-Jacob, St. Sophia Greek Orthodox Church, and the AJCC. Capital Hills Golf Course lies between New Scotland Avenue and Delaware Avenue adjacent to the project corridor.

Nearby business uses include office space to the west of the project corridor just south of Route 20, a florist to the northwest of Route 20, and a dentist office to the east of the corridor, north of Schoolhouse Road.

The FHWA NAC, based on land use or activity category, are listed in Table IV-1. This table lists the noise levels for each activity category where there may be noise impacts that require consideration of mitigation. According to the NAP and 23 CFR 772, if a predicted noise level shows a substantial increase (6 dBA or more) over an existing noise level, an impact may occur. A noise impact may also occur if a noise level approaches or exceeds the NAC. "Approaches" is defined as being within 1 dBA of the NAC (67 dBA and 72 dBA for Activity Categories B and C, respectively).

Table IV-1
Noise Abatement Criteria
Hourly A-Weighted Sound Level - Decibels (dBA)

Activity Category	L_{eq}(h)	Description of Activity Category
A	57 dBA (Exterior)	Tracts of land which serenity and quiet are of extraordinary significance and serve an important public need, and where preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 dBA (Exterior)	Residences, motels, hotels, schools, churches, public meeting rooms, libraries, hospitals, picnic areas, recreation areas, playgrounds, active sports areas and parks.
C	72 dBA (Exterior)	Developed lands, properties or activities not included in Categories A and B above.
D	---	For undeveloped lands
E	52 dBA (Interior)	Residences, motels, hotels, schools, churches, public meeting rooms, libraries, hospitals, and auditoriums.

V. MEASURED NOISE LEVELS

Long-term (24-hour) noise measurements were performed at two residential locations along the project corridor as part of the "New York State Thruway Authority: Thruway-wide Noise Barrier Prioritization Study." The noise levels at both locations are dominated by Thruway traffic. Based on the measurements, the loudest hour of the day at both locations was 4:00 p.m., which is the afternoon peak traffic period. As described below, the measurements for this Noise Study Report were taken during the peak afternoon traffic period, as well as the peak morning traffic period.

Existing noise level measurements were conducted during the winter and spring of 2004 and 2005 and April of 2006 at the ~~11~~ 12 noise measurement locations shown on Figures ~~2A~~1A, ~~2B~~1B, and ~~2C~~1C. These sites represent noise sensitive land uses adjacent to the project area. The results of these measurements are shown in Table V-1.

Noise levels at each of the noise measurement sites were determined in accordance with the procedures contained in the New York State Department of Transportation's document "Field Measurements of Existing Noise Levels." Field measurements were obtained using a Metrosonics Metrologger model dB3080 (ANSI Type II) noise level meter (Serial No. 2763).

To accurately measure the sound level representative of each site, measurements of at least 15 minutes were taken during the a.m. peak traffic period and the p.m. peak traffic period for each of the sites. Noise levels recorded were the maximum noise level, L_{max}, and the equivalent noise level, L_{eq}. The measured L_{eq} noise levels, time and date measured, and activity category are shown in Table V-1.

Table V-1
Measured Noise Levels
L_{eq} (h) (dBA)

Receptor	FHWA Activity Category	Time	Date	L_{eq} (dBA)
B	B	7:50 a.m. 5:05 p.m.	4/13/05 4/13/05	66 71
D	B	7:25 a.m. 5:40 p.m.	4/13/05 4/13/05	74 76
I	B	6:55 a.m. 5:00 p.m.	12/21/04 3/17/05	65 70
P	E	7:00 a.m. 4:10 p.m. 4:45 p.m.	4/6/05 4/5/05 6/23/05	69 70 70[1]
S	B	7:10 a.m. 4:30 p.m.	3/31/05 3/17/05	73 73
JJ	B	8:15 a.m. 4:40 p.m.	5/19/05 5/19/05	64 67
W	B	7:30 a.m. 4:40 p.m.	4/14/05 4/14/05	69 70
Y	B	7:45 a.m. 4:30 p.m.	12/16/04 11/30/04	66 70
AA	B	7:00 a.m. 4:05 p.m.	12/14/04 11/30/04	70 74
EE (on berm)	B	7:30 a.m. 4:35 p.m. 4:55 p.m.	12/14/04 5/5/05 5/5/05	73 73 76
N Whitehall Court (courtyard)	B	4:30 p.m.	6/23/05	59
KK Noonan Lane	B	7:00 a.m. 4:15 p.m.	5/2/06 5/1/06	62 64

Note:
1. The measurement at Receptor N was taken on 6/23/05 to determine the existing noise level inside the courtyard of the Whitehall Court Apartments, which is considered an area of outdoor use used by all residents. While on site, a measurement at Receptor P on the exterior of the building was repeated to verify the previous noise measurement taken on 4/5/05 and 4/6/05.

VI. PREDICTED NOISE LEVELS

The design year (2028) noise levels were predicted using the FHWA noise modeling program, Traffic Noise Model (TNM), and are reported in terms of the L_{eq}. The FHWA model considers such factors as:

- Traffic volumes and classifications
- Vehicle operating speeds
- Roadway alignment and grade
- Physical barriers

The following is a discussion of these factors.

1. <u>Traffic Volumes and Classifications:</u>

The existing (2008) and predicted (2028) design hour traffic volumes used in the noise analysis are based on the traffic study conducted for this project. The design hour traffic volumes are presented in Chapter II.C.1.h. (Traffic Volumes) and Chapter III.C.2.b.(a) (Design Year Traffic Forecasts) of the EIS.

2. <u>Vehicle Operating Speeds:</u>

The operating speed used in the analysis for the NYS Thruway mainline is 110 km/hr (65 mph). Using the same speed as the maximum speed on the on-ramps and off-ramps, the TNM program models the increase and decrease in speeds associated with acceleration or deceleration on the ramps.

3. <u>Roadway Alignment and Grade:</u>

The roadway alignments and grades for the existing conditions and the proposed alternatives were incorporated into the FHWA noise analysis model.

4. <u>Physical Barriers:</u>

Existing and proposed physical features, such as embankment slopes, earth cut sections, retaining walls, and earth berms, can act as noise barriers. These physical features are incorporated into the FHWA model to ensure that the predicted noise levels reflect the attenuation actually provided by these barriers.

