2.13-1 INTRODUCTION

This section of Chapter 2 examines the potential for noise impacts from Project 1, Shaft and Bypass Tunnel Construction. Impacts on noise levels in the surrounding communities during construction of Project 1 can result from noise from on-site construction equipment and from construction and delivery vehicles traveling to and from the west and east connection sites. Noise levels caused by construction activities would vary widely, depending on the phase of construction, time of day, and the location of the construction relative to sensitive receptor[1] locations.

This analysis includes a quantitative analysis of both on-site and on-road noise sources, the overall combined impact of both sources where applicable, and potential combined impacts from construction at both the west of Hudson and east of Hudson study areas. Appendix 2.13, "Noise," provides additional data.

Even though Project 1 is not located in New York City, the New York City Department of Environmental Protection (DEP) would specify that noise from construction activities and some construction equipment meet the noise reduction requirements of the New York City Noise Control Code (Local Law 113, section §24-219). As such, Project 1's contractors would be required to implement a noise mitigation plan, comparable to plans that would be required if the construction were to occur in New York City.

Additionally, Project 1 would comply with the "Notice of Adoption of Rules for Citywide Construction Noise Mitigation," developed by DEP to supplement the New York City Noise Control Code. These supplemental regulations include, but are not limited to, the following:

- All construction sites must post a complete, accurate, and visible noise mitigation plan.
- All equipment must be maintained and adequately equipped to comply with noise level standards.

[1] A sensitive receptor location is an area where human activity may be adversely affected by elevated noise levels, including residences, parks, churches, etc.

- On-site construction activities should not create excessive, unnecessary noise (e.g., vehicles should not idle for excessive periods of time), and where activities may result in excessive noise levels, efforts to reduce the impact on sensitive noise receptors should be implemented using source and/or pathway controls.
- Construction field workers must be trained on minimizing construction site noise levels.
- Efforts to coordinate with nearby sensitive noise receptors and mitigate negative impacts should be undertaken.

The following additional measures, which go beyond typical construction techniques, would be implemented to the extent feasible as part of Project 1:

- To the extent practical, particularly noisy equipment, such as generators, cranes, trailers, concrete pumps, concrete trucks, and dump trucks, would be positioned away and shielded from sensitive receptor locations.
- Noise barriers would be used to provide shielding (e.g., 16-foot Conex trailer barriers at locations where particularly loud construction activities would occur near sensitive receptors).
- Noise curtains or equipment enclosures would be used to provide shielding to sensitive receptor locations.

The noise analyses described in this section and undertaken for this EIS reflect the benefits of such noise mitigation measures, which will be incorporated into the specifications for the DEP contractors.

Section 2.13 is organized as follows:

- Sections 2.13-1.1 and 2.13-1.2, which comprise the remainder of the "Introduction," describe noise fundamentals and the noise levels used in a New York City Environmental Quality Review (CEQR) analysis as well as the local town codes used for this noise analysis.
- Section 2.13-2, "Methodology," describes the methodology for analyzing potential noise impacts for Project 1.
- Sections 2.13-3 and 2.13-4 describe existing noise levels and potential future noise levels without and with Project 1 at both the west connection site and east connection site, respectively. The absolute noise levels and noise level increases that would result from construction of Project 1 at both connection sites are compared to relevant noise criteria and to noise levels in the surrounding area to quantify and identify potential temporary significant adverse noise impacts.
- Section 2.13-5 presents conclusions.

2.13-1.1 NOISE FUNDAMENTALS

EFFECTS OF NOISE ON PEOPLE

Quantitative information on the effects of airborne noise on people is well documented. If sufficiently loud, noise may adversely affect people in several ways. For example, noise may interfere with such activities as sleep, verbal communication, and tasks requiring concentration or coordination. It may also cause annoyance, hearing damage, and other physiological problems. Several noise scales and rating methods are used to quantify the effects of noise on people. These scales and methods consider such factors as loudness, duration, time of occurrence, and changes in noise level with time. However, all the stated effects of noise on people vary greatly with each individual.

NOISE MEASUREMENT

A number of factors affect sound as it is perceived by the human ear. These include the actual level of the sound (or noise), the frequencies involved, the period of exposure to the noise, and changes or fluctuations in the noise levels during exposure. Levels of noise are measured in units called decibels (dBs). Since the human ear cannot perceive all pitches or frequencies equally well, this measure is adjusted or weighted to correspond to human hearing. A measurement system that simulates the response of the human ear, the "A-weighted sound level" or "dBA," is used in view of its widespread recognition and its close correlation with human judgment of loudness and annoyance. In this construction noise analysis, all measured levels are reported in dBA or A-weighted decibels. Typical sound levels for various types of activities are shown in **Table 2.13-1**.

Table 2.13-1
Common Noise Levels

Sound Source	(dBA)
Military jet, air raid siren	130
Amplified rock music	110
Jet takeoff at 1,640 feet	100
Freight train at 100 feet	95
Train horn at 100 feet	90
Heavy truck at 50 feet	80-90
Busy city street, loud shout	80
Busy traffic intersection	70-80
Highway traffic or train at 50 feet	70
Predominantly industrial area	60
Light car traffic at 50 feet, city or commercial areas, or residential areas close to industry	50-60
Background noise in an office	50
Suburban areas with medium density transportation	40-50
Public library	40
Soft whisper at 15 feet	30
Threshold of hearing	0

Note: A 10 dBA increase in level appears to double the loudness, and a 10 dBA decrease halves the apparent loudness.
Source: Cowan, James P. *Handbook of Environmental Acoustics,* Van Nostrand Reinhold, New York, 1994.
Egan, M. David, Architectural Acoustics. McGraw-Hill Book Company, 1988.

RESPONSE TO CHANGES IN NOISE LEVELS

The average ability of an individual to perceive changes in noise levels is presented in **Table 2.13-2**. Generally, changes in noise levels of less than 3 dBA are barely perceptible to most listeners, and changes in noise levels of 10 dBA are normally perceived as doublings (or halvings) of noise loudness. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

Table 2.13-2
Average Ability to Perceive Changes in Noise Levels

Change (dBA)	Human Perception of Sound
2-3	Barely perceptible
5	Readily noticeable
10	A doubling or halving of the loudness of sound
20	A "dramatic change"
40	Difference between a faintly audible sound and a very loud sound

Source: Bolt Beranek and Neuman, Inc., *Fundamentals and Abatement of Highway Traffic Noise*, Report No. PB-222-703. Prepared for Federal Highway Administration, June 1973.

NOISE DESCRIPTORS

Because a sound pressure level measured in dBA describes a noise level at just one moment, and very few noises are constant, other ways of describing noise over more extended periods have been developed. One way of describing fluctuating sound is to describe the fluctuating noise heard over a specific period as if it is a steady, unchanging sound. For this condition, a descriptor called the "equivalent sound level," or "L_{eq}," can be computed. L_{eq} is the constant sound level in a given situation and period (e.g., 1 hour, denoted by $L_{eq(1)}$, or 24 hours, denoted by $L_{eq(24)}$) that conveys the same sound energy as the actual time-varying sound. **Figure 2.13-1** shows an example of the relationship between the instantaneous noise level over a measurement period and the L_{eq} over the same period. The measurement was performed on River Road North near the east connection site on the morning of October 24, 2011, using the same spot noise measurement procedures described in section 2.13-2, "Methodology." The figure shows that the instantaneous level may fluctuate, whereas the L_{eq} value includes all of the sound energy in all of the instantaneous levels during the measurement period.

Statistical sound level descriptors, such as L_1, L_{10}, L_{50}, L_{90}, and L_x, are sometimes used to indicate noise levels that are exceeded 1, 10, 50, 90, and X percent of the time, respectively. In addition, the L_{max} and L_{min} noise descriptors can be used to describe the maximum and minimum instantaneous noise levels, respectively, during a given period.

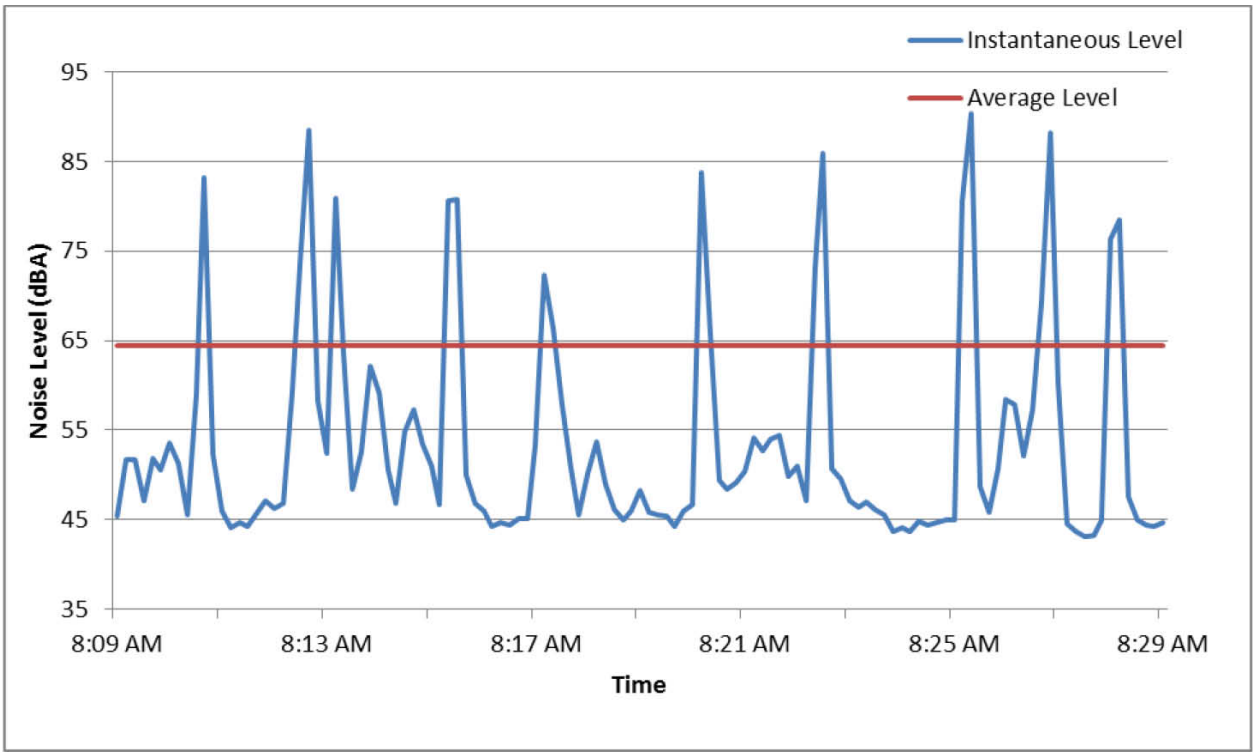


Figure 2.13-1 Instantaneous Noise Level vs. L_{eq}

back

The maximum 1-hour equivalent sound level ($L_{eq(1)}$) is the noise descriptor that best reflects human perception of environmental noise. This measure also includes all of the sound energy associated with construction activity, and provides an indication of highest expected incremental sound levels. Further, this is the measure recommended for use in the *CEQR Technical Manual* and the Federal Highway Administration's (FHWA) *Construction Noise Handbook* for construction noise impact evaluation. Consequently, for purposes of analyzing Project 1, the $L_{eq(1)}$ has been selected as the noise descriptor to be used for noise impact evaluation.

2.13-1.2 CONSTRUCTION NOISE IMPACT CRITERIA

For the purposes of this analysis, the suggested *CEQR Technical Manual* noise impact criteria, as well as the noise limits from the local town codes at each connection site, were considered along with the anticipated duration of the predicted noise impacts to evaluate potential temporary significant adverse impacts that may result from Project 1 construction. The following sections outline the town codes and provide information on *CEQR Technical Manual* noise impact criteria.

TOWN OF NEWBURGH TOWN CODE

Chapter 125 of the Town of Newburgh Town Code, "Noise and Illumination Controls," provides different permissible noise levels from 8 AM to 10 PM and from 10 PM to 8 AM, and makes a

further distinction of permissible levels by zoning district. The Code holds all noise, whether intermittent, impulsive, sporadic, or continuous, to the limits shown in **Table 2.13-3**. The west connection site is located in both the Business (B) and Agricultural Residential (AR) Districts. The Code states that the "sound level determination or measurement shall be conducted not nearer to the sound source than the closest property line of the parcel on which such noise is generated, except where otherwise specified" (§125-5.B). No measurement parameter (e.g., L_{max}, L_{eq}) is specified. It should be noted that the measured existing noise levels at most measurement locations in the west of Hudson study area along the Route 9W corridor (described later in this section) currently exceed these limits during the applicable time periods.

Table 2.13-3
Town of Newburgh
Maximum Sound Pressure Levels by Time and Zoning District

Time Period	AR District	B Districts
8 AM to 10 PM	65 decibels	80 decibels
10 PM to 8 AM	56 decibels	70 decibels
Source: §125-5 of Town of Newburgh Town Code.		

Sounds generated by construction activities during the period from 7 AM to 7 PM are exempt from the limitations of the Code as per §125-9.D(2). In addition, per §125-6.A, "noise emanating from the operation of motor vehicles on public highways and private roads" is regulated by the New York State Vehicle and Traffic Law and is therefore not subject to the Town of Newburgh noise regulations. However, the limitations identified in Table 2.13-3 were used in the analysis at the west connection site as appropriate to assist in determining potential temporary significant adverse impacts from mobile sources as well as the required stationary sources of noise associated with construction at the west connection site.

TOWN OF WAPPINGER TOWN CODE

Chapter 166, "Noise," of the Wappinger Town Code prohibits "any noise which can be heard by a person with normal hearing beyond the boundaries of property" (§166-2). The Code further restricts construction or demolition noise by stating that "Construction or demolition which emits such noises is prohibited between the hours of 7:00 PM and 7:00 AM, except in the event of an emergency requiring immediate construction or demolition" (§166-2.B). There are no provisions in Chapter 166 for variances or waivers of these limitations.

Chapter 240, "Zoning," includes a set of performance standards (Article XI, "Performance Standards") applicable to the operation of business and industrial uses and any activity associated with a business and industrial use. The standards applicable to noise are identified in §240-103.A, and "noises emanating from construction and construction maintenance activities between 8:00 AM and sunset" are exempted from the noise level regulations. The maximum permitted sound pressure levels in various octave bands included in §240-103.A are shown in **Table 2.13-4**. The sound pressure level limits below are specified in "old" octave bands. These bands have not been used in almost 40 years,

and instrumentation is no longer available to measure noise levels per these specifications. American National Standards Institute (ANSI) has promulgated a standard on the conversion of old octave bands to the current preferred values (and vice versa), to allow measurement and assessment. This conversion was done and the converted limits are shown in **Table 2.13-5**.

Table 2.13-4
Wappinger Town Code
Maximum Permitted Sound Levels ("Old" Octave Bands)

Octave Band (Hz)	Maximum Permitted Sound Pressure Level (dB)[1]
0 to 74	66
75 to 149	58
150 to 299	55
300 to 599	50
600 to 1199	45
1200 to 2399	42
2400 to 4799	38
4800 to 20000	35

Notes: [1]Maximum permitted sound pressure levels would be 6 dB less for locations within a residential district, or between the hours of 9 PM and 7 AM or at any time on a Sunday.
Source: §240-103.A(2) of Wappinger Town Code.

Table 2.13-5
Wappinger Town Code
Maximum Permitted Sound Levels

Octave Band (Hz)	Maximum Permitted Sound Pressure Level (dB)[1]
63	64
125	57
250	54
500	49
1000	44
2000	41
4000	37
8000	34

Notes: [1]Maximum permitted sound pressure levels would be 6 dB less for locations within a residential district, or between the hours of 9 PM and 7 AM or at any time on a Sunday.
Source: §240-103.A(2) of Wappinger Town Code and ANSI S1.6

For the purposes of this analysis, which was performed using broadband noise emission levels yielding A-weighted $L_{eq(1)}$ values, these limits were converted to dBA. The result is a limit of 51 dBA for non-residential districts during the daytime hours or 45 dBA on Sundays or during the nighttime hours. The 45 dBA limit would apply at all times in residential districts. While compliance or non-compliance with the converted dBA limits would not translate directly to compliance or non-compliance with the Code in each octave band, it is a reasonable approximation for the purposes of this analysis. It should be noted that the measured existing noise levels at most measurement locations in the east of Hudson study area, which are described later in this section, currently exceed these limits during the applicable time period. In the existing Wappinger Town Code, construction activity is exempt from these levels between 8 AM and sunset, and these maximum limits were used in the analysis as appropriate to assist in determining potential

temporary significant adverse noise impacts from both stationary (equipment) sources and mobile sources associated with the east connection site.

It is noted that the Town of Wappinger has indicated to DEP its intent to revise its Town Code. DEP understands that, at the time of the writing of this EIS, a draft set of Town Code revisions has been prepared by consultants to the town, but it has not yet been made available for public review.

CITY ENVIRONMENTAL QUALITY REVIEW

The *CEQR Technical Manual* suggests that significant noise impacts from construction would occur "only at sensitive receptors that would be subjected to high construction noise levels for an extensive period of time." In addition, the *CEQR Technical Manual* states that impact guideline for vehicular sources, using existing noise levels as the baseline, should be used for assessing construction impacts. The suggested impact guidelines are shown in **Table 2.13-6**.

Table 2.13-6
CEQR Noise Level Impact Guidelines (in dBA)

Time Period	Existing $L_{eq(1)}$	Impact Guideline $L_{eq(1)}$
7 AM – 10 PM	Less than or equal to 60	Existing + 5
	Between 60 and 62	65
	Greater than 62	Existing + 3
10 PM – 7 AM	Anything	Existing + 3

Source: *CEQR Technical Manual*.

The impact guidelines in the *CEQR Technical Manual* were used to help determine potential temporary significant adverse impacts from both stationary (equipment) sources and mobile sources associated with both connection sites.

In addition to the CEQR incremental noise increase guidelines, the *CEQR Technical Manual*'s suggested acceptable interior noise level guideline for residential uses was also considered in this analysis. The manual recommends an interior noise limit of 45 dBA $L_{10(1)}$, where $L_{10(1)}$ is the noise level exceeded 10 percent of the time over a 1-hour period. This CEQR guideline was compared to predicted interior $L_{10(1)}$ noise levels from external sources during the construction period to determine whether interior noise levels at nearby residential receptors would be acceptable according to CEQR guidelines.

2.13-2 METHODOLOGY

The noise analysis for Project 1, Shaft and Bypass Tunnel Construction was performed following U.S. Environmental Protection Agency (EPA) and *CEQR Technical Manual* suggested procedures and analytical tools, as further discussed below, to determine source emission levels. The estimated source noise levels were then used as input to a computerized noise level prediction and assessment model to determine the potential impacts at the two study areas.

This section presents details relevant to the on-site source and on-road source construction noise analysis methodology. The on-site noise analysis was conducted to evaluate potential temporary significant adverse noise impacts from construction activities at both the west connection site and the east connection site. As described in the evaluation of construction air quality impacts (see Section 2.11, "Air Quality," and Appendix 2.11), construction of Project 1 would entail a number of activities at both the connection sites. Noise sources would include the equipment listed in **Table 2.13-7** as well as trucks traveling to and from a connection site and moving about on-site construction areas. The on-road noise analysis was also conducted to ensure that combined impacts from on-site and on-road sources were determined where applicable for each of the study areas.

Table 2.13-7
Construction Equipment Noise Emission Levels

Construction Equipment	L_{max} Noise Level at 50 Feet (dBA)
Backhoe	80
Chipper	88[2]
Compressors	58[1]
Concrete Batch Plant	83
Concrete Mixer Truck	85
Concrete Pump	82
Crane	85
Crane (shaft crane)	71[2]
Bulldozer	85
Drill Jumbo	91[2]
Drill Rig Truck	84
Drum Mixer	80
Dump Truck	84
Excavator	85
Fuel Truck (flatbed truck)	84
Forklift	64[2]
Front End Loader	80
Generator	65[2]
Grader	85
Impact Pile Driver	82[2]
Lift	85
Paver	82
Pickup Truck	55
Power Plant	77[2]
Pump	77
Rock Crusher	91[2]
Roller/Compactor	85
Shaft Jumbo	93[2]
Tractor Trailer	84
Ventilation System	82[2]
Vibratory Sheeting Driver	95
Water Jet	78
Welder/Torch	73
Winch	70[2]

Notes:
[1] Level mandated by New York City Noise Code.
[2] Level supplied by vendor information.
Sources:
Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006, and Federal Highway Administration Roadway Construction Noise Model (FHWA RCNM), 2006.

2.13-2.1 CONSTRUCTION NOISE SOURCES

Construction activities for Project 1 would result in increased noise levels caused by: (1) the operation of construction equipment on each connection site, including construction-related trucks, and (2) the movement of construction-related vehicles (i.e., worker trips, and material and equipment trips) on the surrounding roadways adjacent to the connection sites during construction. The noise emission levels of typical construction equipment likely to be used as part of the construction of Project 1 are shown above in Table 2.13-7.

2.13-2.2 CONSTRUCTION NOISE ASSESSMENT PERIODS

Noise levels caused by construction activities for Project 1 would vary widely depending on the phase of construction, time of day, and the location of the construction relative to receptor locations.

The potential worst-case analysis periods during each phase of construction were determined through a screening analysis of the construction equipment estimates throughout the construction period. The screening analysis consisted of examining the construction equipment expected to be used during each construction phase and then selecting the periods when the greatest number of the loudest pieces of equipment would be used (including generators, rock crushers, pile drivers, shaft jumbos, excavators, graders, pavers, drill jumbos, bulldozers, wood chippers, and concrete mixers). The periods with the greatest number of the loudest pieces of equipment are expected to be times when the greatest impacts within each construction phase would occur. To ensure a conservative analysis, the maximum estimated construction-related truck traffic data was also used in all analyzed construction phases.

However, there will be periods of construction when work would be less intensive. Therefore, in addition to the worst-case analysis periods, the potential noise impacts during other "off-peak" periods within each phase of construction were evaluated as necessary. The potential temporary noise impacts predicted during these off-peak periods of construction were also evaluated for the anticipated work hours by construction phase. The duration of worst-case and off-peak construction period noise impacts during the expected construction phases and work periods were used to help determine potential temporary significant adverse impacts from both stationary (equipment) sources and mobile sources associated with both connection sites.

Since DEP is concurrently undertaking design of the proposed bypass tunnel construction and connection while the EIS was under preparation, many measures have been incorporated into the Project 1 design that have substantially reduced the potential for additional temporary significant adverse impacts resulting from the construction of Project 1. These included eliminating the need for additional shafts at both connection sites and employing inundation plugs instead; limiting work hours at the east connection site for phases of work that do not delay completion of Project 1; limiting truck traffic to and from the east connection site between 11 PM and 7 AM; committing to tree clearing at both connection sites during seasonal periods that would not disturb potential Indiana bat populations; and utilizing connection sites already under DEP ownership or sold to DEP by willing sellers.

2.13-2.3 DEVELOPMENT OF NOISE SOURCE LEVELS AND SELECTION OF ANALYSIS PERIODS

Project 1's construction noise analyses use a noise source estimation method and a modeling approach that have been previously used for evaluating noise impacts of construction projects in New York State. Because the level of construction activities for Project 1 would vary from month to month, the time periods when the greatest noise impacts are expected were used to develop the analysis by following the methodology described above for each construction phase. Information from Section 2.1, "Description of Project 1 Construction Program," and Section 2.10, "Transportation," was used for the noise impact assessment.

In general, the level of noise generated by the operation of on-site construction equipment at a specific receptor location near a construction site is calculated by computing the logarithmic sum of the noise produced by all pieces of equipment operating at the construction site. For each piece of equipment, the noise levels at a receptor site are a function of:

- The noise emission level of the equipment;
- A usage factor, which accounts for the percentage of time the equipment is operating;
- The distance between the piece of equipment and the receptor;
- Topography and ground effects; and
- Shielding (i.e., intervening objects blocking the line of sight between the equipment and the receptor).

Similarly, noise levels from on-site and on-road traffic are a function of:

- The noise emission levels of the type of vehicle (i.e., auto, light-duty truck, heavy-duty truck, bus, etc.)
- Vehicular speed;
- The distance between the roadway and the receptor;
- Topography and ground effects; and
- Shielding.

2.13-2.4 MODEL SELECTION AND DEVELOPMENT

Noise effects due to Project 1 construction activities (on-site equipment as well as on-site and on-road vehicular sources) were evaluated using the CadnaA computerized model, a state-of-the-art analysis tool for noise prediction and assessment developed by DataKustik. The model can be used for the analysis of a wide variety of noise sources, including stationary sources (such as construction equipment, industrial equipment, and power generation equipment), transportation sources (such as roads, highways, railroad lines, busways, and airports), and other specialized sources (such as sporting facilities). The major factors that the model takes into account are:

- Noise emission levels of the noise sources;

- Attenuation (or reduction of noise) with distance;
- Ground contours;
- Reflections from barriers and structures (and from terrain across the Hudson River at the east connection site); and
- Attenuation due to shielding.

The CadnaA model is based on the acoustic propagation standards promulgated in International Standard ISO 9613-2. This standard is currently under review for adoption by the ANSI as an American standard.

The geographic data used to develop the CadnaA model included CAD drawings of connection site work areas by construction period, adjacent building footprints and heights, changes in grade elevations by construction phase, locations of streets, and locations of sensitive receptors. For each analysis period, the location and characteristics for each piece of construction equipment, including noise emission levels and equipment usage rates as well as noise control measures, were input to the model. In addition, noise that would be reflected or shielded by barriers erected on the construction site or adjacent buildings is accounted for in the model. To complete the model, construction-related vehicles were assigned to the adjacent roadways based on their routes described in Section 2.10, "Transportation."

Future noise levels during the construction period were examined as follows:

- The model determined A-weighted $L_{eq(1)}$ noise levels for each analysis period, at each receptor location, as well as the contribution from each noise source.
- The construction-generated levels were added to existing levels to predict future $L_{eq(1)}$ noise levels during the construction period.
- The incremental change in $L_{eq(1)}$ noise levels resulting from construction activity was calculated by subtracting measured existing $L_{eq(1)}$ noise levels from predicted $L_{eq(1)}$ noise levels during the construction period.
- Future exterior $L_{10(1)}$ noise levels during the construction period were calculated by adding the predicted incremental change in noise levels to the measured existing $L_{10(1)}$ noise levels.
- Predicted interior $L_{10(1)}$ noise levels from exterior sources were calculated by subtracting 12 dBA for an open window condition or 24 dBA for a closed window condition[2] from the predicted exterior noise levels. (Such predicted interior $L_{10(1)}$ noise levels are those resulting only from exterior noise entering the dwelling. In cases when interior noise levels from external sources are relatively low, interior noise levels may actually be dominated by sources of noise within the dwelling itself, such as appliances, HVAC systems, or speech.)

[2] "Protective Noise Levels," EPA 550/9-79-100, November 1979.

2.13-2.5 SELECTION OF NOISE RECEPTOR LOCATIONS

The receptor sites were chosen based on their proximity to areas with the highest potential for noise impacts during construction (i.e., closest sensitive receptors and major feeder streets to the two connection sites). The selected noise receptor sites are all in residential areas or locations, which are representative of other sensitive noise receptors in the immediate study areas, and are generally the locations where maximum noise impacts from Project 1 would be expected.

Thirteen noise receptor sites were selected for noise impact assessment purposes: five in the west of Hudson study area and eight in the east of Hudson study area. The noise receptor sites in the west of Hudson study area are shown in **Figure 2.13-2** and listed in **Table 2.13-8**. The noise receptor sites in the east of Hudson study area are shown in **Figure 2.13-3** and listed in **Table 2.13-9**. In addition to the discrete noise receptor sites analyzed, construction noise levels for each shift of the worst-case period for each phase of construction at each connection site were calculated for wide areas surrounding the sites, and are shown in noise contour maps, as described below.

Table 2.13-8
Discrete Noise Receptor Sites Near the West Connection Site

Noise Receptor	Location	Land Use(s) Represented	Type of Measurements
1^W	165 Lattintown Road	Residential	24-hour
2^W	Route 9W between the 5503 Route 9W property driveway and Pine Road	Residential	24-hour
3^W	Pine Road west of Route 9W	Residential	None[1]
4^W	65 Lockwood Lane	Residential	None[1]
5^W	Route 9W between Highland Avenue and the 5503 Route 9W property driveway	Residential	None[2]

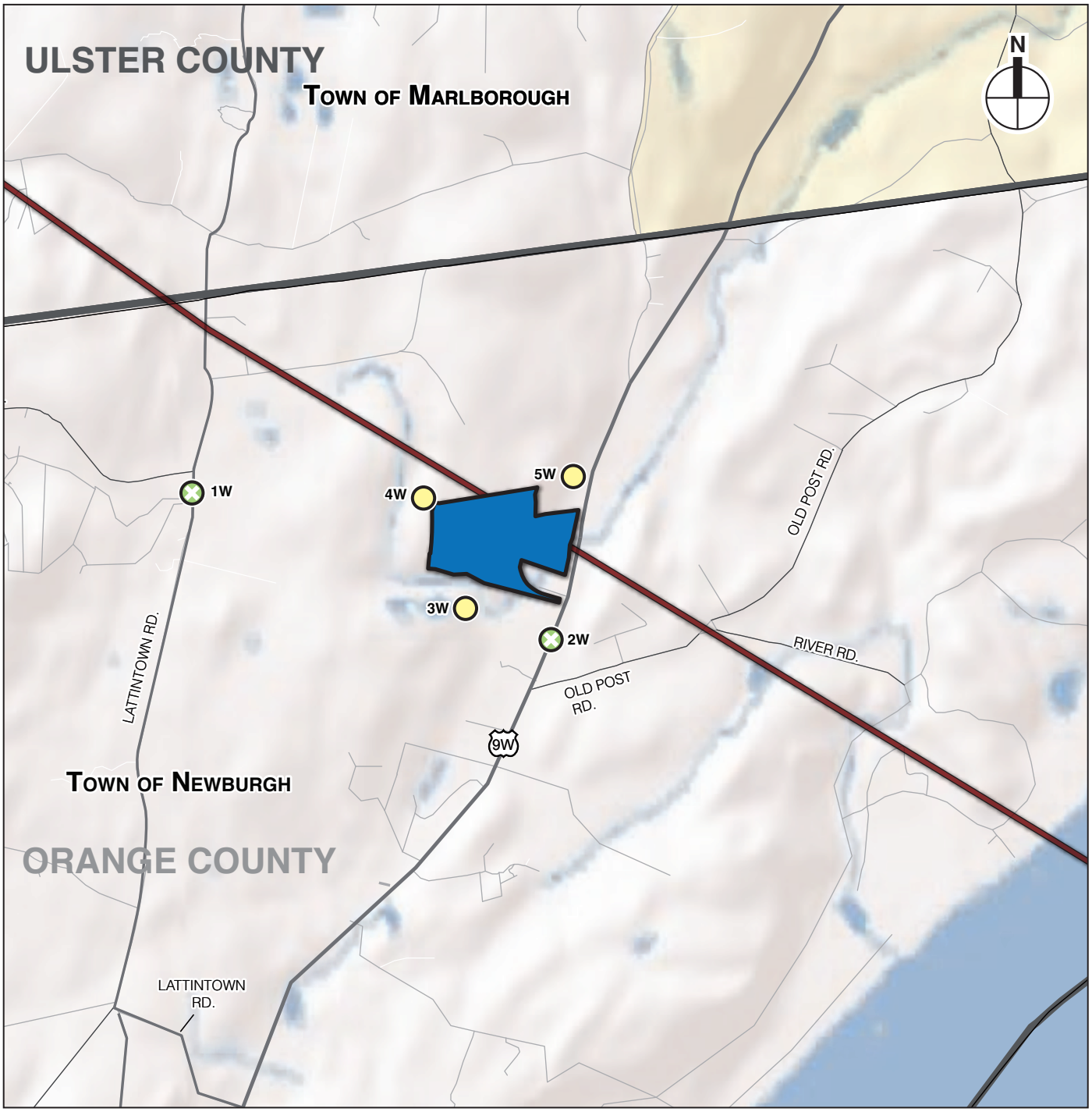
Notes:
[1] Noise measurements at comparable 1^W for baseline noise levels.
[2] Noise measurements at comparable 2^W for baseline noise levels.

Table 2.13-9
Discrete Noise Receptor Sites Near the East Connection Site

Noise Receptor	Location	Land Use(s) Represented	Type of Measurements
1^E	River Road North at Old State Road	Residential	24-hour
2^E	Liberty Street at Chelsea Road	Residential	20-minute measurements between 6 AM and 9 AM and 2 PM and 8 PM[3]
3^E	River Road North at Sky Top Drive	Residential	24-hour
4^E	30 Cobblestone Road	Residential	20-minute measurements between 6 AM and 9 AM and 2 PM and 8 PM[3]
5^E	191 River Road North	Residential	Continuous measurement between 8 AM and 7 PM[3]
6^E	198 River Road North	Residential	None[1]
7^E	217 River Road North	Residential	Continuous measurement between 8AM and 7PM[3]
8^E	219 River Road North	Residential	None[2]

Notes:
[1] Noise measurements at site 3^E provided baseline noise levels.
[2] Noise measurements at site 7^E provided baseline noise levels.
[3] Baseline levels during other times of day based on the hour-to-hour variation at a nearby comparable 24-hour continuous measurement location.

11.15.11



East Connection Site

Delaware Aqueduct
Rondout-West Branch Tunnel

Noise Receptor Location
(No Noise Measurement)

Noise Receptor Location
(Continuous Noise Monitoring)

Figure 2.13-2

West Connection Site: Noise Receptor Locations

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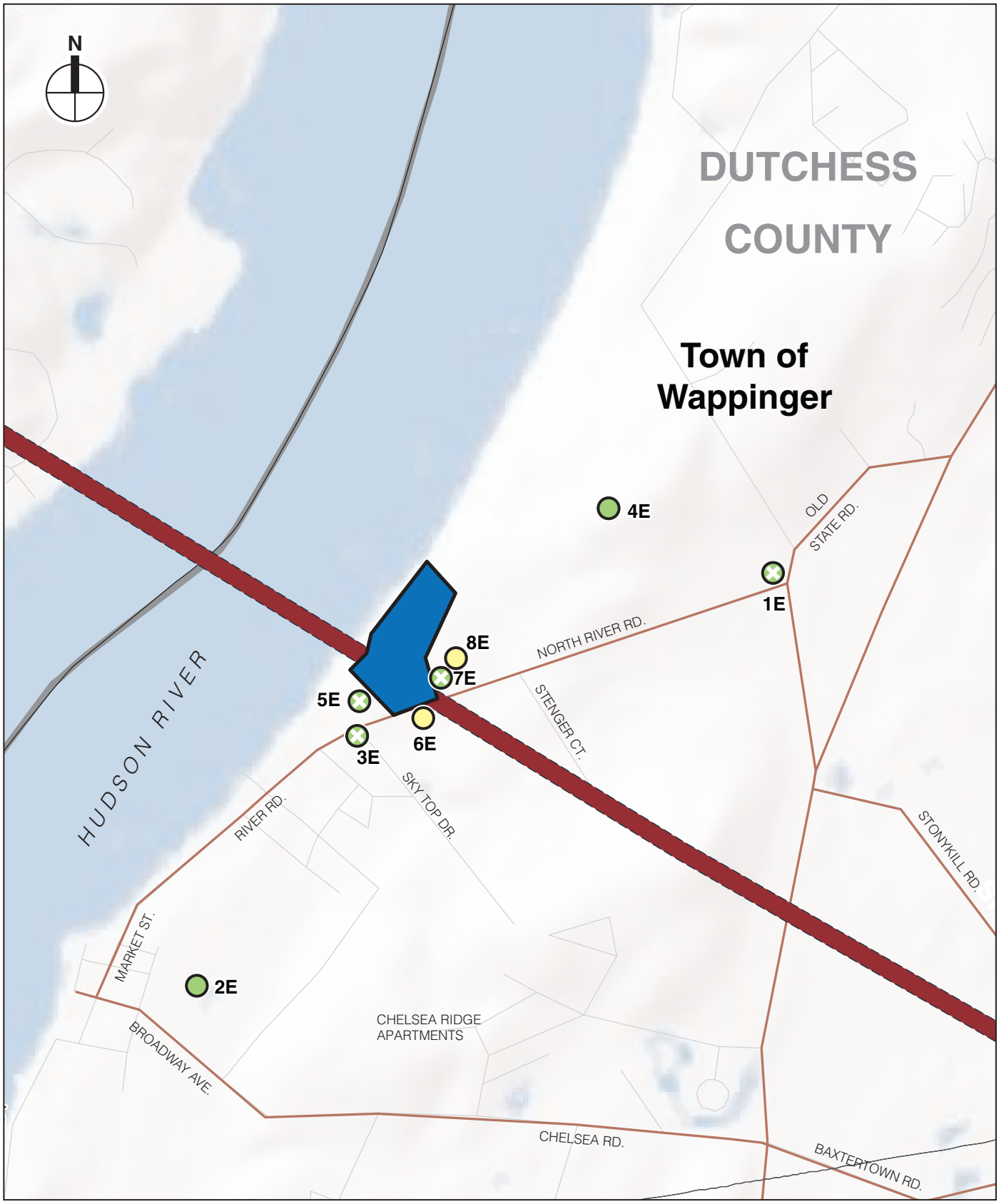

East Connection Site

Delaware Aqueduct
Rondout-West Branch Tunnel

Noise Receptor Location (No Noise Measurement)

Noise Receptor Location (Spot Noise Monitoring)

Noise Receptor Location
(Continuous Noise Monitoring)

0 1/2 MILE
SCALE

Figure 2.13-3

East Connection Site: Noise Receptor Locations

2.13-2.6 NOISE MEASUREMENT SITES

WEST OF HUDSON STUDY AREA (WEST CONNECTION SITE)

Existing noise levels at two of the five noise receptor locations in the west of Hudson study area were measured to determine the baseline noise levels against which predicted construction-generated noise levels were later compared. The locations where existing measurements were based on other comparable locations are described below. Existing noise levels at the other three receptor locations near the west connection site were estimated based on measured levels at nearby receptors as they were not readily accessible or required for noise measurements, since the other locations provided applicable noise measurements for existing conditions. The measured existing noise levels and projected construction-generated noise levels were used to determine the estimated incremental noise levels and durations of such noise expected with Project 1 construction on the west connection site.