Using the inputs for the traffic volumes, speeds, roadway alignments, and physical noise barriers, the Traffic Noise Model (TNM) program was run to predict the worst-case traffic noise levels throughout the project corridor for the existing condition, no-build condition, and build condition.

The existing noise levels predicted by the model were first compared to the measured noise levels. A difference of 3 dBA or less between the modeled noise levels and the measured noise levels indicates that the inputs into the noise model can be used with confidence. The worst-case measured existing levels in Table V-1 were compared to the modeled existing levels in Table VI-1. In all of the measurement locations, the difference between the measured and modeled noise levels differed by three decibels or less (see Table VI-1). Based on this comparison, the inputs into the noise model can be used with confidence.

Additional noise receptor locations, other than the ~~11~~ <u>12</u> measurement locations, were analyzed using the TNM program. The additional noise receptor locations were used to determine whether impacts may occur at locations other than the measurement locations and are also provided in Table VI-1. These receptors primarily include other residential communities along the project corridor.

Table VI-1
Predicted Noise Levels

Receptor	FHWA Activity Category (noise level)	Noise Level L_{eq} (dBA) (TNM modeled outputs)			Difference Between Worst Case Measured & Existing Modeled Noise Levels L_{eq} (dBA)
		Existing	Design Year (2028) No-Build Condition	Design Year (2028) Build Condition	
A	B (66)	68	68[1]	67	- - -
B	B (66)	74	74	73	3
C	B (66)	67	68	67	- - -
D	B (66)	73	74	73	3
E	B (66)	70	71	72	- - -
F	B (66)	65	66	67	- - -
G	B (66)	70	70	72	- - -
H	B (66)	64	65	67	- - -
I	B (66)	71	72	73	1
J	B (66)	64	65	66	- - -
K	B (66)	63	64	64	- - -
L	B (66)	66	67	67	- - -
M	B (66)	64	67	66	- - -
N	B (66)	61	62	64	2
P	E (52)[2]	44[3]	45[3]	45[3]	N/A
Q	B (66)	68	69	70	- - -
R	B (66)	67	67	68	- - -
S	B (66)	72	73	74	1
T	B (66)	65	65	66	- - -
U	B (66)	67	68	68	- - -
V	B (66)	64	65	66	- - -
W	B (66)	72	73	73	2
X	B (66)	65	66	66	- - -
Y	B (66)	69	70	71	1
Z	B (66)	65	66	67	- - -
AA	B (66)	72	73	73	2
BB	B (66)	66	67	68	- - -
CC	B (66)	69	70	69	- - -
DD	B (66)	66	67	66	- - -
EE	B (66)	70	70	71	3
FF	B (66)	66	67	67	- - -
GG	B (66)	66	67	69	- - -
HH	E (52)[2]	45[3]	46[3]	47[3]	- - -
II	B (66)	62	63	63	- - -
JJ	B (66)	64	65	65	3
KK	B (66)	66	67	68	2

Notes:

1. Shaded areas indicate locations at which the predicted noise levels represent a noise impact in accordance with the NAP.

2. Interior activity category applied since no outdoor activity is associated with the receptor.

3. The modeled noise level at receptors P and ~~represents~~HH represents the interior noise level, which is derived by reducing the modeled exterior noise level by 20 dBA, the normal reduction provided by a building structure.

No-Build Alternative:

The No-Build Alternative traffic noise levels, shown in Table VI-1, represent the future worst-case traffic noise levels that may occur by 2028 if the project were not constructed. In general, traffic noise levels are expected to increase by 1 dBA over existing traffic noise levels due to an increase in traffic volumes. Note that the predicted noise levels under the No-Build Alternative are all within 1 or 2 dBA of the predicted noise levels under the Build Alternative.

Build Alternative:

Table VI-1 provides the Build Alternative traffic noise levels. As shown, the predicted noise levels under the Build Alternative are all within 1 or 2 dBA of the predicted noise levels under the No-Build Alternative. In fact, in several areas, the predicted noise levels under the Build Alternative are equal to or lower than the predicted noise levels under the No-Build Alternative. This is due to the fact that the additional lane under the Build Alternative would be primarily located in the existing median, which would move some traffic further away from certain receptors.

In some areas, the travel lanes would be shifted slightly to the outside of the existing lanes, primarily to accommodate the emergency cross-overs. Shifting the travel lanes to the outside of the existing travel lanes would place traffic slightly closer to certain receptors, resulting in an increase in noise levels of 1 or 2 dBA compared to the noise levels under the No-Build Alternative.

VII. NOISE IMPACTS

According to the NAP and 23 CFR 772, a noise impact may occur if the predicted noise level approaches or exceeds the FHWA Noise Abatement Criteria (NAC) or if the predicted design year noise level is substantially higher than the existing noise level. "Approaches" is defined as being within 1 dBA of the NAC. "Substantially higher" is defined as an increase of six or more decibels over the existing noise levels. The NAC used for determining noise-impacted areas is 67 dBA for residential and recreational areas (Activity Category B in Table IV-1) and 72 dBA for commercial areas (Activity Category C in Table IV-1).

Areas that may experience a noise impact include the lawn areas of homes, court yard or patio areas of apartment buildings, play areas of schools or daycare centers, recreational fields, and exterior areas of businesses that may have an outdoor area of use.

Noise impacts are expected to occur at the following locations for the Build Alternative:

1. Three residential properties along Noonan Lane running parallel to the Thruway (Receptor KK).

~~1~~2. Residential properties located on the streets that run perpendicular and parallel to the Thruway at Interchange 23, which include Southern Boulevard, Kenosha Street, Leighton Street, Mountain Street and Philbrick Street (Receptors A, B and C).

~~2~~3. Residential properties along Bohl Avenue, running parallel to the Thruway (Receptor D).

~~3~~4. Residential properties along Mereline Avenue, running parallel to the Thruway (Receptors E and F).

~~4~~5. Residential properties along Holmes Court, Edgecomb Street, Rose Court, Kelton Court, Marriette Place and Swartson Court as well as the tennis courts for the new middle school (Receptors G, H, I and J).

~~5~~6. Residential properties along Cheshire Court, running parallel to the Thruway (Receptor L).

~~6~~7. Recreational fields for the Albany Jewish Community Center (Receptor M).

~~7~~8. Holy Wisdom Apartment Complex and St. Sophia Nursery School along Whitehall Road (Receptors Q and R).

~~8~~9. Residential properties along Hemlock Lane, running parallel to the Thruway (Receptor S).