As shown in Table 2.13-8, continuous 24-hour noise measurements were performed at two noise receptor sites in the west of Hudson study area in the vicinity of the west connection site and along expected auto and truck routes from the construction of Project 1 near potentially sensitive uses. A description and background information for each of the noise measurement sites is provided below.

- Site (Receptor) 1^W is located at 165 Lattintown Road. It is in a fairly quiet residential area with limited traffic, which is the dominant noise source.
- Site (Receptor) 2^W is located on Route 9W between the private driveway providing access to the 5503 Route 9W property and Pine Road. Traffic on U.S. Route 9W is the dominant noise source.
- Site (Receptor) 3^W is located on Pine Road west of U.S. Route 9W. Performing noise measurements at this location was not required, since noise levels are expected be dominated by traffic on Route 9W. Due to the distance from Route 9W, this location is expected to have similar noise levels to those at Site 1^W.
- Site (Receptor) 4^W is located at 65 Lockwood Lane. Performing noise measurements at this location was not required, since noise levels are expected to be dominated by traffic on Lockwood Lane, which is a relatively quiet street, and consequently this location is expected to have similar noise levels to those at Site 1^W.
- Site (Receptor) 5^W is located on U.S. Route 9W between Highland Avenue and the 5503 Route 9W property driveway. Performing noise measurements at this location was not required, since noise levels are expected to be dominated by traffic on U.S. Route 9W, and consequently this location is expected to have similar noise levels to those at Site 2^W.

EAST OF HUDSON STUDY AREA (EAST CONNECTION SITE)

Existing noise levels at six of the eight noise receptor locations in the east of Hudson study area were measured to determine the baseline noise levels against which predicted construction-generated noise estimates were later compared. Existing noise levels at the other two receptor locations near the east connection site were estimated based on measured levels at nearby receptors as they were not readily accessible or required for noise measurements, since the other locations provided applicable noise measurements for existing conditions. The locations where existing measurements were based on other comparable locations are described below. The measured existing noise levels and projected construction-generated noise levels were used to determine the estimated incremental noise levels and durations of such noise expected with Project 1 construction on the east connection site.

As shown in Table 2.13-9, continuous 24-hour noise measurements were performed at two noise receptor sites in the east of Hudson study area. Shorter duration (8 AM to 7 PM) continuous noise measurements were performed at two noise receptor sites near the east connection site, and 20-minute spot noise measurements were performed at two noise receptor sites near the east connection site in the vicinity of the potential connection site and along expected auto and truck routes from the construction of Project 1 near potentially sensitive uses. At locations where spot measurements or shorter duration continuous measurements were performed, baseline noise levels for other times of the day were developed by adjusting the measured levels based on the hour-to-hour variation in noise levels at a nearby comparable location where a 24-hour continuous noise measurement was performed. For instance, if noise levels during the 11 PM to 7 AM time period were 10 dBA lower than those during the 3 PM to 11 PM time period at a nearby comparable receptor, then the measured level during the 3 PM to 11 PM time period at the receptor in question was adjusted lower by 10 dBA to estimate the level during the 11 PM to 7 AM time period.

A description and background information for each of the noise measurement sites is provided below.

- Site (Receptor) 1^E is located at the corner of River Road North and Old State Road. It is in a fairly quiet residential area with limited traffic, which is the dominant noise source.
- Site (Receptor) 2^E is located on Liberty Street at Chelsea Road. It is in a fairly quiet residential area with limited traffic, which is the dominant noise source.
- Site (Receptor) 3^E is located on River Road North at Sky Top Drive near the Shaft 6 site (i.e., east connection site). It is in a fairly quiet residential area with limited traffic, which is the dominant noise source.
- Site (Receptor) 4^E is located at 30 Cobblestone Road. It is in a fairly quiet residential area with limited traffic, which is the dominant noise source.

- Site (Receptor) 5^E is located at 191 River Road North immediately south of the Shaft 6 site (i.e., east connection site). It is in a fairly quiet residential area with limited traffic, which is the dominant noise source.
- Site (Receptor) 6^E is located at 198 River Road North immediately across from the Shaft 6 site (i.e., east connection site). It is in a fairly quiet residential area with limited traffic, which is the dominant noise source.
- Site (Receptor) 7^E is located at 217 River Road North immediately north of the Shaft 6 site (i.e., east connection site). It is in a fairly quiet residential area with limited traffic, which is the dominant noise source.
- Site (Receptor) 8^E is located at 219 River Road North north of the Shaft 6 site (i.e., east connection site). It is in a fairly quiet residential area with limited traffic, which is the dominant noise source.

2.13-2.7 CONTINUOUS NOISE MEASUREMENT PROCEDURE

The following continuous measurement procedure was used:

- Calibrate noise meter at the beginning of the 24-hour and 8 AM to 7 PM noise monitoring periods.
- Annotate site-specific information, such as location, date, time, weather conditions, direction of traffic, and distance of microphone to curb or nearest traffic lane.
- Begin L_{eq}, L_1, L_{10}, L_{50}, L_{90}, L_{min}, and L_{max} noise measurements, with automatic data logging at 20-minute intervals (the meter operated unattended for the measurement period).
- Perform calibration check at the end of the noise monitoring period.

Noise monitoring was not performed when:

- Area pavement was not generally dry;
- Winds were greater than 12 miles per hour;
- Relative humidity exceeded 90 percent; and
- There was non-typical noise, such as that caused by construction, sirens, idling trucks, or airplane over-flights.

However, since noise monitoring lasted over an extended period, it would not be unusual for any of the conditions above to have occurred temporarily.

2.13-2.8 SPOT NOISE MEASUREMENT PROCEDURE

Noise measurements for construction mobile source noise analyses were taken during potential peak construction worker and truck travel periods—AM (6 AM to 9 AM) and PM (2 PM to 8 PM) on a typical weekday (i.e., Tuesday, Wednesday, or Thursday). The lowest measured noise

levels during these periods and the continuous measurements described above provide conservative baseline noise levels for comparison to noise levels expected by construction. Noise measurements were taken for 20 minutes.

The following measurement procedure was used:

- Set up instrumentation and microphone and calibrate.
- Annotate site-specific information, such as location, date, time, weather conditions, direction of traffic, and distance of microphone to curb or nearest traffic lane.
- Begin L_{eq}, L_1, L_{10}, L_{50}, L_{90}, L_{min}, and L_{max} noise measurements, noting horns, sirens, or other unusual noise events; the noise contribution from sirens, horns, aircraft flyovers, etc. was not included in the spot-measurements.
- Classify and count passing vehicles on the nearest roadway. The vehicle categories counted were: passenger cars, light trucks and vans; medium trucks (cargo vehicles with two axles and six tires); heavy trucks (cargo vehicles with three or more axles); and buses.
- Stop sampling and note L_{eq}.
- Check calibration.

Noise monitoring was not performed when:

- Area pavement was not generally dry;
- Winds were greater than 12 miles per hour;
- Relative humidity exceeded 90 percent; and
- There was non-typical noise, such as that caused by construction, sirens, idling trucks, or airplane over-flights.

2.13-2.9 EQUIPMENT USED DURING NOISE MONITORING

Measurements were performed using Brüel & Kjær Sound Level Meters (SLMs) Type 2260 (S/Ns 2384814 and 2375602), Brüel & Kjær Sound Level Calibrators Type 4231 (S/Ns 2412436, 2688762, and 2001692), Brüel & Kjær ½-inch microphones Type 4189 (S/Ns 2378182, 2385722, and 2021267). The Brüel & Kjær SLMs are Type 1 instruments according to ANSI Standard S1.4-1983 (R2006). For all receptor sites, the instrument/microphone was mounted at a height of at least 5 to 6 feet above the ground. Microphones were mounted at least approximately 5 feet away from any large reflecting surfaces. The SLMs were last factory calibrated on July 22, 2010, July 30, 2010, and July 22, 2010, respectively, which were valid through July 2011[3]. The calibration of the SLMs was field-checked before and after readings using the Brüel & Kjær Type 4231 sound level calibrator with the appropriate adaptors. Measurements at each location

[3] Noise monitoring was performed between December 2010 and June 2011.

were made on the A-scale (dBA). The data were digitally recorded by the sound level meters and displayed at the end of the measurement period in units of dBA. Measured quantities included L_{eq}, L_1, L_{10}, L_{50}, and L_{90} levels. A windscreen was used during all sound measurements except for calibration. All measurement procedures were based on the guidelines outlined in ANSI Standard S1.13-2005.

2.13-2.10 NOISE REDUCTION MEASURES

As discussed above, DEP has determined that construction associated with Project 1 would be required to conform to the noise reduction requirements of the New York City Noise Control Code. Outlined below is a list of source controls, including noise reduction measures required by the New York City Noise Control Code, and path controls that would occur with construction.

SOURCE CONTROLS

In terms of source controls (methods to reduce noise levels at the noise source or during most sensitive time periods), the following types of measures would be required during Project 1 construction:

- DEP would require construction equipment noise emissions levels to meet the mandated New York City Noise Control Code levels. Table 2.13-3 shows the noise levels for typical construction equipment and the mandated noise levels under the New York City Noise Control Code for the equipment that would be used for construction of Project 1.
- DEP would require all contractors and subcontractors to properly maintain their equipment.

PATH CONTROLS

In terms of path controls (e.g., placement of equipment and implementation of barriers between equipment and sensitive receptors), the following measures, which go beyond typical construction techniques, would be implemented to the extent feasible:

- Particularly noisy equipment, such as generators, cranes, trailers, concrete pumps, concrete trucks, and dump trucks, would be shielded and positioned away from sensitive receptor locations.
- Noise barriers would be used to provide shielding (e.g., 16-foot Conex trailer barriers at locations where particularly loud construction activities would occur near sensitive receptors).
- Noise curtains, equipment enclosures, would be used to provide shielding to sensitive receptor locations.

2.13-3 WEST OF HUDSON

2.13-3.1 EXISTING CONDITIONS—WEST OF HUDSON

Table 2.13-10 presents the location of each noise receptor in the west of Hudson study area and summarizes the lowest monitored existing noise levels (in $L_{eq(1)}$) during each of the three potential construction shifts at the noise receptor locations. The lowest existing noise levels in an analysis time period were selected to conservatively estimate future without Project 1 noise levels and, in turn, potential Project 1-related noise increments. The complete set of the noise measurements is provided in Appendix 2.13, "Noise."

Table 2.13-10
West Connection Site
Existing Noise Levels (in dBA)

Site	Measurement Location	Time	Measured Existing $L_{eq(1)}$
1^W	165 Lattintown Road	First shift (7 AM to 3 PM)	61.4
		Second shift (3 PM to 11 PM)	57.8
		Third shift (11 PM to 7 AM)	48.6
2^W	Route 9W between 5503 Route 9W property driveway and Pine Road	First shift (7 AM to 3 PM)	74.2
		Second shift (3 PM to 11 PM)	71.2
		Third shift (11 PM to 7 AM)	65.8
3^W	Pine Road west of Route 9W[1]	First shift (7 AM to 3 PM)	61.4
		Second shift (3 PM to 11 PM)	57.8
		Third shift (11 PM to 7 AM)	48.6
4^W	65 Lockwood Lane[1]	First shift (7 AM to 3 PM)	61.4
		Second shift (3 PM to 11 PM)	57.8
		Third shift (11 PM to 7 AM)	48.6
5^W	Route 9W between Highland Avenue and 5503 Route 9W property driveway[2]	First shift (7 AM to 3 PM)	74.2
		Second shift (3 PM to 11 PM)	71.2
		Third shift (11 PM to 7 AM)	65.8

Notes:
[1] Baseline levels based on site 1^W.
[2] Baseline levels based on site 2^W.

As discussed earlier in this section, at locations where no noise level measurements were performed, baseline levels were estimated based on measured levels at a similar, nearby location.

2.13-3.2 FUTURE WITHOUT PROJECT 1, SHAFT AND BYPASS TUNNEL CONSTRUCTION—WEST OF HUDSON

In the future without Project 1, noise levels are expected to be similar to existing noise levels shown in Table 2.13-10, mainly because land uses are expected to remain generally the same in the area surrounding the west connection site. While the traffic analysis in Section 2.10, "Transportation," assumed a growth rate in traffic, this additional traffic would not significantly change the estimated existing conditions noise levels. The noise assessment conservatively assumed the existing noise levels for the future without Project 1 conditions; however, this

conservative choice would not affect the determination of potential temporary significant adverse noise impacts from the construction of Project 1.

2.13-3.3 PROBABLE IMPACTS OF PROJECT 1, SHAFT AND BYPASS TUNNEL CONSTRUCTION—WEST OF HUDSON

This section summarizes the potential noise impacts that could result from Project 1's construction activities at the west connection site. The most likely effects on local noise levels during construction activities would result from:

- Noise emissions generated by on-site construction equipment and from trucks entering and leaving the west connection site during construction; and
- Noise emissions generated by project-related construction trucks and worker vehicles traveling on local roads to and from the west connection site.

An analysis of the potential for noise impacts from on-site construction sources was performed using the methodology described above. Four phases of construction were modeled, including:

- Phase 1: Site Preparation (7 AM to 11 PM only);
- Phase 2: Shaft Construction (24 hours/day);
- Phase 3: Bypass Tunnel Excavation (24 hours/day); and
- Phase 4: Bypass Tunnel Lining (24 hours/day), Project 1 Demobilization, and Preparation for Project 2B.

In reality, noise levels in the first shift are not anticipated to reach maximum sustained levels until later in the shift after construction workers arrive at the site and are given pre-shift briefings of the day's activities. Similarly, maximum sustained levels during the second shift would more than likely occur in the earlier portion of that shift and are less likely to occur in the hour between 10 PM and 11 PM.

Figures 2.13-4, 2.13-5, 2.13-6, and **2.13-7** depict the west connection site, the location of likely on-site noise sources during the worst-case period in each phase of construction, and the roadways that construction-generated traffic would utilize near the site for each of the four phases of construction.

MODELING RESULTS

Following the methodology described above, the noise analysis first examined the worst-case period expected to occur in each phase of construction. This results in a conservative estimation of noise impacts for each construction phase. However, during each phase the worst-case period may occur only for a portion of the phase. Specifically, at the west connection site, it is expected that Phase 1: Site Preparation would last approximately 14 months, but the analyzed worst-case period would last approximately 4 months. Phase 2: Shaft Construction would last approximately 13 months with no period of lesser intensity construction in that phase. Phase 3: Bypass Tunnel Excavation would last

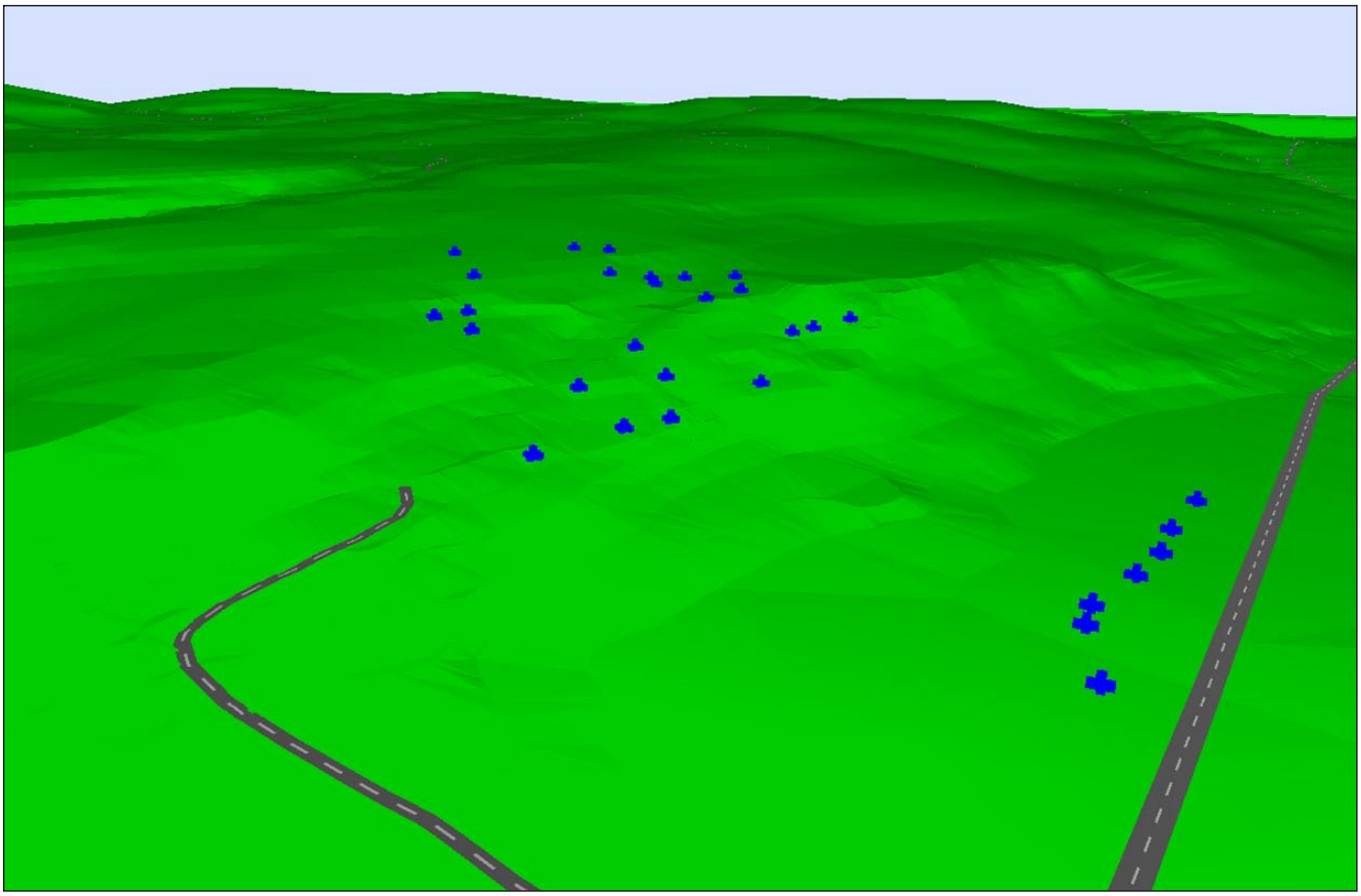

Figure 2.13-4
West Connection
Site Preparation (Phase 1) Model Input

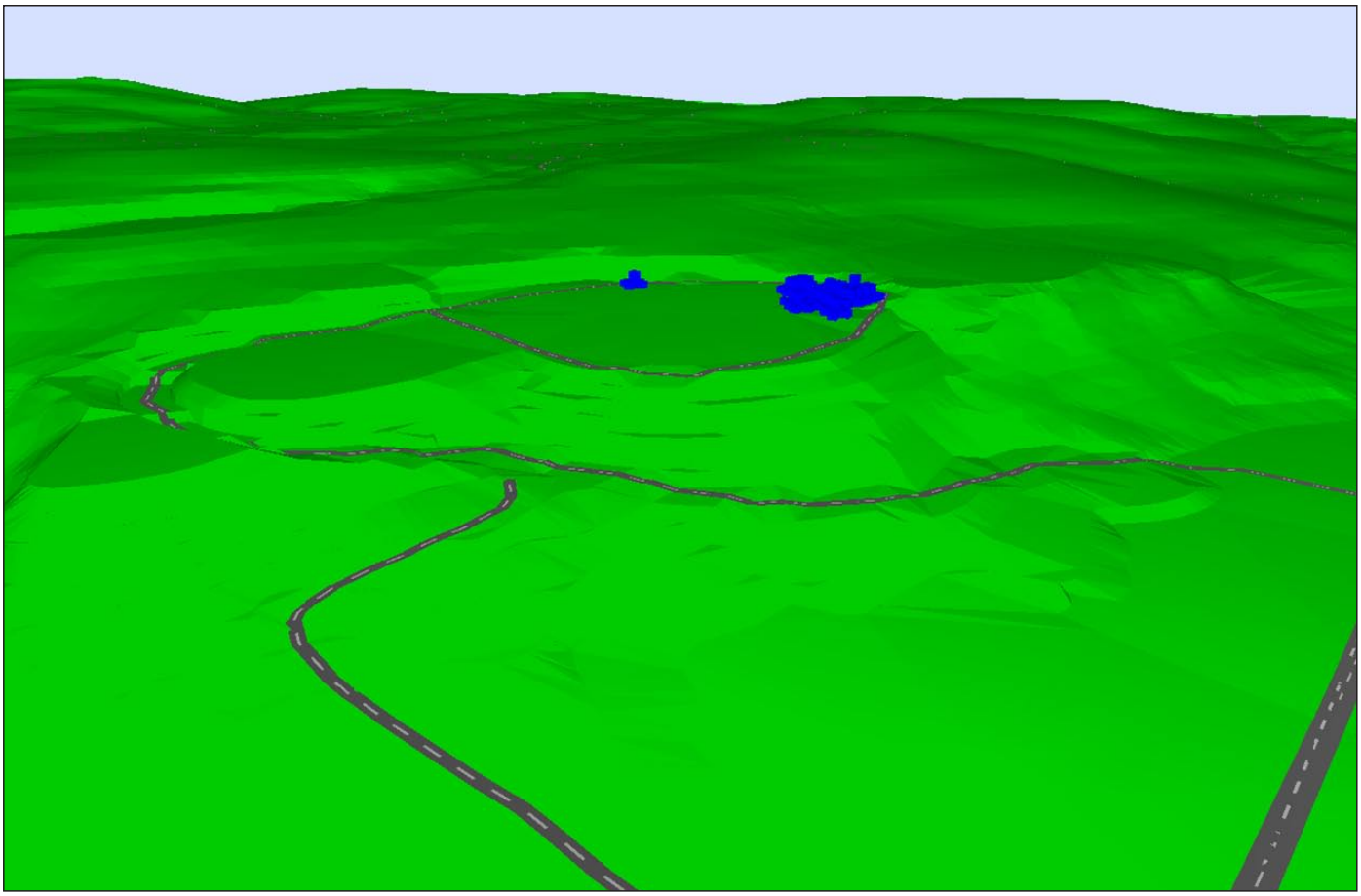

Figure 2.13-5
West Connection
Shaft Construction (Phase 2) Model Input

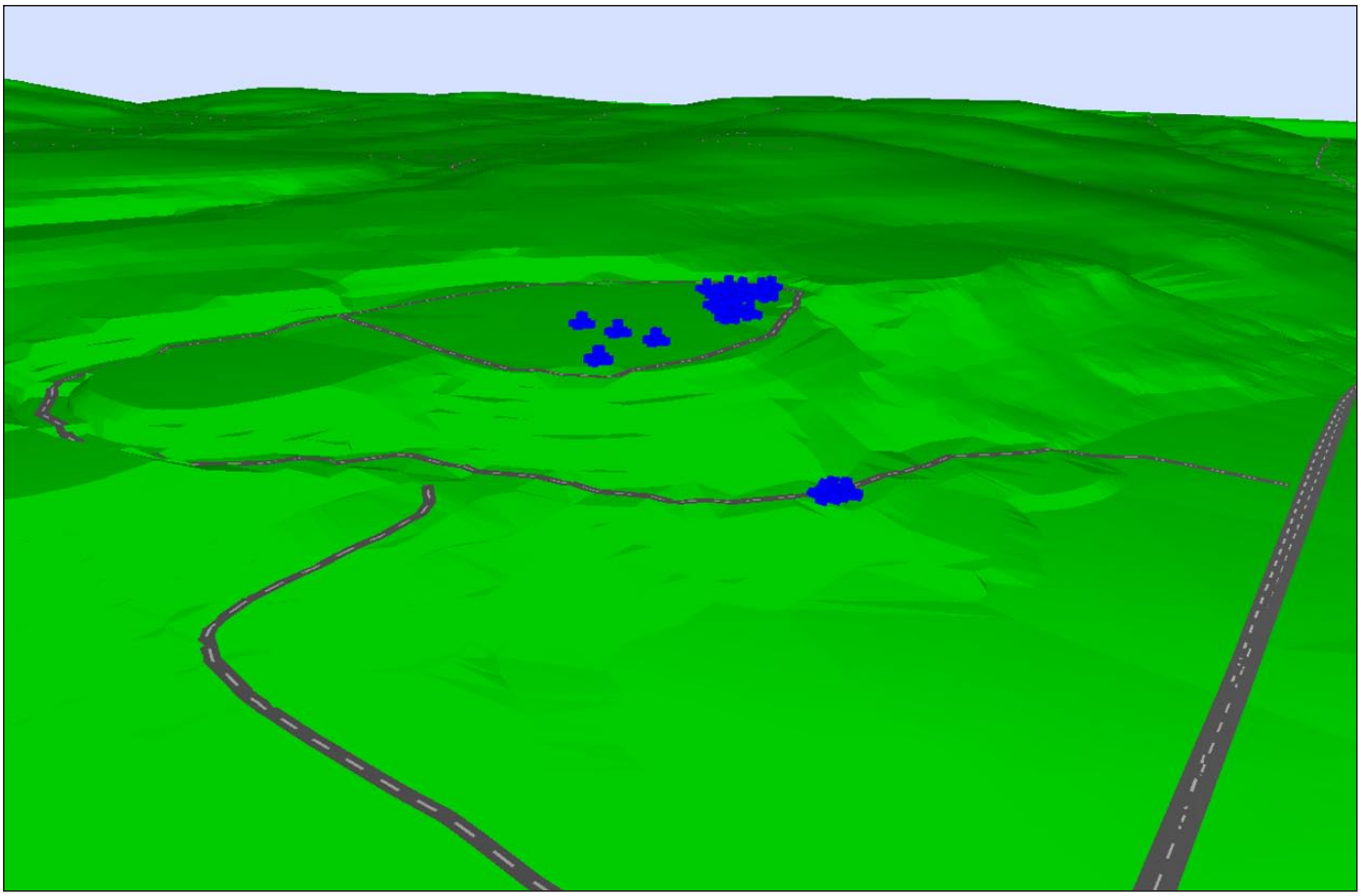

Figure 2.13-6
West Connection
Tunnel Excavation (Phase 3) Model Input

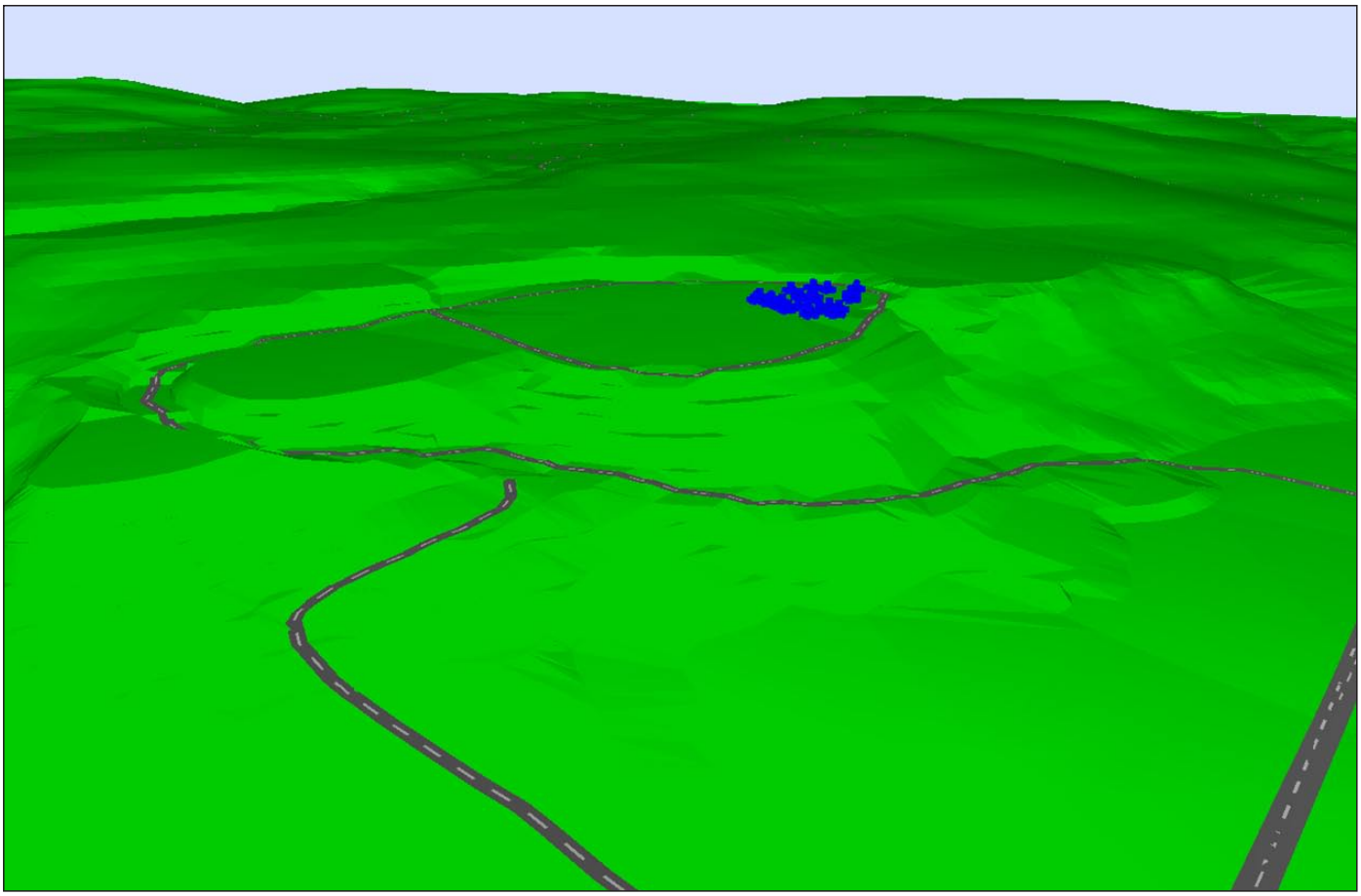

Figure 2.13-7
West Connection
Tunnel Lining (Phase 4) Model Input

approximately 43 months, and of that time, the analyzed worst-case period would be expected to last approximately 35 months. Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B would last approximately 19 months, but the analyzed worst-case period would last approximately 1 month.

Therefore, when the calculated potential noise impacts from the worst-case period in a phase resulted in potential noise increments greater than the *CEQR Technical Manual* guideline, another analysis was conducted. The second analysis evaluated the off-peak conditions for that phase of construction (in other words, not the worst-case period in a phase, but less active construction conditions expected in a phase) to provide a deeper understanding of the nature and duration of potential effects.

As described earlier in section 2.13-2, DEP examined the potential off-site noise impacts from the expected worst-case period construction activities in each phase, evaluated the greatest potential sources of off-site noise impacts, and undertook evaluations of potential measures to practically reduce off-site noise levels. As a result, DEP would require construction equipment to meet the New York City Noise Control Code standards. However, no additional mitigation measures have been identified that could materially reduce the predicted off-site noise impacts from the construction activities at the west connection site. This is because the projected sources contributing to the impacts off-site would be spread out, and there would be relatively large distances between the sources and the receptors.

Tables 2.13-11, **2.13-12**, and **2.13-13** show the following for each phase of construction at each receptor site during each construction shift:

- Existing noise levels;
- Resulting calculated future total construction noise level for the worst-case period per phase; and
- Maximum predicted incremental increase in noise levels for the worst-case period per phase.

In Tables 2.13-11, 2.13-12, and 2.13-13, locations where predicted incremental noise levels would exceed the *CEQR Technical Manual* impact guideline for the worst-case period per phase are shown in **bold**.

Table 2.13-11
L_{eq} 1-hour Noise Levels (in dBA) with Construction of Project 1, West Connection Site, Worst-Case Period First Shift (7 AM to 3 PM)

Site	Existing Noise Level	Phase 1: Site Preparation		Phase 2: Shaft Construction		Phase 3: Bypass Tunnel Excavation		Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B	
		Total Construction Noise Level	Maximum Predicted Increment	Total Construction Noise Level	Maximum Predicted Increment	Total Construction Noise Level	Maximum Predicted Increment	Total Construction Noise Level	Maximum Predicted Increment
1^W	61.4	61.4	0.0	61.4	0.0	61.4	0.0	61.4	0.0
2^W	74.2	74.7	0.5	74.4	0.2	74.7	0.5	74.4	0.2
3^W	61.4	62.0	0.6	62.0	0.6	62.1	0.7	61.7	0.3
4^W	61.4	61.7	0.3	62.0	0.6	61.6	0.2	61.6	0.2
5^W	74.2	74.3	0.1	74.2	0.0	74.2	0.0	74.2	0.0

Notes:
For the first shift, there were would be predicted exceedances of the *CEQR Technical Manual* impact guideline. CEQR impact guideline (7 AM to 10 PM)
1. If the future without proposed project ≤ 60 dBA $L_{eq(1)}$, an exceedance of the *CEQR Technical Manual* impact guideline would be an increase of at least 5 dBA $L_{eq(1)}$.
2. If 62 dBA $L_{eq(1)}$ ≥ the future without proposed project ≥ 60 dBA $L_{eq(1)}$, an exceedance of the *CEQR Technical Manual* impact guideline would be an absolute noise level of at least 65 dBA $L_{eq(1)}$.
3. If the future without proposed project ≥ 62 dBA $L_{eq(1)}$, an exceedance of the *CEQR Technical Manual* impact guideline would be an increase of at least 3 dBA $L_{eq(1)}$.