~~9~~10. Residential properties along Andover Road, running parallel to the Thruway (Receptor T).

~~10~~11. Residential properties along Onondaga Court and Seneca Court that run parallel to the Thruway (Receptors U, V and W).

~~11~~12. Residential properties along Eastland Circle, running parallel to the Thruway (Receptor X).
~~12~~13. Residential properties along Townwood Drive, Green Hill Court, Sand Pine Lane, and McKown Road that run parallel to the Thruway (Receptors Y, Z and BB).
~~13~~14. Residential properties along Vaughn Drive and McKown Road that run parallel to the Thruway (Receptor AA).
~~14~~15. Residential properties along Cranberry Court and Elderberry Court that run parallel to the Thruway (Receptors CC, DD and EE).
~~15~~16. Residential properties along Woodlake Road and Birch Court that run parallel to the Thruway (Receptors FF and GG).

Noise impacts are not expected to occur at the following locations for the Build Alternative:

1. The Whitehall Court Senior Apartments located along Whitehall Road that run parallel to the Thruway (Receptors N and P).
2. The Renaissance Floral Design establishment located along Route 20 (Western Avenue) next to the Thruway (Receptor HH).
3. Residential properties along Schoolhouse Road that run parallel to the Thruway (Receptor II).
4. Residential properties along Winding Brook Manor that run parallel to the Thruway (Receptor JJ).

Table VII-1 provides the total number of impacts on various land uses for the Build and No-Build Alternatives.

TABLE VII-1
Summary of Noise-Impacted Properties

Alternative	Residential (FHWA NAC Category B)	Commercial, Industrial, Office, etc. (FHWA NAC Category C)	Schools, Churches, Hotels, Motels, and Recreation Areas (FHWA NAC Category B)	Totals
No-Build	~~178~~195	0	4	~~182~~199
Build	~~186~~203	0	4	~~190~~207

VIII. NOISE ABATEMENT

Noise abatement measures were investigated for those sites that are expected to have noise impacts. When noise abatement measures are being considered, NAP and 23 CFR 772 require that every reasonable effort shall be made to obtain substantial noise reductions. A "substantial" noise reduction is defined as a 10 dBA desirable noise level reduction, with a minimum acceptable reduction of 7 dBA, at the most benefited property. In addition, noise abatement measures must be economically reasonable when compared to the number of units benefited. A benefited property is any property where the noise level is reduced by 5 dBA or more by implementation of the noise abatement measure(s).

1. Noise Abatement Analysis

A. Traffic Management/Highway Design

One method of noise abatement is through traffic management, which could include specific lane designations, prohibition or time restriction of certain vehicle types, and modified speed limits. These methods are not applicable for use along the NYS Thruway. Therefore, traffic management has been dismissed as a method of noise abatement for this project.

Highway design modification, by locating the highway farther from receptors or decreasing profile grades, is another method of noise abatement. The proposed alternatives are located in the most practical locations in order to utilize the existing roadway and minimize impacts to a variety of environmental concerns including wetlands and developed properties. Changes in horizontal or vertical geometry that would reduce noise impacts are not possible without compromising highway design criteria or creating additional environmental impacts. Furthermore, changes in location of the proposed alternative, while possibly reducing noise impacts in some areas, may cause new impacts in other areas. For these reasons, highway design modifications have not been considered as a method of noise abatement for this project.

B. Noise Barriers

Noise barriers were evaluated for all sites that are expected to have noise impacts. Through the use of the TNM program, noise barriers were placed to provide for the best case scenario in terms of reduction of noise and reasonableness in terms of cost.

In areas where noise impacts may occur, barrier analysis was conducted using the TNM program. The program analyzes noise abatement in the form of vertical noise barrier walls. Barrier heights and lengths are varied to determine the optimal barrier size to maximize the cost/benefit ratio for the impacted sites. Table VIII-1 below lists the proposed barrier locations, dimensions, costs, and the number of units benefited by each barrier.

Barriers considered must be both feasible and reasonable. The NAP states that feasibility of a barrier deals primarily with engineering considerations (e.g., whether a barrier can be built given the topography of the location; whether a substantial noise reduction can be achieved given certain access control, drainage, safety, or maintenance requirements). At a minimum, feasibility must include the practical capability of the measure being built as well as achieving a substantial reduction. Reasonableness should be based on a number of factors, not just one criterion. The overall noise abatement benefits must be determined to outweigh the overall adverse social, economic, and environmental effects and the cost of the noise abatement measures. Reasonable cost was determined by using a cost index based on total cost-per-dwelling-unit-benefited, as well as the unit cost per square meter of the noise barrier material installed. A unit cost of $300 per square meter with a cost index of $50,000 per benefited dwelling unit was used for the analysis. The $300 per square meter unit cost is based on an evaluation of bid data from recent Thruway noise barrier construction projects. According to the NAP, for a unit cost of $200 per square meter or higher, a cost index of $50,000 per benefited unit should be used. Each of the total barrier costs presented below includes construction costs and incidental costs, such as right-of-way, clearing and grubbing, grading, etc.

~~Fifteen~~ Sixteen (~~15~~16) barriers were considered for the project, and 10 of those barriers were determined to be feasible and reasonable. The ~~15~~ 16 barrier locations are described below.

- Barrier 1 (Receptors A, B, and C): This barrier is located between the NYS Thruway and a residential neighborhood that includes Southern Boulevard, Kenosha Street, Leighton Street, Mountain Street, and Philbrick Street within the City of Albany (see Figure ~~3A~~2A). Barrier 1 begins approximately 100 meters

(330 feet) northeast of the Interchange 23 toll booths. The barrier follows along the eastern side of the Thruway right-of-way (ROW) for approximately ~~700~~ 780 meters (~~2,300~~2,562 feet) and has a typical height of 5 meters (16 feet). Barrier 1 has an area of approximately ~~3,500~~3,900 square meters (~~37,674~~41,979 square feet) with an associated cost of $~~1,050,000~~1,171,500. This barrier benefits ~~42~~ 44 dwellings for a cost-per-unit-benefited of $~~25,000~~26,625.

Maximum reduction – 10 dBA
Units benefited – ~~42~~44

- Barrier 2 (Receptor D): This barrier is located between the Thruway and the residential neighborhood of Bohl Avenue including the resident north of Delaware Avenue in the City of Albany (see Figure ~~3B~~2B). Barrier 2 begins approximately 170 meters (560 feet) south of the Delaware Avenue overpass. The barrier follows along the western side of the Thruway ROW for approximately 170 meters (560 feet), meets the Delaware Avenue bridge and then continues along the western side of the Thruway for approximately 112 meters (365 feet) and has a typical height of ~~4~~ 5 meters (~~13~~ 16 feet). Barrier 2 has an approximate area of ~~680~~ 1295 square meters (~~7,319~~13,950 square feet) with an associated cost of $~~204,000~~388,800. This barrier benefits ~~8~~ 9 dwellings for a cost-per-unit-benefited of $~~25,500~~43,200.

Maximum reduction – 10 dBA
Units benefited – ~~8~~9

- Barrier 3 (Receptors E and F): This barrier is located between the Thruway and the residential neighborhood of Mereline Avenue in the City of Albany (see Figure ~~3B~~2B). Barrier 3 begins at the Delaware Avenue overpass. The barrier follows along the eastern side of the Thruway ROW for approximately ~~220~~ 180 meters (~~720~~ 591 feet) and has a typical height of 5.5 meters (18 feet). Barrier 3 has an approximate area of ~~1,210~~990 square meters (~~13,024~~10,656 square feet) with an associated cost of $~~363,000~~297,000. This barrier benefits 11 dwellings for a cost-per-unit-benefited of $~~33,000~~27,000.

Maximum reduction – 10 dBA
Units benefited – 11

- Barrier 4 (Receptors G, H, and I): This barrier is located between the Thruway and a residential neighborhood that includes Holmes Court, Edgecomb Street, Rose Court, Kelton Court, Mariette Place, and Swartson Court within the City of Albany (see Figure ~~3C~~2C). Barrier 4 would also shield the ~~proposed~~ tennis courts of the new middle school~~ (currently under construction)~~. The barrier begins approximately 280 meters (920 feet) north of the Delaware Avenue overpass. The barrier follows along the eastern side of the Thruway ROW for approximately 580 meters (1,900 feet) and has a typical height of 4 meters (13 feet). Barrier 4 has an approximate area of 2,320 square meters (24,972 square feet) with an associated cost of $696,000.

  An analysis of an extension of Barrier 4 to benefit properties represented by Receptor J indicated that no benefit would be provided. A barrier extension of 200 meters (660 feet) to the north beyond the neighborhoods on Mariette Place and Swartson Court would reduce noise levels in this area by only 4 dBA. Therefore, the additional 200-meter (660-foot) section of noise barrier was removed from consideration.

  Barrier 4, at 580 meters (1,900 feet) in length, benefits 16 dwellings and the proposed tennis courts of the new middle school. To arrive at the total number of units benefited, an assumption must be made for the "units" represented by the tennis courts. An assumption of 20 units to represent the number of individuals that would be using the courts as well as any spectators was used to calculate the total benefited units. In total, Barrier 4 benefits 16 dwellings plus 20 units for the tennis courts for a cost-per-unit-benefited of $19,333.

Maximum reduction – 10 dBA
Units benefited – 36

- Barrier 5 (Receptors K, L, and M): This barrier is located between the Thruway and the residential neighborhood of Cheshire Court, which is located in the Whitehall Station development on Whitehall Road in the City of Albany (see Figure ~~3D~~2D). The barrier begins approximately 1,650 meters (5,410 feet) north of the Delaware Avenue overpass. Barrier 5 follows along the eastern side of the Thruway ROW for approximately 275 meters (900 feet) and has a typical height of ~~9.5~~10 meters (~~31~~ 33 feet). Barrier 5 has an approximate area of ~~2,610~~2,750 square meters (~~28,094~~29,600 square feet) with an associated cost of $~~783,750~~825,000. Barrier 5 benefits 2 dwellings for a cost-per-unit-benefited of $412,500. Although feasible, this barrier is not reasonable since the cost-per-unit-benefited substantially exceeds $50,000.~~This barrier does not provide a substantial noise level reduction and is therefore not feasible~~.

  Maximum reduction – ~~6~~ 8 dBA
  Units benefited – 2

  A modification to Barrier 5 was evaluated to determine whether placement of the barrier along the existing berm would provide a further benefit for other residents within the Whitehall Station development. The modified barrier, Barrier 5A (see Figure 2D) runs parallel to the Thruway for approximately 275 meters (900 feet) and has a typical height of 8.0 meters (26 feet). Barrier 5A has an approximate area of 2,200 square meters (23,680 square feet). The barrier is located outside the Thruway ROW, which would require approximately 3,695 square meters (39,773 square feet) of ROW acquisitions. Barrier 5a with an associated cost of $778,240 and a noise level reduction of 8 decibels benefits 11 dwellings for a cost-per-unit benefited of $70,749 per dwelling. Although feasible, this barrier is not reasonable since the cost-per-unit-benefited exceeds $50,000.

  Maximum reduction – 8 dBA
  Units benefited – ~~0~~11

  An extension to the noise barrier to benefit the fields behind the Albany Jewish Community Center (AJCC) was also considered. However, it was determined that since ~~a barrier~~ Barrier 5A was not considered reasonable, extending the barrier would only increase the cost-per-unit-benefited and therefore, still be considered ~~not~~ unreasonable. Furthermore, the ~~benefit the~~ properties on Cheshire Court, which are located 60 meters (200 feet) from the existing edge of pavement received a benefit because of the placement of the barrier along the existing berm outside of the Thruway ROW~~, a barrier would also not benefit the fields,~~. In order to achieve a benefit for the fields, which are located 90 meters (295 feet) away from the existing edge of pavement, additional ROW would need to be acquired, which would further increase the cost of the barrier. Thus, it was determined that a barrier extension would not ~~provide a substantial noise level reduction~~be considered reasonable.

- Barrier 6 (Receptors Q and R): This barrier is located between the Thruway and both Saint Sophia and Holy Wisdom Apartments along Whitehall Road located in the City of Albany (see Figure ~~3E~~2E). The barrier begins approximately 680 meters (2,230 feet) southeast of New Scotland Road. Barrier 6 follows along the eastern side of the Thruway ROW for approximately 420 meters (1,380 feet) and has a typical height of 5 meters (16 feet). Barrier 6 has an approximate area of 2,100 square meters (22,604 square feet) and an associated cost of $630,000. This barrier benefits a patio located adjacent to the Holy Wisdom Apartment building. Since all residents of the apartment building can use the patio, the benefit is assumed to be provided for each of the 48 units. Barrier 6 also benefits the outdoor play area associated with St. Sophia Nursery School. An assumption of 20 individuals was used for the number of people that would use the play area at any given time. Therefore, the barrier would benefit 20 "units" for St. Sophia Nursery School. The total benefited units for Barrier 6 is 68, for a cost-per-unit-benefited of $9,265.