Table 2.13-12
L_{eq} 1-hour Noise Levels (in dBA) with Construction of Project 1, West Connection Site, Worst-Case Period Second Shift (3 PM to 11 PM)

Site	Existing Noise Level	Phase 1: Site Preparation		Phase 2: Shaft Construction		Phase 3: Bypass Tunnel Excavation		Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B	
		Total Construction Noise Level	Maximum Predicted Increment	Total Construction Noise Level	Maximum Predicted Increment	Total Construction Noise Level	Maximum Predicted Increment	Total Construction Noise Level	Maximum Predicted Increment
1^W	57.8	57.9	0.1	57.9	0.1	57.8	0.0	57.8	0.0
2^W	71.2	72.1	0.9	71.6	0.4	72.2	1.0	71.9	0.7
3^W	57.8	59.1	1.3	59.0	1.2	59.3	1.5	71.9	0.7
4^W	57.8	58.6	0.8	59.0	1.2	58.3	0.5	58.3	0.5
5^W	71.2	71.4	0.2	71.3	0.1	71.3	0.1	71.3	0.1

Notes:
For the second shift, there would be no predicted exceedances of the *CEQR Technical Manual* impact guideline. CEQR impact guideline (for 10 PM to 7 AM) conservatively applied for 3 PM to 11 PM.
1. Exceedance of the *CEQR Technical Manual* impact guideline would be an increase of at least 3 dBA $L_{eq(1)}$.

Table 2.13-13
L_{eq} 1-hour Noise Levels (in dBA) with Construction of Project 1, West Connection Site, Worst-Case Period Third Shift (11 PM to 7 AM)

Site	Existing Noise Level	Phase 2: Shaft Construction		Phase 3: Bypass Tunnel Excavation		Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B	
		Total Construction Noise Level	Maximum Predicted Increment	Total Construction Noise Level	Maximum Predicted Increment	Total Construction Noise Level	Maximum Predicted Increment
1^W	48.6	49.4	0.8	49.0	0.4	48.9	0.3
2^W	65.8	67.0	1.2	68.6	2.8	67.7	1.9
3^W	48.6	54.2	**5.6**	55.2	**6.6**	52.4	**3.8**
4^W	48.6	54.3	**5.7**	51.6	**3.0**	51.5	2.9
5^W	65.8	66.0	0.2	66.0	0.2	66.0	0.2

Notes:
Locations where predicted incremental noise levels would exceed the *CEQR Technical Manual* impact guideline are shown in **bold**. CEQR impact guideline (10 PM to 7 AM).
1. Exceedance of the *CEQR Technical Manual* impact guideline would be an increase of at least 3 dBA $L_{eq(1)}$.

COMPARISON TO NEWBURGH TOWN NOISE CODE

Using the lower limits for a residential zone, the Newburgh Town Code has a maximum sound pressure level of 65 dBA from 8 AM to 10 PM and 56 dBA from 10 PM to 8 AM. As discussed above, construction is exempt from the Newburgh Town Code noise limits from 7 AM to 7 PM. Therefore, the period in which Project 1 would be subject to the maximum allowable sound pressure levels in the Town of Newburgh's Town Code is from 7 PM to 7 AM. Since the second shift work would go beyond 10 PM, the 56 dBA level was conservatively applied for the period from 7 PM to 7 AM in this assessment.

At receptors 2^{W} and 5^{W}, construction noise is not predicted to exceed the maximum allowable sound pressure levels specified by the Newburgh Town Code (56 dBA). At all of the other receptors, 1^{W}, 3^{W}, and 4^{W} during all four phases of construction, construction noise from Project 1 is predicted to exceed the maximum allowable sound pressure level for residential districts during the worst-case periods between the hours of 7 PM and 7 AM. As noted in section 2.13-1.2 above, the measured existing noise levels at most measurement locations in the west of Hudson study area along the Route 9W corridor currently exceed the Newburgh Town Code limits during the applicable time periods. Based on the predicted values, DEP may need to apply to the Zoning Board of Appeals for a variance.

COMPARISON TO CEQR TECHNICAL MANUAL IMPACT GUIDELINES

At receptors 1^{W}, 2^{W}, and 5^{W}, the *CEQR Technical Manual* impact guideline for a potential noise impact is not predicted to be exceeded during any time period during any of phases of construction even for the worst-case construction periods. Provided below is an assessment of predicted exceedances of the *CEQR Technical Manual* impact guideline at receptors 3^{W} and 4^{W}. Based on the evaluation of predicted incremental noise levels and their relative durations during the worst-case period and off-peak period, a determination of the potential for predicted temporary significant adverse noise impacts was made.

Receptor 3^{W} – Residence on Pine Road Immediately South of the West Connection Site

At receptor 3^{W}, representing the residence on Pine Road immediately south of the west connection site, the *CEQR Technical Manual* impact guideline is predicted to be exceeded during the following periods:

- Phase 2: Shaft Construction during the third shift (11 PM to 7 AM);
- Phase 3: Bypass Tunnel Excavation during the third shift (11 PM to 7 AM); and
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B during the third shift (11 PM to 7 AM).

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration of the CEQR impact guideline exceedance, by phase and shift.

Phase 2: Shaft Construction

Phase 2: Shaft Construction is expected to occur over a 13-month period, during which three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase at this receptor during the worst-case period is predicted to be 5.6 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of construction truck trips, the operation of on-site equipment, and the particularly low existing noise levels at this location.

Duration of Predicted Exceedances. The duration of the predicted incremental worst-case noise levels is expected to be the entirety of the approximately 13 months of Phase 2.

Phase 3: Bypass Tunnel Excavation
Phase 3: Bypass Tunnel Excavation is expected to occur over a 43-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 6.6 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of construction truck trips, the operation of on-site equipment, and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 5.7 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline of 3 dBA, the duration of the predicted exceedance is the duration of Phase 3, approximately 43 months. The duration of the predicted incremental worst-case noise levels is expected to be approximately 3 years (36 months).

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B is expected to occur over a 19-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 3.8 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of construction truck trips, the operation of on-site equipment, and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 3.3 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline of 3 dBA, the duration of the predicted exceedance is the duration of Phase 4, approximately 19 months. The duration of the predicted incremental worst-case noise levels is expected to be approximately 1 month.

Determination of Significance of Noise Impacts

Based on the duration and magnitude of the exceedances of the CEQR impact guideline, as described above, there would be a predicted temporary significant adverse noise impact at this receptor, which is representative of the residence on Pine Road immediately south of the west connection site.

The exterior noise level during the period with the highest predicted nighttime noise level increase at this location would be 55.2 dBA $L_{eq(1)}$ during the third shift (11 PM to 7 AM) of Phase 3, an incremental increase of 6.6 dBA over the measured existing value of 48.6 dBA.

In addition, the interior $L_{10(1)}$ noise level, calculated as described in section 2.13-2, "Methodology," at this receptor during the period of the greatest incremental noise increase would be 34.7 dBA with windows open and 22.7 dBA with windows closed—below the 45 dBA CEQR guideline of acceptability (see section 2.13-1.2) for the 11 PM to 7 AM period.

Receptor 4^{W} – 65 Lockwood Lane Residence Northwest of the West Connection Site

At receptor 4^{W}, representing the residence at 65 Lockwood Lane to the northwest of the west connection site, the *CEQR Technical Manual* impact guideline is predicted to be exceeded during the following:

- Phase 2: Shaft Construction during the third shift (11 PM to 7 AM);
- Phase 3: Bypass Tunnel Excavation during the third shift (11 PM to 7 AM)

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration of the CEQR impact guideline exceedance, by phase and shift.

Phase 2: Shaft Construction

Phase 2: Shaft Construction is expected to occur over a 13-month period, during which three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase at this receptor during the worst-case period is predicted to be 5.7 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of construction truck trips, the operation of on-site equipment, and the particularly low existing noise levels at this location.

Duration of Predicted Exceedances. The duration of the predicted incremental worst-case noise levels is expected to be the entirety of the approximately 13 months of Phase 2.

Phase 3: Bypass Tunnel Excavation
Phase 3: Bypass Tunnel Excavation is expected to occur over a 43-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 3.0 dBA, which meets the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of construction truck trips, the operation of on-site equipment, and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be met (which is equivalent to exceeding) at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 2.0 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. The duration of the predicted incremental worst-case noise levels is expected to be approximately 3 years (36 months) of the approximately 43-month duration of Phase 3. Throughout the remainder of Phase 3, the magnitude of noise level increases would be between that of the predicted off-peak construction, which does not exceed the CEQR impact guideline, and that of the worst-case period, which meets the CEQR impact guideline.

Determination of Significance of Noise Impacts
Based on the duration and magnitude of the exceedances of the CEQR impact guideline, as described above, there would be a predicted temporary significant adverse noise impact at this receptor, which is representative of the residence at 65 Lockwood Lane northwest of the west connection site.

The exterior noise level during the period with the highest predicted nighttime noise level increase at this location would be 54.3 dBA $L_{eq(1)}$ during the third shift (11 PM to 7 AM) of Phase 2, an incremental increase of 5.7 dBA over the measured existing value of 48.6 dBA.

In addition, the interior $L_{10(1)}$ noise level, calculated as described in section 2.13-2 "Methodology," at this receptor during the period of the greatest incremental noise increase would be 33.8 dBA with windows open and 21.8 dBA with windows closed—below the 45 dBA CEQR guideline of acceptability (see section 2.13-1.2) for the 11 PM to 7 AM period.

2.13-4 EAST OF HUDSON

2.13-4.1 EXISTING CONDITIONS—EAST OF HUDSON

Table 2.13-14 presents the location of each noise receptor in the east of Hudson study area and summarizes the lowest monitored existing noise levels (in $L_{eq(1)}$) during each of the three potential construction shifts at the noise receptor locations. The lowest existing noise levels in an analysis time period were selected to conservatively estimate future without Project 1 noise levels and, in turn, potential Project 1-related noise increments. The complete set of the noise measurements is provided in Appendix 2.13, "Noise."

As discussed earlier in this section, at locations where only spot measurements were performed during specific time periods, the lowest measurement during each construction shift was determined based on the measured values at that location and the differences between noise levels from hour to hour at a nearby measurement location. For the 11 PM to 7 AM period, the lowest monitored value at Receptor 1^E was applied to Receptors 4^E, 5^E, 7^E, and 8^E.

2.13-4.2 FUTURE WITHOUT PROJECT 1, SHAFT AND BYPASS TUNNEL CONSTRUCTION—EAST OF HUDSON

In the future without Project 1, noise levels are expected to be similar to existing noise levels as shown in Table 2.13-14, mainly because land uses are expected to remain generally the same in the area surrounding the east connection site. While the traffic analysis in Section 2.10, "Transportation," assumed a growth rate in traffic, this additional traffic would not significantly change the estimated existing conditions noise levels. The noise assessment conservatively assumed the existing noise levels for the future without Project 1 conditions; however, this conservative choice would not affect the determination of potential temporary significant adverse noise impacts from the construction of Project 1.

Table 2.13-14
East Connection Site
Existing Noise Levels (in dBA)

Site	Measurement Location	Time	Measured Existing $L_{eq(1)}$
1^E	River Road North at Old State Road	First shift (7 AM to 3 PM)	58.5
		Second shift (3 PM to 11 PM)	54.0
		Third shift (11 PM to 7 AM)	42.6
2^E	Liberty Street at Chelsea Road	First shift (7 AM to 3 PM)	60.1
		Second shift (3 PM to 11 PM)	64.2
		Third shift (11 PM to 7 AM)	45.8
3^E	River Road North at Sky Top Drive	First shift (7 AM to 3 PM)	61.0
		Second shift (3 PM to 11 PM)	59.1
		Third shift (11 PM to 7 AM)	46.7
4^E	30 Cobblestone Road	First shift (7 AM to 3 PM)	52.5
		Second shift (3 PM to 11 PM)	48.2
		Third shift (11 PM to 7 AM)	42.6[3]
5^E	191 River Road North	First shift (7 AM to 3 PM)	49.7
		Second shift (3 PM to 11 PM)	49.5
		Third shift (11 PM to 7 AM)	42.6[3]
6^E	198 River Road North[1]	First shift (7 AM to 3 PM)	61.0
		Second shift (3 PM to 11 PM)	59.1
		Third shift (11 PM to 7 AM)	46.7
7^E	217 River Road North	First shift (7 AM to 3 PM)	43.2
		Second shift (3 PM to 11 PM)	44.9
		Third shift (11 PM to 7 AM)	42.6[3]
8^E	219 River Road North[2]	First shift (7 AM to 3 PM)	43.2
		Second shift (3 PM to 11 PM)	44.9
		Third shift (11 PM to 7 AM)	42.6[3]

Notes:
[1] Baseline levels based on site 3^E.
[2] Baseline levels based on site 7^E.
[3] Noise levels at this location are not dominated by traffic-generated noise and consequently don't follow the same temporal distribution as those at other measurement locations, so the lowest baseline level that would occur during the third construction shift (11PM to 7AM) was estimated to be the lowest value measured in this neighborhood, which was 42.6 dBA.

2.13-4.3 PROBABLE IMPACTS OF PROJECT 1, SHAFT AND BYPASS TUNNEL CONSTRUCTION—EAST OF HUDSON

This section summarizes the potential noise impacts that could result from Project 1's construction activities at the east connection site. The most likely effects on local noise levels during construction activities would result from:

- Noise generated by on-site construction equipment and from trucks entering and leaving the east connection site during construction; and
- Noise generated by project-related construction trucks and worker vehicles traveling on local roads to and from the east connection site.

An analysis of the potential for noise impacts from on-site construction sources was performed using the methodology described above. Four phases of construction were modeled including:

- Phase 1: Site Preparation (7 AM to 3 PM only);
- Phase 2: Shaft Construction (7 AM to 11 PM only);

- Phase 3: Bypass Tunnel Excavation (24 hours/day for connector tunnel and TBM removal and cleanup; 7 AM to 11 PM for inundation plugs); and
- Phase 4: Bypass Tunnel Lining (24 hours/day), Project 1 Demobilization, and Preparation for Project 2B.

In reality, noise levels in the first shift are not anticipated to reach maximum sustained levels until later in the shift after construction workers arrive at the site and are given pre-shift briefings of the day's activities. Similarly, maximum sustained levels during the second shift would more than likely occur in the earlier portion of that shift and are less likely to occur in the hour between 10 PM and 11 PM.

As discussed in Section 2.1, "Description of Project 1 Construction Program," work would occur 24 hours/day, 5 days/week for approximately 3 months of the approximately 40 months of Phase 3 during connector tunnel and TBM removal and cleanup

Figures 2.13-8, 2.13-9, 2.13-10, 2.13-11, and **2.13-12** depict the east connection site, the location of likely on-site noise sources during the worst-case period in each phase of construction, the noise barriers on the east connection site, and the roadways that construction-generated traffic would utilize near the site for each of the four phases of construction.

MODELING RESULTS

Following the methodology described above, the noise analysis first examined the worst-case period expected to occur in each phase of construction. This results in a conservative estimation of noise impacts for each construction phase. However, during each phase the worst-case period may occur only for a portion of the phase. Specifically, at the east connection site, it is expected that Phase 1: Site Preparation would last approximately 10 months, but the analyzed worst-case period would last approximately 4 months. Phase 2: Shaft Construction would last approximately 23 months, but the analyzed worst-case period, which included some site preparation activities that would continue into the shaft construction phase, would be expected to last 2 months. Phase 3: Bypass Tunnel Excavation would last approximately 40 months, but the analyzed worst-case period would be expected to last approximately 1 month. Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B would last approximately 4 months, but the analyzed worst-case period would last approximately 1 month. Therefore, when the calculated potential noise impacts from the worst-case period in a phase resulted in potential noise increments greater than the *CEQR Technical Manual* guideline, off-peak (in other words, not the worst-case period in a phase, but less active construction conditions expected in a phase) conditions for that phase of construction were also assessed as necessary.