Maximum reduction – 7 dBA
Units benefited – 68

- Barrier 7 (Receptor S): This barrier is located between the Thruway and the residential neighborhood of Hemlock Lane, which is located off New Scotland Avenue in the City of Albany (see Figure ~~3F~~2F). The barrier begins at the New Scotland Avenue overpass. Barrier 7 follows along the eastern side of the Thruway for approximately 230 meters (755 feet) and has a typical height of 6 meters (20 feet). A steep embankment exists between the Thruway and the residences along Hemlock Lane. To reduce the cost of a 12-meter (39-foot) high barrier, the barrier was placed at the top of the embankment outside the existing Thruway ROW line, which would require approximately 1,100 square meters (11,840 square feet) of ROW acquisitions. The cost of acquiring the ROW is less than the cost of increasing the barrier height. Barrier 7 has an approximate area of 1,380 square meters (14,854 square feet) with an associated cost of $449,000 including ROW. This barrier benefits 10 dwellings for a cost-per-unit-benefited of $44,900.

Maximum reduction – 10 dBA
Units benefited – 10

- Barrier 8 (Receptor T): This barrier is located between the Thruway and the residential neighborhood on Andover Road, which is located off Krumkill Road in the Town of Bethlehem (see Figure ~~3G~~2G). The barrier begins approximately 30 meters (100 feet) south of the Krumkill Road overpass. Barrier 8 follows along the western side of the Thruway ROW for approximately 150 meters (490 feet) and has a typical height of ~~5~~ 8 meters (~~16~~ 26 feet). Barrier 8 has an approximate area of ~~750~~ 1,200 square meters (~~8,073~~12,917 square feet) and an approximate cost of $~~225,000~~360,000. This barrier benefits 2 dwellings for a cost-per-unit benefited of $~~112,500~~180,000 per dwelling. Although feasible, this barrier is not reasonable since the cost-per-unit-benefited substantially exceeds $50,000.

Maximum reduction – ~~7~~ 8 dBA
Units benefited – 2

- Barrier 9 (Receptors U and V): This barrier is located between the Thruway and the residential neighborhood of Onondaga Court, which is part of the Indian Hills development located off Russell Road in the Town of Bethlehem (see Figure ~~3H~~2H). The barrier begins approximately 400 meters (1,310 feet) south of the Russell Road overpass. Barrier 9 follows along the western side of the Thruway ROW for approximately 175 meters (575 feet) and has a typical height of 8 meters (26 feet). Barrier 9 has an approximate area of 1,400 square meters (15,069 square feet) and an approximate cost of $420,000. The maximum noise level reduction provided by this barrier is 3 dBA at the closest receptor. Since Barrier 9 does not provide a substantial noise level reduction, it is not considered feasible.

Maximum reduction – 3 dBA
Units benefited – 0

- Barrier 10 (Receptor W): This barrier is located between the Thruway and the residential neighborhood on Seneca Court, which is part of the Indian Hills development located off Russell Road in the Town of Bethlehem (see Figure ~~3H~~2H). The barrier begins approximately 175 meters (575 feet) south of the Russell Road overpass. Barrier 10 follows along the western side of the Thruway ROW for approximately 170 meters (560 feet) and has a typical height of 6 meters (20 feet). Barrier 10 has an approximate area of

1,020 square meters (10,979 square feet) and an approximate cost of $306,000. This barrier benefits 3 dwellings for a cost-per-unit benefited of $102,000 per dwelling. Although feasible, this barrier is not reasonable since the cost-per-unit-benefited substantially exceeds $50,000.

Maximum reduction – 11 dBA
Units benefited – 3

Barrier 10A (Receptors U, V and W): This barrier is a combination of barriers 9 and 10. Both barriers were extended to create one single barrier between the Thruway and the residential neighborhoods on Seneca Court and Onondaga Court, (see Figure 2H). The barrier begins approximately 400 meters (1,310 feet) south of the Russell Road overpass. Barrier 10A follows along the western side of the Thruway ROW for approximately 355 meters (1165 feet) and has a typical height of 10 meters (33 feet). Barrier 101A has an approximate area of 3,550 square meters (38,212 square feet) and an approximate cost of $1,065,000. This barrier benefits 4 dwellings for a cost-per-unit benefited of $266,250 per dwelling. Although feasible, this barrier is not reasonable since the cost-per-unit-benefited substantially exceeds $50,000.

Maximum reduction – 11 dBA
Units benefited – 4

- Barrier 11 (Receptor X): This barrier is located between the Thruway and the residential neighborhood on Eastland Circle, which is located off of Pinewood Ave in the Town of Bethlehem (see Figure ~~3I~~2I). The barrier begins approximately 10 meters (30 feet) north of the Russell Road overpass. Barrier 11 follows along the eastern side of the Thruway ROW for approximately 330 meters (1,080 feet) and has a typical height of 10 meters (33 feet). Barrier 11 has an approximate area of ~~1,320~~3,300 square meters (~~14,208~~35,521 square feet) with an associated cost of $~~396~~990,000. The maximum noise level reduction provided by this barrier is 6 dBA at the closest receptor. Since Barrier 11 does not provide a substantial noise level reduction, it is not considered feasible.

Maximum reduction – 6 dBA
Units benefited – 0

A modification to Barrier 11 was evaluated to determine whether the placement of the barrier to tie into the Russell Road overpass, including increasing the height, would provide a substantial reduction in noise levels for the residents located on Eastland Circle. The modified barrier, Barrier 11A (see Figure 2I) is located on top of the existing berm, located within the existing Thruway ROW. Barrier 11A runs parallel to the Thruway for approximately 330 meters (1,080 feet) and has a typical height of 10.0 meters (33 feet). Barrier 11A has an approximate area of 3,400 square meters (36,597 square feet) with an associated cost of $1,020,000. This barrier would benefit 7 dwellings for a cost-per-unit benefited of $145,714 per dwelling. Although feasible, this barrier is not reasonable since the cost-per-unit-benefited substantially exceeds $50,000.

Maximum reduction – 9 dBA
Units benefited – 7

- Barrier 12 (Receptors Y, Z, and BB): This barrier is located between the Thruway and a residential neighborhood that includes Townwood Drive, Green Hill Court, Sand Pine Lane, and McKown Road, all of which are located in or adjacent to the Woodscape development in the Town of Guilderland (see Figure ~~3J~~2J). The barrier begins approximately 620 meters (2,030 feet) north of the Russell Road overpass. Barrier 12 follows along the eastern side of the Thruway ROW for approximately 660 meters (2,165 feet) and has a typical height of 8 meters (26 feet). Barrier 12 has an approximate area of 5,280 square meters (56,833 square feet) with an associated cost of $1,584,000. This barrier benefits 42 dwellings for a cost-per-unit-benefited of $37,714.

Maximum reduction – 12 dBA
Units benefited – 42

- Barrier 13 (Receptor AA): This barrier is located between the Thruway and the residential neighborhood of Vaughn Drive and McKown Road, which are located in the Town of Guilderland (see Figure ~~3J~~2J). The barrier begins approximately 885 meters (2,900 feet) north of the Russell Road overpass. Barrier 13 follows along the western side of the Thruway ROW for approximately 340 meters (1,115 feet) and has a typical height of 3.5 meters (12 feet). Barrier 13 has an approximate area of 1,190 square meters (12,809 square feet) with an associated cost of $357,000.

  An analysis of an extension of Barrier 13 to benefit a residence along McKown Road indicated that the barrier would not be reasonable. A barrier extension of 220 meters (720 feet) to the north would benefit the residence along McKown Road. However, the additional area would result in a total barrier cost of $588,000 with a cost-per-unit-benefited of $73,500. Therefore, the 220-meter (720-foot) section of noise barrier was removed from consideration.

  Barrier 13, at 340 meters (1,115 feet) in length, benefits 7 dwellings for a cost-per-unit-benefited of $51,000. Although the cost-per-unit-benefited exceeds the $50,000 cost index, the excess is only $1,000, and the noise barrier would provide a substantial noise reduction. Therefore, the Thruway Authority will consider Barrier 13 as both reasonable and feasible for this project.

  Maximum reduction – 10 dBA
  Units benefited – 7

- Barrier 14 (Receptors CC, DD, and EE): This barrier is located between the Thruway and the Strawberry Lane Condominiums, which are located in the Town of Guilderland (see Figure ~~3K~~2K). The barrier begins approximately 280 meters (920 feet) south of the Schoolhouse Road overpass. Barrier 14 follows along the eastern side of the Thruway for approximately 250 meters (820 feet) and has a typical height of 3.5 meters (12 feet). Barrier 14 would require placement of the barrier on top of an existing berm to maximize its effectiveness, which would require a ROW acquisition. The approximate ROW acquisition would be 2,180 square meters (23,465 square feet). Barrier 14 has an approximate area of 875 square meters (9,418 square feet) and an associated cost of $336,750 including ROW. This barrier benefits ~~9~~ 14 dwellings for a cost-per-unit-benefited of $~~37,417~~24,054.

  Maximum reduction – 10 dBA
  Units benefited – ~~9~~14

- Barrier 12/14 (Receptors Y, Z, BB, CC, DD, and EE): This barrier is a combination of Barriers 12 and 14 (see Figure 2Kand 2J). The barrier begins approximately 620 meters (2,030 feet) north of the Russell Road overpass. Barrier 12/14 follows along the eastern side of the Thruway for approximately 1070 meters (3510 feet) and has a typical height of 6.0 meters (20 feet). Barrier 12/14 would require a portion of the barrier to be placed on top of an existing berm (same as Barrier 14) to maximize its effectiveness, which would require a ROW acquisition. The approximate ROW acquisition would be 2,180 square meters (23,465 square feet). Barrier 12/14 has an approximate area of 6420 square meters (69,104 square feet) and an associated cost of $2,000,250 including ROW. This barrier benefits 57 dwellings for a cost-per-unit-benefited of $35,100

  Maximum reduction – 12 dBA
  Units benefited – 57

- Barrier 15 (Receptors FF and GG): This barrier is located between the Thruway and the Woodlake apartment complex in the Town of Guilderland (see Figure ~~3K~~2K). The barrier begins at the northwest side of the Schoolhouse Road overpass. Barrier 15 follows along the western side of the Thruway ROW for approximately 380 meters (1,250 feet) and has a typical height of 6.5 meters (21 feet). Barrier 15 has an approximate area of 2,470 square meters (26,587 square feet) and an associated cost of $741,000. This barrier benefits ~~16~~ 28 dwellings for a cost-per-unit-benefited of $~~46,313~~26,500.

  Maximum reduction – 10 dBA
  Units benefited – ~~16~~28

- Barrier 16 (Receptor KK): This barrier is located between the Thruway and the residential neighborhood of Noonan Lane, which is located in the City of Albany (see Figure 2L). The barrier begins approximately 430 meters south of the Interchange 23 bridge. Barrier 16 follows along the western side of the Thruway ROW for approximately 350 meters (1,150 feet) and has a typical height of 9 meters (29 feet). Barrier 16 has an approximate area of 3,150 square meters (33,906 square feet) and an associated cost of $945,000. This barrier benefits 3 dwellings for a cost-per-unit benefited of $315,000 per dwelling. Although feasible, this barrier is not reasonable since the cost-per-unit-benefited substantially exceeds $50,000.