As described earlier in section 2.13-2, DEP examined the potential off-site noise impacts from the expected worst-case period construction activities in each phase, evaluated the greatest potential sources of off-site noise impacts, and undertook evaluations of potential measures to practically reduce off-site noise levels. These measures were identified and would be included in the

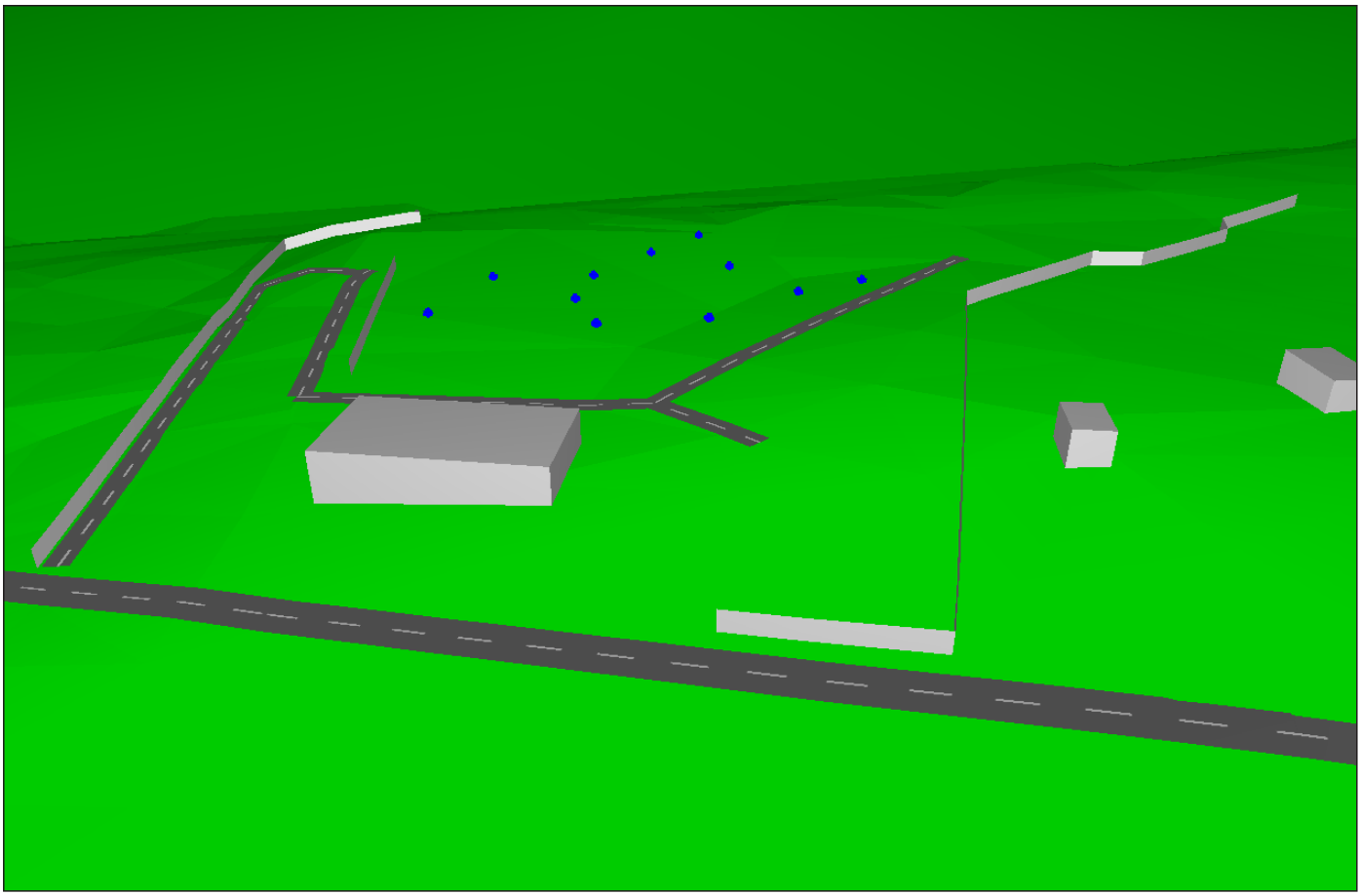

Figure 2.13-8
East Connection
Site Preparation (Phase 1) Model Input

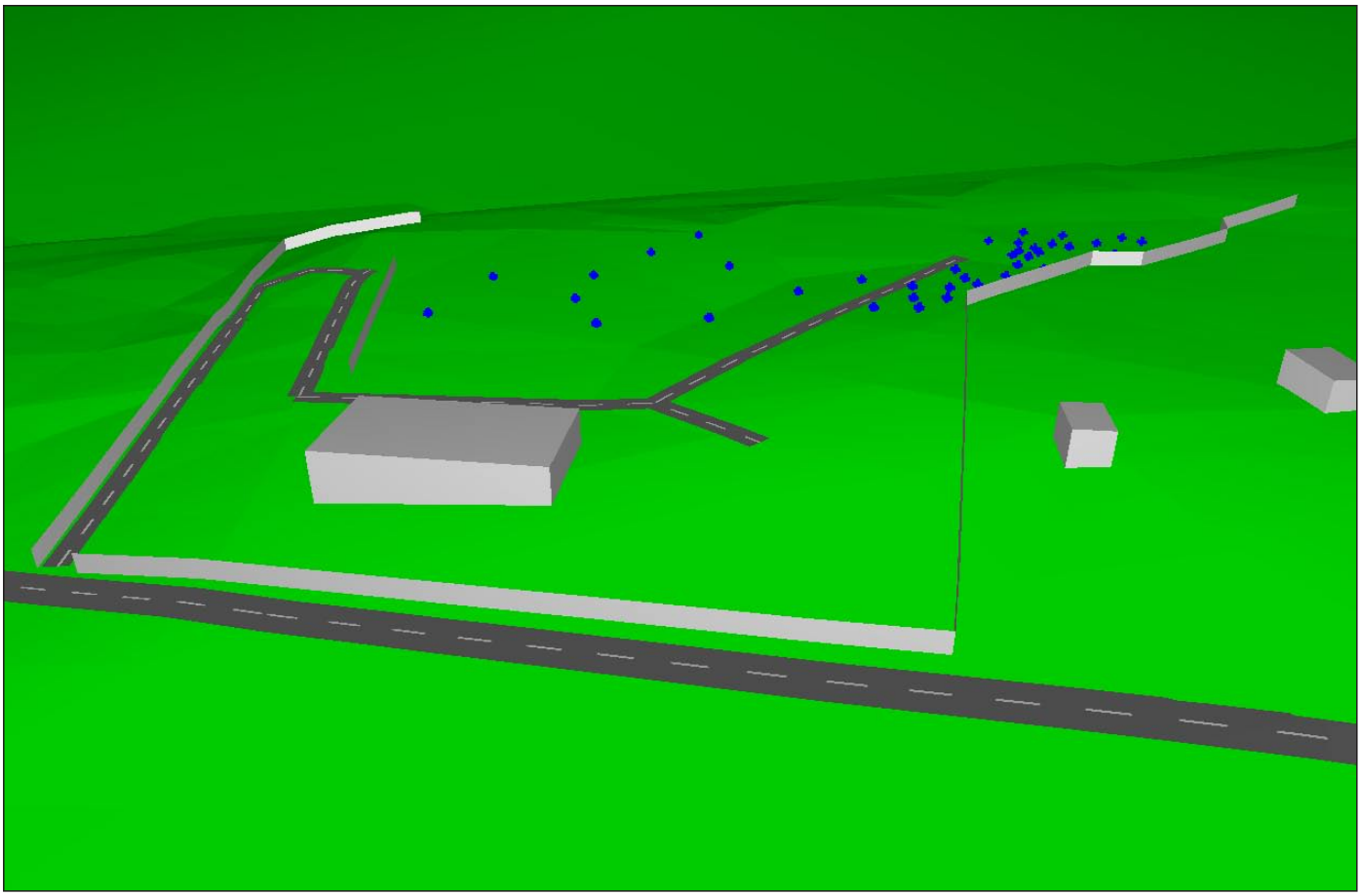

Figure 2.13-9
East Connection
Shaft Construction and Site Preparation Overlap (Phases 1 and 2) Model Input

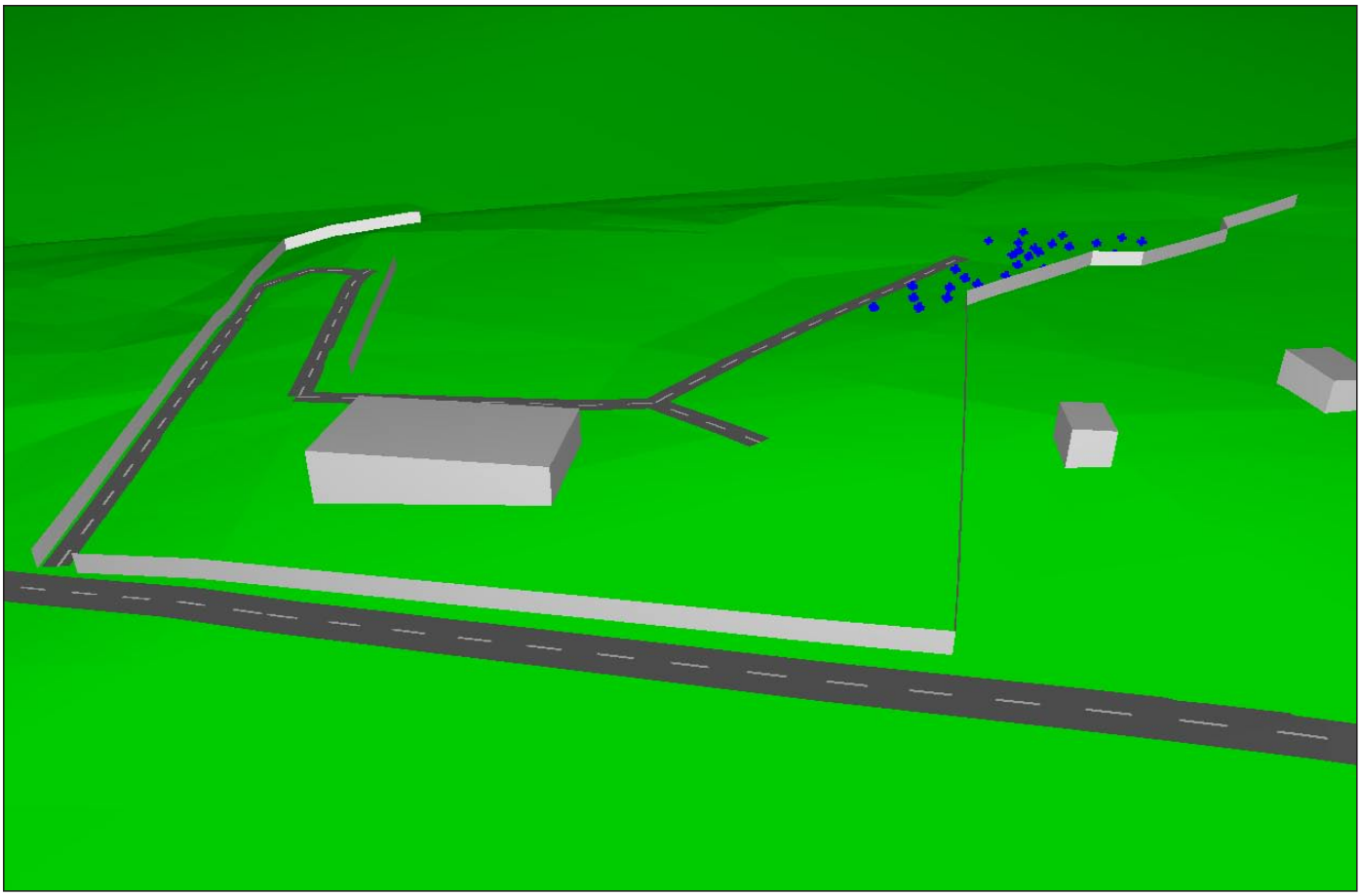

Figure 2.13-10
East Connection
Shaft Construction (Phase 2) Model Input

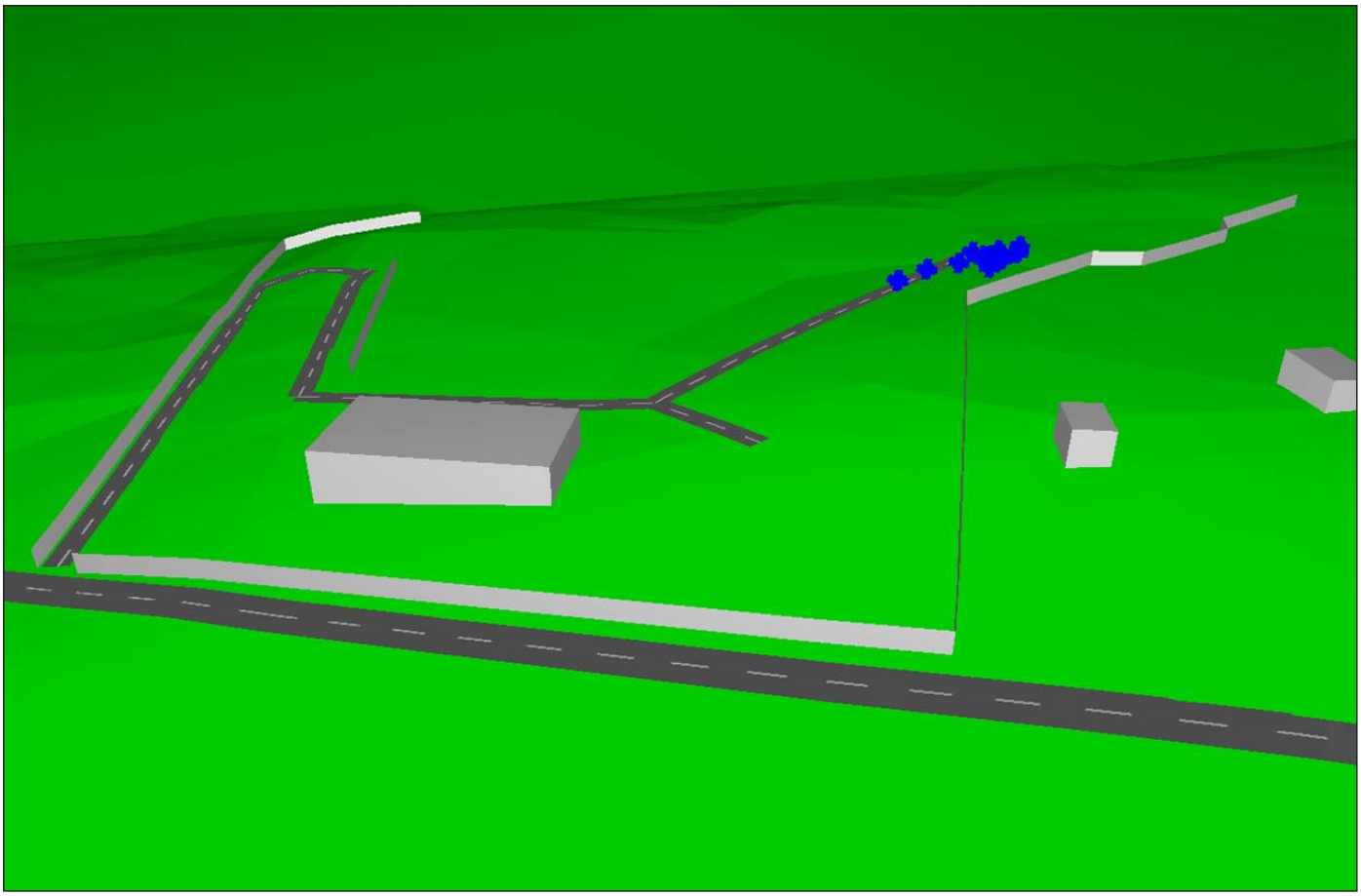

Figure 2.13-11
East Connection
Tunnel Excavation (Phase 3) Model Input

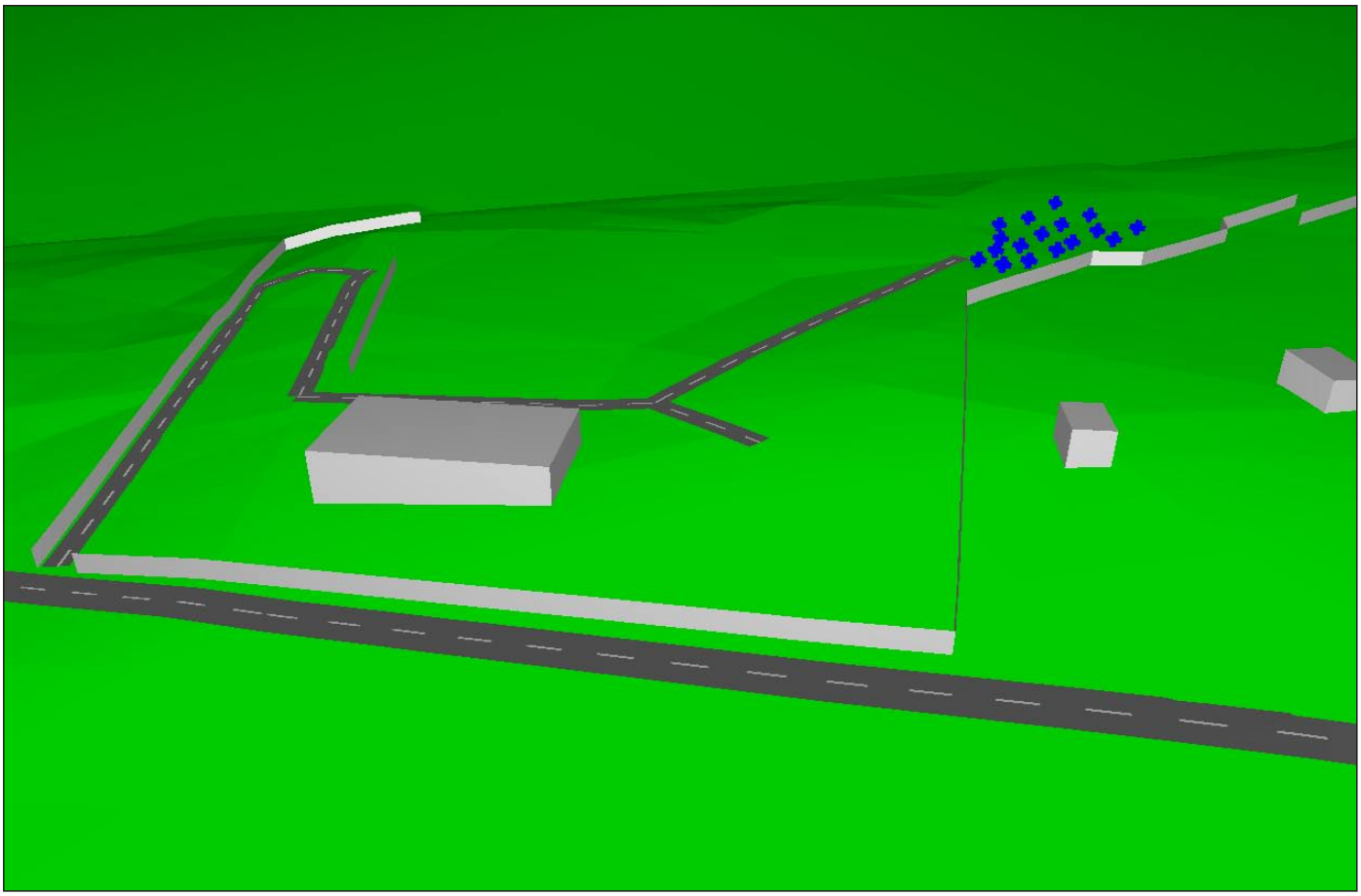

Figure 2.13-12
East Connection
Tunnel Lining (Phase 4) Model Input

contractor's specifications. The noise control benefits of the measures are shown below in the following tables.

Tables 2.13-15, **2.13-16**, and **2.13-17** show the following for each phase of construction at each receptor site during each construction shift:

- Existing noise levels;
- Resulting calculated future total construction noise level for the worst-case period per phase without the planned noise control measures;
- Maximum predicted incremental increase in noise levels for the worst-case period by phase without the planned noise control measures;
- Resulting calculated future total construction noise level for the worst-case period by phase with the planned noise control measures;
- Maximum predicted incremental increase in noise levels for the worst-case period per phase with the planned noise control measures; and
- The noise level reduction (e.g., noise control benefit) expected from the planned noise control measures for the worst-case period per phase.

The noise control measures are included in the proposed construction program and would be implemented as part of Project 1. However, the predicted noise levels without the noise control measures are still included here to illustrate the effectiveness of the measures as compared to the scenario without any noise control.

In Tables 2.13-15, 2.13-16, and 2.13-17, locations where predicted incremental noise levels would exceed the *CEQR Technical Manual* impact guideline for the worst-case period per phase with the planned noise control measures are shown in **bold**.

COMPARISON TO TOWN OF WAPPINGER NOISE CODE

Using the updated octave bands for a residential zone, the Wappinger Town Code has a maximum sound pressure level of 45 dBA before 8 AM and after sunset. Since the first shift would start before 8 AM and the second and third shifts would occur after sunset, the 45 dBA limit would apply to all three shifts. At all receptors during all four phases of construction, construction noise due to Project 1 is predicted to exceed the maximum allowable sound pressure level for residential districts during the worst-case periods before the hour of 8 AM and after sunset. As noted in section 2.13-1.2 above, the measured existing noise levels at most measurement locations in the east of Hudson study area currently exceed the Wappinger Town Code limits. Based on the predicted values, DEP may need to apply to the Zoning Board of Appeals for a variance.

Table 2.13-15
L_{eq} 1-hour Noise Levels (in dBA) with Construction of Project 1, East Connection Site, Worst-Case Period First Shift (7 AM to 3 PM)

Site	Existing Noise Level	Total Construction Noise Level (No Noise Control)	Maximum Predicted Increment (No Noise Control)	Total Construction Noise Level (with Noise Control)	Maximum Predicted Increment (with Noise Control)	Noise Control Benefit
Phase 1: Site Preparation						
1[E]	58.5	59.2	0.7	59.1	0.6	0.1
2[E]	60.1	61.3	1.2	61.3	1.2	0.0
3[E]	61.0	64.9	3.9	64.3	3.3	0.6
4[E]	52.5	55.4	2.9	55.4	2.9	0.0
5[E]	49.7	67.2	17.5	58.1	**8.4**	9.1
6[E]	61.0	63.9	2.9	62.2	1.2	1.7
7[E]	43.2	69.6	26.4	65.3	**22.1**	4.3
8[E]	43.2	68.7	25.5	64.4	**21.2**	4.3
Phase 2: Shaft Construction						
1[E]	58.5	60.0	1.5	59.6	1.1	0.4
2[E]	60.1	62.5	2.4	62.5	2.4	0.0
3[E]	61.0	67.1	6.1	66.3	**5.3**	0.8
4[E]	52.5	58.4	5.9	56.5	4.0	1.9
5[E]	49.7	69.7	20.0	61.8	**12.1**	7.9
6[E]	61.0	68.0	7.0	64.7	3.7	3.3
7[E]	43.2	74.9	31.7	68.2	**25.0**	6.7
8[E]	43.2	75.5	32.3	67.5	**24.3**	8.0
Phase 3: Bypass Tunnel Excavation						
1[E]	58.5	59.5	1.0	59.1	0.6	0.4
2[E]	60.1	62.2	2.1	62.1	2.0	0.1
3[E]	61.0	66.0	5.0	64.5	3.5	1.5
4[E]	52.5	57.5	5.0	55.7	3.2	1.8
5[E]	49.7	67.4	17.7	59.4	**9.7**	8.0
6[E]	61.0	66.4	5.4	62.7	1.7	3.7
7[E]	43.2	72.2	29.0	64.0	**20.8**	8.2
8[E]	43.2	73.5	30.3	64.0	**20.8**	9.5
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B						
1[E]	58.5	59.5	1.0	59.1	0.6	0.4
2[E]	60.1	62.2	2.1	62.2	2.1	0.0
3[E]	61.0	65.3	4.3	64.1	3.1	1.2
4[E]	52.5	57.7	5.2	56.2	3.7	1.5
5[E]	49.7	65.4	15.7	56.4	**6.7**	9.0
6[E]	61.0	66.3	5.3	62.5	1.5	3.8
7[E]	43.2	72.0	28.8	63.9	**20.7**	8.1
8[E]	43.2	73.8	30.6	65.3	**22.1**	8.5

Notes:
Locations where predicted incremental noise levels would exceed the *CEQR Technical Manual* impact guideline with the planned noise control measures are shown in **bold**. CEQR impact guideline (7 AM to 10 PM).
1. If the future without proposed project ≤ 60 dBA $L_{eq(1)}$, an exceedance of the *CEQR Technical Manual* impact guideline would be an increase of at least 5 dBA $L_{eq(1)}$.
2. If 62 dBA $L_{eq(1)}$ ≥ the future without proposed project ≥ 60 dBA $L_{eq(1)}$, an exceedance of the CEQR Technical Manual impact guideline would be an increase of at least 4 dBA $L_{eq(1)}$.
3. If the future without proposed project ≥ 62 dBA $L_{eq(1)}$, an exceedance of the *CEQR Technical Manual* impact guideline would be an increase of at least 3 dBA $L_{eq(1)}$.

Table 2.13-16
L_{eq} 1-hour Noise Levels (in dBA) with Construction of Project 1, Worst-Case Period Second Shift (3 PM to 11 PM)

Site	Existing Noise Level	Total Construction Noise Level (No Noise Control)	Maximum Predicted Increment (No Noise Control)	Total Construction Noise Level (with Noise Control)	Maximum Predicted Increment (with Noise Control)	Noise Control Benefit
Phase 2: Shaft Construction						
1[E]	54.0	57.2	3.2	56.6	2.6	0.6
2[E]	64.2	65.3	1.1	65.2	1.0	0.1
3[E]	59.1	65.1	6.0	64.6	**5.5**	0.5
4[E]	48.2	56.7	8.5	55.1	**6.9**	1.6
5[E]	49.5	66.0	16.5	58.2	**8.7**	7.8
6[E]	59.1	66.5	7.4	62.8	**3.7**	3.7
7[E]	44.9	73.3	28.4	67.8	**22.9**	5.5
8[E]	44.9	74.8	29.9	67.8	**22.9**	7.0
Phase 3: Bypass Tunnel Excavation						
1[E]	54.0	56.4	2.4	55.6	1.6	0.8
2[E]	64.2	65.2	1.0	65.1	0.9	0.1
3[E]	59.1	65.5	6.4	63.8	**4.7**	1.7
4[E]	48.2	56.6	8.4	54.1	**5.9**	2.5
5[E]	49.5	67.4	17.9	59.4	**9.9**	8.0
6[E]	59.1	65.9	6.8	61.5	2.4	4.4
7[E]	44.9	72.2	27.3	64.1	**19.2**	8.1
8[E]	44.9	73.5	28.6	64.1	**19.2**	9.4
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B						
1[E]	54.0	56.4	2.4	55.6	1.6	0.8
2[E]	64.2	65.2	1.0	65.1	0.9	0.1
3[E]	59.1	64.7	5.6	63.3	**4.2**	0.6
4[E]	48.2	56.8	8.6	54.9	**6.7**	1.9
5[E]	49.5	65.4	15.9	56.4	**6.9**	9.0
6[E]	59.1	65.8	6.7	61.3	2.2	4.5
7[E]	44.9	72.0	27.1	64.0	**19.1**	8.0
8[E]	44.9	73.8	28.9	65.3	**20.4**	8.5

Notes:
Locations where predicted incremental noise levels would exceed the *CEQR Technical Manual* impact guideline with the planned noise control measures are shown in **bold**. CEQR impact guideline (10 PM to 7AM)
1. The guideline for an exceedance of the *CEQR Technical Manual* impact guideline would be an increase of at least 3 dBA $L_{eq(1)}$

Table 2.13-17
L_{eq} 1-hour Noise Levels (in dBA) with Construction of Project 1, East Connection Site, Worst-Case Period Third Shift (11 PM to 7 AM)

Site	Existing Noise Level	Total Construction Noise Level (No Noise Control)	Maximum Predicted Increment (No Noise Control)	Total Construction Noise Level (with Noise Control)	Maximum Predicted Increment (with Noise Control)	Noise Control Benefit
Phase 3: Bypass Tunnel Excavation						
1[E]	42.6	53.0	10.4	51.1	**8.5**	1.9
2[E]	45.8	58.3	12.5	52.9	**7.1**	5.4
3[E]	46.7	64.5	17.8	60.5	**13.8**	4.0
4[E]	42.6	56.1	13.5	53.0	**10.4**	3.1
5[E]	42.6	67.3	24.7	58.6	**16.0**	8.7
6[E]	46.7	65.0	18.3	57.8	**11.1**	7.2
7[E]	42.6	72.2	29.6	64.0	**21.4**	8.2
8[E]	42.6	73.5	30.9	64.0	**21.4**	9.5
Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B						
1[E]	42.6	53.0	10.4	51.1	**8.5**	1.9
2[E]	45.8	58.3	12.5	52.9	**7.1**	5.4
3[E]	46.7	63.4	16.7	59.2	**12.5**	4.2
4[E]	42.6	56.4	13.8	54.1	**11.5**	2.3
5[E]	42.6	65.3	22.7	55.2	**12.6**	10.1
6[E]	46.7	64.9	18.2	57.5	**10.8**	7.4
7[E]	42.6	72.0	29.4	63.9	**21.3**	8.1
8[E]	42.6	73.8	31.2	65.3	**22.7**	8.5

Notes:
Locations where predicted incremental noise levels would exceed the *CEQR Technical Manual* impact criteria with the planned noise control measures are shown in **bold**. CEQR impact criteria (10 PM to 7 AM).
1. The criteria for an exceedance of the *CEQR Technical Manual* impact criteria would be an increase of at least 3 dBA $L_{eq(1)}$.

COMPARISON TO CEQR TECHNICAL MANUAL IMPACT GUIDELINES

At all of the east of Hudson study area receptors, the *CEQR Technical Manual* impact criteria for a potential noise impact is predicted to be exceeded during at least one time period during a phase of construction for the worst-case construction periods. Provided below is an assessment of predicted exceedances of the *CEQR Technical Manual* impact guideline. Based on the evaluation of predicted incremental noise levels and their relative durations during the worst-case period and off-peak period, a determination of the potential for predicted temporary significant adverse noise impacts was made.

Receptor 1 [E] – Residential Locations Along River Road North and Old State Road North of the East Connection Site

At receptor 1[E], representing residential locations along River Road North and Old State Road north of the east connection site, the *CEQR Technical Manual* impact guideline is predicted to be exceeded during the following:

- Phase 3: Bypass Tunnel Excavation during the third shift (11 PM to 7 AM); and
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B during the third shift (11 PM to 7 AM).

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration of the CEQR impact guideline exceedance, by phase and shift.

Phase 3: Bypass Tunnel Excavation
Phase 3: Bypass Tunnel Excavation, which would include the inundation plug construction, is expected to occur over a 40-month time period. During the period when the inundation plug work is occurring, two shifts would generally occur (7 AM to 3 PM and 3 PM to 11 PM). Drilling work undertaken on the inundation plugs would occur in two shifts of 8 hours. (This work would last approximately 13 months if the contractor employs three drill rigs. The duration could be longer if only one or two rigs are employed on-site during this phase; however, the general nature of the work would not change.) A third shift (11 PM to 7 AM) of construction would be required for approximately 1 month during construction of the connector tunnels and 2 months for TBM removal and cleanup.

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase at this receptor during the worst-case period is predicted to be 8.5 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of construction worker trips, which would be limited to a short period when employees enter/exit the east connection site for the approximately 3 months of limited 24-hour work during this phase.

Duration of Predicted Exceedances. The duration of the predicted incremental worst-case noise levels is expected to be approximately 3 months of the approximately 40-month duration of Phase 3, when 11 PM to 7 AM work would be required. In those limited months, the noise impacts would only occur during the 11 PM shift change when construction worker vehicles are on the road. During the remainder of the 11 PM to 7 AM shift, the incremental noise levels would be about 1 dBA or less, which would not exceed the CEQR impact guideline. During the other portions of the phase, when no work would take place during the third shift (11 PM to 7 AM), no significant noise level increase would occur.

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B
Phase 4 is expected to occur over a 4-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase at this receptor during the worst-case period is predicted to be 8.5 dBA, which exceeds the CEQR impact guideline of 3 dBA. Like the Phase 3 assessment for this time period, it was determined that the primary source of the noise increase would be construction worker trips, which would be limited to a short period when employees enter and exit the east connection site for the limited 24-hour work periods during this phase.

Duration of Predicted Exceedances. The duration of the predicted incremental worst-case noise levels is expected to be approximately 4 months when 24-hour work would be required. In those limited months, the noise impacts would only occur during the 11 PM shift change when construction worker vehicles are on the road. During the other periods of the 11 PM to 7 AM shift, the incremental noise levels would be about 1 dBA or less for this phase, which would not exceed the CEQR impact guideline.

Determination of Significance of Noise Impacts

Based on the above, the predicted exceedances of the CEQR impact guideline would be limited to the 11 PM to 7 AM time period over a period of only 7 months for the 7½ year construction timeline for Project 1. The predicted exceedances would be limited to a short period when employees enter and exit the east connection site for the limited 24-hour work periods during this phase and thus would not be a predicted temporary significant adverse noise impact at this receptor, which is representative of residential locations along River Road North and Old State Road north of the east connection site.

Receptor 2^{E} – Residential Locations Along Chelsea Road South of the East Connection Site

At receptor 2^{E}, representing residential locations along Chelsea Road south of the east connection site, the *CEQR Technical Manual* impact guideline is predicted to be exceeded during the following:

- Phase 3: Bypass Tunnel Excavation during the third shift (11 PM to 7 AM); and
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B during the third shift (11 PM to 7 AM).

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration of the CEQR impact guideline exceedance, by phase and shift.

Phase 3: Bypass Tunnel Excavation

Phase 3: Bypass Tunnel Excavation, which would include the inundation plug construction, is expected to occur over a 40-month time period. During the period when the inundation plug work is occurring, two shifts would generally occur (7 AM to 3 PM and 3 PM to 11 PM). Drilling work undertaken on the inundation plugs would occur in two shifts of 8 hours. (This work would last approximately 13 months if the contractor employs three drill rigs. The duration

could be longer if only one or two rigs are employed on site during this phase; however, the general nature of the work would not change.) A third shift (11 PM to 7 AM) of construction would be required for approximately 1 month during construction of the connector tunnels and 2 months for TBM removal and cleanup.

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase at this receptor during the worst-case period is predicted to be 7.1 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of construction worker trips, which would be limited to a short period when employees enter and exit the east connection site for the limited 24-hour work periods during this phase.

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level meet or exceed the CEQR impact guideline of 3 dBA, the duration of the predicted exceedance is the approximately 3 months of Phase 3 when 11 PM to 7 AM work would be required. The duration of the predicted incremental worst-case noise levels is expected to only occur during the 11 PM shift change when construction worker vehicles would be on the road. During the other portions of the phase, when no work would take place from11 PM to 7 AM, no significant noise level increase would occur.

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B
Phase 4 is expected to occur over a 4-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase at this receptor during the worst-case period is predicted to be 7.1 dBA, which exceeds the CEQR impact guideline of 3 dBA. Like the Phase 3 assessment for this time period, it was determined that the primary source of the noise increase would be construction worker trips, which would be limited to a short period when employees enter and exit the east connection site for the limited 24-hour work periods during this phase.

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level meet or exceed the CEQR impact guideline of 3 dBA, the duration of the predicted exceedance is the approximately 4 months of Phase 4 when 11 PM to 7 AM work would be required. The duration of the predicted incremental worst-case noise levels is expected

to only occur during the 11 PM shift change when construction worker vehicles would be on the road.

Determination of Significance of Noise Impacts
Based on the above, the predicted exceedances of the CEQR impact guideline would be limited to the 11 PM to 7 AM time period over a period of only 7 months for the 7½ year construction timeline for Project 1. The predicted worst-case exceedances would be limited to a short period when employees enter and exit the east connection site for the limited 24-hour work periods during this phase and thus would not be a predicted temporary significant adverse noise impact at this receptor, which is representative of residential locations along Chelsea Road South of the east connection site.

Receptor 3^{E} – Residential Locations Along River Road East of the East Connection Site
At receptor 3^{E}, representing residential locations south and near the east connection site, the *CEQR Technical Manual* impact guideline is predicted to be exceeded during the following:

- Phase 2: Shaft Construction during the first shift (7 AM to 3 PM) and second shift (3 PM to 11 PM);
- Phase 3: Bypass Tunnel Excavation during the second shift (3 PM to 11 PM) and third shift (11 PM to 7 AM); and
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B during the second shift (3 PM to 11 PM) and third shift (11 PM to 7 AM).

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration the CEQR impact guideline exceedances by phase and shift.

Phase 2: Shaft Construction
Phase 2: Shaft Construction, which would include some overlap with Phase 1: Site Preparation activities, is expected to occur over a 23-month period, during which two shifts would occur (7 AM to 3 PM and 3 PM to 11 PM).

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 5.3 dBA, which exceeds the CEQR impact guideline of 4 dBA. It was determined that the noise level increase would be primarily a result of construction truck trips and worker trips traveling along River Road North to the east connection site and the operation of on-site equipment. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 2.3 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 5.5 dBA, which exceeds the CEQR impact guideline of 3 dBA.

It was determined that the noise level increase would be primarily a result of construction truck trips and worker trips traveling along River Road North to the east connection site and the operation of on-site equipment. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 3.2 dBA during the second shift (3 PM to 11 PM).

Duration of Predicted Exceedances. The duration of the predicted worst-case noise levels during the first shift (7 AM to 3 PM) of Phase 2 is expected to be approximately 2 months out of the approximately 23 months of construction.

However, since both the predicted worst-case noise level and off-peak noise level for the second shift (3 PM to 11 PM) exceed the CEQR impact guideline of 3 dBA, the duration of the predicted exceedance is the approximately 23 months of Phase 2 when 3 PM to 11 PM work would be required.