  Maximum reduction – 7 dBA
  Units benefited – 3

Table VIII-1
Noise Barrier Summary

Noise Barrier[1]	FHWA Activity Category	Noise Abatement Criteria	Existing Noise Level	No Build (2028) Noise Level	Build (2028) Noise Level	Approx. Barrier Location (Sta.)	Length in meters (feet)	Average Height in meters (feet)	Amount of ROW Required, m^2 ($feet^2$)	Max Noise Level Reduction[2]	Benefited Units[3]	Approx. Noise Barrier Cost	Approx. Cost Per Benefited Unit
1 (Receptors A, B, C)	B	67 dBA	74	74	73	Interchange 23 to N2+590	780 (2562)	5.0 (16)	None	10	44	$1,171,500	$26,625
2 (Receptor D)	B	67 dBA	73	74	73	S2+730 to S3+010	282 (925)	5.0 (16)	None	10	9	$388,800	$43,200
3 (Receptors E, F)	B	67 dBA	70	71	72	N2+935 to N3+155	180 (591)	5.5 (18)	None	10	11	$297,000	$27,000
4 (Receptors G, H, I)	B	67 dBA	70	70	72	N3+200 to N3+780	580 (1900)	4.0 (13)	None	10	36	$696,000	$19,333
5 (Receptors K, L, M)	B	67 dBA	66	67	67	N4+390 to N4+670	275 (900)	10.0 (33)	None	8	2	$825,000	$412,500[6]
5A (Receptors K, L, M)	B	67 dBA	66	67	67	N4+390 to N4+670	275 (900)	8.0 (26)	3,695 (39,773)	8	11	$778,240	$70,749[6]
6 (Receptors Q, R)	B	67 dBA	68	69	70	N5+190 to N5+610	420 (1380)	5.0 (16)	None	7	68	$630,000	$9,265
7 (Receptor S)	B	67 dBA	72	73	74	N5+910 to N6+150	230 (755)	6.0 (20)	1,100 (11,840)	10	10	$449,000[5]	$44,900
8 (Receptor T)	B	67 dBA	65	65	66	S6+610 to S6+760	150 (490)	8.0 (26)	None	8	2	$360,000	$180,000[6]
9 (Receptors U,V)	B	67 dBA	67	68	68	S7+200 to S7+370	175 (575)	8.0 (26)	None	3	0	$420,000	N/A[4]
10 (Receptor W)	B	67 dBA	72	73	73	S7+420 to S7+590	170 (560)	6.0 (20)	None	11	3	$306,000	$102,000[6]
10A (Receptors U,V,W)	B	67 dBA	67 72	68 73	68 73	S7+200 to S7+590	355 (1165)	10.0 (33)	None	11	4	$1,065,000	$266,250[6]
11 (Receptor X)	B	67 dBA	65	66	66	N7+610 to N7+940	330 (1080)	10.0 (33)	None	6	0	$990,000	N/A[4]
11A (Receptor X)	B	67 dBA	65	66	66	N7+610 to N7+940	330 (1080)	10.0 (33)	None	9	7	$1,020,000	$145,714[6]
12 (Receptors Y, Z, BB)	B	67 dBA	69	70	71	N8+210 to N8+880	660 (2165)	8.0 (26)	None	12	42	$1,584,000	$37,714
13 (Receptor AA)	B	67 dBA	72	73	73	S8+490 to S8+830	340 (1115)	3.5 (12)	None	10	7	$357,000	$51,000[7]
14 (Receptors CC, DD ,EE)	B	67 dBA	69	70	69	N9+000 to N9+280	250 (820)	3.5 (12)	2,180 (23,465)	10	14	$336,750[8]	$24,054
12/14[9] (Receptors Y, Z, BB, CC, DD, EE)	B	67 dBA	69/69	70/70	71/69	N8+210 to N9+280	1070 (3510)	6.0 (20)	2,180 (23,465)	12	57	$2,000,250[9]	$35,100
15 (Receptors FF, GG)	B	67 dBA	66	67	67	S9+280 to S9+640	380 (1250)	6.5 (21)	None	10	28	$741,000	$26,500
16 (Receptor KK)	B	67 dBA	66	67	68	S1+550 to S1+950	350 (1150)	9.0 (29)	None	7	3	$945,000	$315,000[6]

Notes:
1. Shaded rows indicate the barriers recommended for consideration.
2. To be considered effective, a barrier must reduce the noise level by at least 7 dBA at one property.
3. A benefited unit is defined as a dwelling with a noise reduction of 5 dBA or more. If a barrier does not reduce noise levels by at least 7 dBA, benefits are not counted.
4. N/A = Not applicable since barrier is not feasible.
5. Barrier 5A requires the acquisition of 3,695 square meters (39,773 square feet) of ROW. The ROW cost has been included.
5. Barrier 7 requires the acquisition of 1,100 square meters (11,840 square feet) of ROW. The ROW cost has been included.
6. Although feasible, barrier is not reasonable since it substantially exceeds $50,000 per dwelling unit.
7. Although the cost-per-unit-benefited exceeds $50,000, the Thruway Authority will commit to constructing the barrier since the excess is only $1,000 and the barrier would provide a substantial noise reduction.

8. Barrier 14 requires the acquisition of 2,180 square meters (23,465 square feet) of ROW. The ROW cost has been included.
9. Combination of Barrier 12 and Barrier 14 requires the acquisition of 2,180 square meters (23,465 square feet) of ROW. The ROW cost has been included.

Table VIII-1
Noise Barrier Summary

Noise Barrier[1]	FHWA Activity Category	Noise Abatement Criteria	Existing Noise Level	No Build (2028) Noise Level	Build (2028) Noise Level	Approx. Barrier Location (Sta.)	Length in meters (feet)	Average Height in meters (feet)	Amount of ROW Required, m^2 ($feet^2$)	Max Noise Level Reduction[2]	Benefited Units[3]	Approx. Noise Barrier Cost	Approx. Cost Per Benefited Unit
1 (Receptors A, B, C)	B	67 dBA	74	74	73	Interchange 23 to N2+590	700 (2300)	5.0 (16)	None	10	42	$1,050,000	$25,000
2 (Receptor D)	B	67 dBA	73	74	73	S2+730 to S2+900	170 (560)	4.0 (13)	None	10	8	$204,000	$25,500
3 (Receptors E, F)	B	67 dBA	70	71	72	N2+935 to N3+155	220 (720)	5.5 (18)	None	10	11	$363,000	$33,000
4 (Receptors G, H, I)	B	67 dBA	70	70	72	N3+200 to N3+780	580 (1900)	4.0 (13)	None	10	36	$696,000	$19,333
5 (Receptors K, L, M)	B	67 dBA	66	67	67	N4+390 to N4+670	275 (900)	9.5 (31)	None	6	0	$783,750	N/A[4]
6 (Receptors Q, R)	B	67 dBA	68	69	70	N5+190 to N5+610	420 (1380)	5.0 (16)	None	7	68	$630,000	$9,265
7 (Receptor S)	B	67 dBA	72	73	74	N5+910 to N6+150	230 (755)	6.0 (20)	1,100 (11,840)	10	10	$449,000[5]	$44,900
8 (Receptor T)	B	67 dBA	65	65	66	S6+610 to S6+760	150 (490)	5.0 (16)	None	7	2	$225,000	$112,500[6]
9 (Receptors U,V)	B	67 dBA	67	68	68	S7+200 to S7+370	175 (575)	8.0 (26)	None	3	0	$420,000	N/A[4]
10 (Receptor W)	B	67 dBA	72	73	73	S7+420 to S7+590	170 (560)	6.0 (20)	None	11	3	$306,000	$102,000[6]
11 (Receptor X)	B	67 dBA	65	66	66	N7+610 to N7+940	330 (1080)	4.0 (13)	None	6	0	$396,000	N/A[4]
12 (Receptors Y, Z, BB)	B	67 dBA	69	70	71	N8+210 to N8+880	660 (2165)	8.0 (26)	None	12	42	$1,584,000	$37,714
13 (Receptor AA)	B	67 dBA	72	73	73	S8+490 to S8+830	340 (1115)	3.5 (12)	None	10	7	$357,000	$51,000[7]
14 (Receptors CC, DD, EE)	B	67 dBA	69	70	69	N9+000 to N9+280	250 (820)	3.5 (12)	2,180 (23,465)	10	9	$336,750[8]	$37,417
15 (Receptors FF, GG)	B	67 dBA	66	67	67	S9+280 to S9+640	380 (1250)	6.5 (21)	None	10	16	$741,000	$46,313

IX. SUMMARY

Noise abatement measures were considered for each impacted area. Abatement measures using traffic management and highway design modification were considered, but dismissed as not being practical and applicable to the project. The construction of noise barrier walls was then considered for each impacted area. Based on the analysis, Barriers 1 through 4, Barriers 6 through 7, and Barriers 12/14 (combined) ~~through~~ 13 and 15 were found to be both feasible and reasonable. These barriers are recommended to be constructed as part of the project pending public review.

Barrier 5 and 5A ~~was~~ were considered to mitigate the impacts at Receptor L; however, the barriers ~~was~~ were dismissed as not being ~~feasible~~ reasonable due to their high cost-per-unit-benefited.~~because it would not provide a substantial noise level reduction~~. Barrier 8 was considered to mitigate the impacts at Receptor T; however, the barrier was dismissed as not being reasonable due to its high cost-per-unit-benefited. Barrier 9 was considered to mitigate the impacts at Receptors U and V; however, the barrier was dismissed because it would not provide a substantial noise level reduction. Barrier 10 was considered to mitigate the impacts at Receptor W; however, the barrier was dismissed as not being reasonable due to its high cost-per-unit-benefited. Barrier 10A (combination of barriers 9 and 10) was considered to mitigate the impacts at Receptors U, V and W; however, the barrier was dismissed as not being reasonable due to its high cost-per-unit-benefited. Barrier 11 and 11A ~~was~~ were considered to mitigate the impacts at Receptor X; however, ~~the~~ barrier 11 ~~was~~was dismissed as not being feasible, because it would not provide a substantial noise level reduction. Barrier 11A was dismissed as not being reasonable due to its high cost-per-unit-benefited. ~~because it would not provide a substantial noise level reduction.~~ Barrier 16 was considered to mitigate the impacts at Receptor KK; however, the barrier was dismissed as not being reasonable due to its high cost-per-unit-benefited.

If the assumptions that were used in this noise analysis are later determined to have changed substantially, the recommended barriers may no longer be valid. A final decision on the barriers will be made upon completion of the project design and the public involvement process.

X. COORDINATION WITH THE PUBLIC AND LOCAL OFFICIALS

Public coordination for the proposed project will include a public comment period on the Draft Environmental Impact Statement (EIS) and a public hearing. The location of potential noise barriers will be discussed with the public. The recommended noise barriers would only be constructed if desired by the public.

Local officials will be informed of the project development and design details through correspondence and meetings. The process will be ongoing throughout the duration of the project, and will continue as the plans are developed.

Copies of this report, the EIS, the Federal Highway Administration Federal-Aid Policy Guide, Subchapter H, Part 772 of Title 23 of the Code of Federal Regulations, and the New York State Department of Transportation Environmental Analysis Bureau Noise Analysis Policy will be available to local officials. These reports contain information regarding future noise levels in proximity to the proposed Thruway improvements that may be helpful to the local communities. Local communities can use the information to minimize or avoid future incompatible land uses.

XI. CONSTRUCTION NOISE

Construction noise differs from traffic noise in the following ways:

- Construction noise only lasts for the duration of the construction contract.

- Construction activities are generally short-term.
- Construction noise is intermittent and depends on the type of operation.
- Construction noise is sporadic in nature, whereas traffic noise occurs continuously over the life of the facility.

Construction activities that may cause noise impacts include earthwork, land clearing, paving, and structure construction. Exact noise levels due to construction cannot be determined at specific sites since the number and types of construction equipment that would be used cannot be predicted. Based on typical noise levels for the equipment anticipated for construction of the project, noise levels may reach 70 dBA within approximately 60 meters (200 feet) of the construction boundary and 80 dBA within 23 meters (75 feet).

Due to the existence of residences along the Thruway, nighttime construction of the highway improvements should be limited to only those operations that cannot be performed during the day. The staging proposed for the reconstruction between Interchange 23 to 24 would allow most of the work to be completed during the day. Only those activities that require lane closures would need to be performed at night. These activities would include:

- Initial set-up of the traffic staging/lane shifts.
- Excavation and embankment to be removed or placed for temporary widening for staging.
- Placement of temporary pavement for staging.

Although construction noise is unavoidable in its entirety, it can be mitigated and controlled. Mitigation measures should be incorporated into the contract documents to reduce construction noise and perceived impacts in the project area. For a project of this type, the following example mitigation strategies are available:

<u>Source Control:</u>

1. Use properly designed and well-maintained mufflers in all internal combustion engines, engine enclosures, and intake silencers.

2. Perform regular equipment maintenance. Use new equipment subject to new product noise emission standards.

<u>Site Control:</u>

1. Place stationary equipment as far away as possible from particularly sensitive receptors.

2 Strategically choose waste disposal sites.

3. Coordinate work operations to coincide with time periods when people would least likely be affected.

4. Limit work hours (i.e., limited night-time operations).

5. Eliminate "tail gate banging."

6. Reduce backing-up procedures for equipment with backup alarms. Replace backup alarms with strobes where acceptable per OSHA and other regulations.

7. Construct proposed noise barriers prior to any other construction operations.

<u>Community Awareness</u>:

1. Notify the public of construction operations prior to starting construction.
2. Establish methods to handle complaints.