Phase 3: Bypass Tunnel Excavation

Phase 3: Bypass Tunnel Excavation, which would include the inundation plug construction, is expected to occur over a 40-month time period. During the period when the inundation plug work is occurring, two shifts would generally occur (7AM to 3 PM and 3 PM to 11 PM). Drilling work undertaken on the inundation plugs would occur in two shifts of 8 hours. (This work would last approximately 13 months if the contractor employs three drill rigs. The duration could be longer if only one or two rigs are employed on site during this phase; however, the general nature of the work would not change.) A third shift (11 PM to 7 AM) of construction would be required for approximately 1 month during construction of the connector tunnels and 2 months for TBM removal and cleanup.

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 4.7 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 1.2 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 13.8 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR*

Technical Manual guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 11.1 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. The duration of the predicted worst-case noise levels during the second shift (3 PM to 11 PM) of Phase 3 is expected to be approximately 3 months out of the approximately 40 months of construction. Throughout the remainder of Phase 3, the magnitude of noise level increases would be between that of the predicted off-peak construction, which does not exceed the CEQR impact guideline during the second shift, and that of the worst-case period, which exceeds the CEQR impact guideline during the second shift.

The duration of the predicted worst-case noise levels during the third shift (11 PM to 7 AM) is expected to occur during the approximately 3 months when 11 PM to 7 AM work would be required. Throughout the rest of Phase 3, when no work would take place during the third shift (11 PM to 7 AM), no significant noise level increase would occur during those hours.

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B
Phase 4 is expected to occur over a 4-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 4.2 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 3.1 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 12.5 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 12.1 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline of 3 dBA during the second shift (3 PM to 11 PM) and third shift (11 PM to 7 AM), the duration of the predicted exceedance is the

approximately 4 months of Phase 4. The duration of the incremental worst-case noise level is expected to be approximately 1 month out of the approximately 4 months of Phase 4.

Determination of Significance of Noise Impacts
Based on the duration and magnitude of the exceedances of the CEQR impact guideline, as described above, there would be a predicted temporary significant adverse noise impact at this receptor, which is representative of a residential location south of and near the east connection site.

The exterior noise level during the period with the highest predicted noise level at this location would be 60.5 dBA $L_{eq(1)}$ during the third shift (11 PM to 7 AM) of Phase 3, an incremental increase of 13.8 dBA over the measured existing value of 46.7 dBA. This noise level, which would be expected to occur over the course of approximately 1 month of the 7½ year construction timeline for Project 1, is considered moderate compared to levels that occur at different times of day at this location and existing noise levels throughout the area.

In addition, the interior $L_{10(1)}$ noise level, calculated as described in section 2.13-2, "Methodology," at this receptor during the period of the greatest incremental noise increase would be 45.0 dBA with windows open and 33.0 dBA with windows closed—below the 45 dBA CEQR guideline of acceptability (see section 2.13-1.2) for the 11 PM to 7 AM period.

Receptor 4^{E} – Residential Locations Along Cobblestone Road North of the East Connection Site

At receptor 4^{E}, representing residential locations along Cobblestone Road north of the east connection site, the *CEQR Technical Manual* impact is predicted to be exceeded during the following:

- Phase 2: Shaft Construction during the second shift (3 PM to 11 PM);
- Phase 3: Bypass Tunnel Excavation during the second shift (3 PM to 11 PM) and third shift (11 PM to 7 AM); and
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B during the second shift (3 PM to 11 PM) and third shift (11 PM to 7 AM).

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration the CEQR impact criteria exceedance by phase and shift.

Phase 2: Shaft Construction
Phase 2: Shaft Construction, which would include some overlap with Phase 1: Site Preparation activities, is expected to occur over a 23-month period, during which two shifts would occur (7 AM to 3 PM and 3 PM to 11 PM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 6.9 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and low measured background levels. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 2.4 dBA during the second shift (3 PM to 11 PM).

Duration of Predicted Exceedances. The duration of the predicted incremental worst-case noise levels is expected to be approximately 2 months out of the approximately 23 months of Phase 2 for the second shift (3 PM to 11 PM). Throughout the remainder of the approximately 23 months of Phase 2, the magnitude of noise level increases would be between that of the predicted off-peak construction, which does not exceed the CEQR impact guideline, and that of the worst-case period, which exceeds the CEQR impact guideline.

Phase 3: Bypass Tunnel Excavation

Phase 3: Bypass Tunnel Excavation, which would include the inundation plug construction, is expected to occur over a 40-month time period. During the period when the inundation plug work is occurring, two shifts would generally occur (7 AM to 3 PM and 3 PM to 11 PM). Drilling work undertaken on the inundation plugs would occur in two shifts of 8 hours. (This work would last approximately 13 months if the contractor employs three drill rigs. The duration could be longer if only one or two rigs are employed on site during this phase; however, the general nature of the work would not change.) A third shift (11 PM to 7 AM) of construction would be required for approximately 1 month during construction of the connector tunnels and 2 months for TBM removal and cleanup.

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 5.9 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and low background noise levels. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 0.5 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 10.4 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR*

Technical Manual guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 7.1 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. During the second shift (3 PM to 11 PM), the duration of the predicted worst-case noise levels is expected to be approximately 1 month for connector tunnels and 2 months for TBM removal and cleanup in Phase 3. Throughout the remainder of Phase 3, the magnitude of noise level increases would be between that of the predicted off-peak construction and that of the worst-case period.

Since both the predicted worst-case noise level and off-peak noise level meet or exceed the CEQR impact guideline of 3 dBA, the duration of the predicted exceedance is the approximately 3 months of Phase 3 when 11 PM to 7 AM work would be required. Throughout the remainder of Phase 3, when no work would take place during the third shift (11 PM to 7 AM), no significant noise level increase would occur during those hours.

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B
Phase 4 is expected to occur over a 4-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 6.7 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and low background noise levels. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 6.6 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 11.5 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 11.4 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level meet or exceed the CEQR impact guideline of 3 dBA, the duration of the predicted exceedance is the approximately 4 months of Phase 4 during both the second shift (3

PM to 11 PM) and third shift (11 PM to 7 AM). The duration of the predicted incremental worst-case noise level is expected to be approximately 1 month out of the approximately 4 months of Phase 4.

Determination of Significance of Noise Impacts

Based on the above, exceedances of the CEQR impact guideline are predicted for limited construction shifts and phases of the approximately 7½ year construction timeline for Project 1. Consequently, there would not be a predicted temporary significant adverse noise impact at this receptor, which is representative of residential locations along Cobblestone Road north of the east connection site.

Receptor 5^{E} – Residence at 191 River Road North Immediately South of the East Connection Site

At receptor 5^{E}, representing 191 River Road North, a residential location along River Road immediately south of the east connection site, the *CEQR Technical Manual* impact criteria is predicted to be exceeded during the following:

- Phase 1: Site Preparation during the first shift (7 AM to 3 PM);
- Phase 2: Shaft Construction during the first shift (7 AM to 3 PM) and second shift (3 PM to 11 PM);
- Phase 3: Bypass Tunnel Excavation during the first shift (7 AM to 3 PM), second shift (3 PM to 11 PM), and third shift (11 PM to 7 AM); and
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B during the first shift (7 AM to 3 PM), second shift (3 PM to 11 PM), and third shift (11 PM to 7 AM).

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration the CEQR impact criteria exceedance by phase and shift.

Phase 1: Site Preparation

Phase 1: Site Preparation is expected to occur over a 10-month period, during which one shift would occur (7 AM to 3 PM).

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 8.4 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 1, noise levels were also determined for off-peak construction. For the off-peak period of Phase 1 at this location, the increase at this receptor is predicted to be 7.8 dBA during the first shift (7 AM to 3 PM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline of 5 dBA, the duration of the predicted exceedance is the approximately 10 months of Phase 1 when 7 AM to 3 PM work would be required. The duration of the predicted incremental worst-case noise levels is expected to be approximately 4 months out of the approximately 10 months of Phase 1.

Phase 2: Shaft Construction
Phase 2: Shaft Construction, which would include some overlap with Phase 1: Site Preparation activities, is expected to occur over a 23-month period, during which two shifts would occur (7 AM to 3 PM and 3 PM to 11 PM).

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 12.1 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 4.8 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 8.7 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 4.9 dBA during the second shift (3 PM to 11 PM).

Duration of Predicted Exceedances. For the first shift of Phase 2, the duration of the predicted incremental worst-case noise levels is expected to be approximately 2 months out of the approximately 23 months of construction for the first shift (7 AM to 3 PM). Throughout the remainder of Phase 2, the magnitude of noise level increases would be between that of the predicted off-peak construction and that of the worst-case period.

Since both the predicted worst-case noise level and off-peak noise level meet or exceed the CEQR impact guideline of 3 dBA for the second shift (3 PM to 11 PM), the duration of the predicted exceedance is the approximately 23 months of Phase 2 when 3 PM to 11 PM work would be required.

Phase 3: Bypass Tunnel Excavation
Phase 3: Bypass Tunnel Excavation, which would include the inundation plug construction, is expected to occur over a 40-month time period. During the period when the inundation plug work is occurring, two shifts would generally occur (7 AM to 3 PM and 3 PM to 11 PM).

Drilling work undertaken on the inundation plugs would occur in two shifts of 8 hours. (This work would last approximately 13 months if the contractor employs three drill rigs. The duration could be longer if only one or two rigs are employed on site during this phase; however, the general nature of the work would not change.) For the duration of this 40-month time period that the estimated 3 months of three shift work and the inundation plug work is not underway, the incremental noise levels are expected to be less than the CEQR impact guideline A third shift (11 PM to 7 AM) of construction would be required for approximately 1 month during construction of the connector tunnels and 2 months for TBM removal and cleanup.

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 9.7 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 2.1 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 9.9 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 2.2 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 16.0 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 10.4 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. For the first shift of Phase 3, the duration of the predicted worst-case noise levels is expected to be approximately 1 month for connector tunnels and 2 months for TBM removal and cleanup. Throughout the remainder of Phase 3, the magnitude of noise level increases for this shift would be between that of the predicted off-peak construction and that of the worst-case period.

For the second shift of Phase 3, the duration of the predicted worst-case noise levels is expected to be approximately 1 month for connector tunnels and 2 months for TBM removal. Throughout the remainder of Phase 3, the magnitude of noise level increases for this shift would be between that of the predicted off-peak construction, which does not exceed the CEQR impact guideline, and that of the worst-case period, which exceeds the CEQR impact guideline.

Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline of 3 dBA for the third shift of Phase 3, the duration of the predicted exceedance is the approximately 3 months of Phase 3 when 11 PM to 7 AM work would be required.

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B
Phase 4 is expected to occur over a 4-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 6.7 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 6.2 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 6.9 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 6.3 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 12.6 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) of the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 12.3 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. The duration of the predicted incremental worst-case noise level is expected to be approximately 1 month out of the approximately 4 months of Phase 4 construction during all three shifts (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

Throughout the remainder of Phase 4, the magnitude of noise level increases would be between that of the predicted off-peak construction and that of the worst-case period, both of which exceed the CEQR impact guideline.

Determination of Significance of Noise Impacts
Based on the duration and magnitude of the exceedances of the CEQR impact guideline, as described above, there would be a predicted temporary significant adverse noise impact at this receptor, which is representative of the residence at 191 River Road North immediately south of the east connection site.

The exterior noise level during the period with the highest predicted noise level at this location would be 58.6 dBA $L_{eq(1)}$ during the third shift (11 PM to 7 AM) of Phase 3, an incremental increase of 16.0 dBA over the measured existing value of 42.6 dBA.

In addition, the interior $L_{10(1)}$ noise level, calculated as described in section 2.13-2, "Methodology," at this receptor during the period of the greatest incremental noise increase would be 42.7 dBA with windows open and 30.7 dBA with windows closed—below the 45 dBA CEQR guideline of acceptability (see section 2.13-1.2) for the 11 PM to 7 AM period.

Receptor 6^E – Residence at 198 River Road East of the East Connection Site

At receptor 6^E, representing a residential location on at 198 River Road North east of the east connection site, the *CEQR Technical Manual* impact criteria is predicted to be exceeded during the following:

- Phase 2: Shaft Construction during the second shift (3 PM to 11 PM);
- Phase 3: Bypass Tunnel Excavation during the third shift (11 PM to 7 AM); and
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B during the third shift (11 PM to 7 AM).

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration of the CEQR impact criteria exceedance, by phase and shift. The background levels at this location are higher than those monitored on the west side of River Road at receptor 5^E. This contributes to somewhat lesser predicted noise impacts at this location versus locations on the west side of River Road adjacent to the east connection site.

Phase 2: Shaft Construction
Phase 2: Shaft Construction, which would include some overlap with Phase 1: Site Preparation activities, is expected to occur over a 23-month period, during which two shifts would occur (7 AM to 3 PM and 3 PM to 11 PM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 3.7 dBA, which exceeds the CEQR impact guideline of 3 dBA.

It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 1.1 dBA during the second shift (3 PM to 11 PM).

Duration of Predicted Exceedances. The duration of the predicted incremental worst-case noise levels is expected to be approximately 2 months out of the approximately 23 months of Phase 2 for the second shift (3 PM to 11 PM). Throughout the remainder of Phase 2 the magnitude of noise level increases would be between that of the predicted off-peak construction, which does not exceed the CEQR impact guideline, and that of the worst-case period, which exceeds the CEQR impact guideline.

Phase 3: Bypass Tunnel Excavation

Bypass Tunnel Excavation, which would include the inundation plug construction, is expected to occur over a 40-month time period. During the period when the inundation plug work is occurring, two shifts would generally occur (7 AM to 3 PM and 3 PM to 11 PM). Drilling work undertaken on the inundation plugs would occur in two shifts of 8 hours. (This work would last approximately 13 months if the contractor employs three drill rigs. The duration could be longer if only one or two rigs are employed on site during this phase; however, the general nature of the work would not change.) A third shift (11 PM to 7 AM) of construction would be required for approximately 1 month during construction of the connector tunnels and 2 months for TBM removal and cleanup.

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 11.1 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 9.2 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline of 3 dBA for the third shift of Phase 3, the duration of the predicted exceedance is the approximately 3 months of Phase 3 when 11 PM to 7 AM work would be required out of the approximately 40 months of Phase 3. Throughout the

remainder of Phase 3, when no work would take place during the third shift (11 PM to 7 AM), no significant noise level increase would occur.

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B
Phase 4 is expected to occur over a 4-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). No significant noise level increases are predicted during the first shift.

Second Shift (3 PM to 11 PM). No significant noise level increases are predicted during the second shift.

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 10.8 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 10.3 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline of 3 dBA for the third shift of Phase 4, the duration of the predicted exceedance is the approximately 4 months of Phase 4 when 11 PM to 7 AM work would be required. The duration of the predicted incremental worst-case noise level is expected to be approximately 1 month out of the approximately 4 months of Phase 4.

Determination of Significance of Noise Impacts
Based on the duration and magnitude of the exceedances of the CEQR impact guideline, as described above, there would be a predicted temporary significant adverse noise impact at this receptor, which is representative of the residence at 198 River Road North east of the east connection site.

The exterior noise level during the period with the highest predicted noise level at this location would be 57.8 dBA $L_{eq(1)}$ during the third shift (11 PM to 7 AM) of Phase 3, an incremental increase of 11.1 dBA over the measured existing value of 46.7 dBA. This noise level would be expected to occur over the course of approximately 1 month of the 7½ year construction timeline for Project 1.

In addition, the interior $L_{10(1)}$ noise level, calculated as described in section 2.13-2, "Methodology," at this receptor during the period of the greatest incremental noise increase would be 42.3 dBA with windows open and 30.3 dBA with windows closed—below the 45 dBA CEQR guideline of acceptability (see section 2.13-1.2) for the 11 PM to 7 AM period.

Receptor 7^E – Residence at 217 River Road North Immediately North of the East Connection Site

At receptor 7^E, representing 217 River Road North, a residential location along River Road immediately north of the east connection site, the *CEQR Technical Manual* impact criteria is predicted to be exceeded during the following:

- Phase 1: Site Preparation during the first shift (7 AM to 3 PM);
- Phase 2: Shaft Construction during the first shift (7 AM to 3 PM) and second shift (3 PM to 11 PM);
- Phase 3: Bypass Tunnel Excavation during the first shift (7 AM to 3 PM), second shift (3 PM to 11 PM), and third shift (11 PM to 7 AM); and
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B during the first shift (7 AM to 3 PM), second shift (3 PM to 11 PM), and third shift (11 PM to 7 AM).

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration of the CEQR impact criteria exceedance, by phase and shift.

Phase 1: Site Preparation
Phase 1: Site Preparation is expected to occur over a 10-month period, during which one shift would occur (7 AM to 3 PM).

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 22.1 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 1, noise levels were also determined for off-peak construction. For the off-peak period of Phase 1 at this location, the increase at this receptor is predicted to be 19.8 dBA during the first shift (7 AM to 3 PM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline of 5 dBA for the first shift of Phase 1, the duration of the predicted exceedance is the approximately 10 months of Phase 1 when 7 AM to 3 PM work would be required. The duration of the predicted incremental worst-case noise levels is expected to be approximately 4 months out of the approximately 10 months of Phase 1.

Phase 2: Shaft Construction
Phase 2: Shaft Construction, which would include some overlap with Phase 1: Site Preparation activities, is expected to occur over a 23-month period, during which two shifts would occur (7 AM to 3 PM and 3 PM to 11 PM).

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 25.0 dBA, which exceeds the CEQR impact guideline of 5 dBA. It

was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 17.6 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 22.9 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 15.9 dBA during the second shift (3 PM to 11 PM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline during the first and second shifts of Phase 2, the duration of the predicted exceedance is the approximately 23 months of Phase 2 when 7 AM to 11 PM work would be required. The duration of the predicted incremental worst-case noise levels is expected to be approximately 2 months out of the approximately 23 months of Phase 2 for both shifts.

Phase 3: Bypass Tunnel Excavation

Phase 3: Bypass Tunnel Excavation, which would include the inundation plug construction, is expected to occur over a 40-month time period. During the period when the inundation plug work is occurring, two shifts would generally occur (7 AM to 3 PM and 3 PM to 11 PM). Drilling work undertaken on the inundation plugs would occur in two shifts of 8 hours. (This work would last approximately 13 months if the contractor employs three drill rigs. The duration could be longer if only one or two rigs are employed on site during this phase; however, the general nature of the work would not change.) A third shift (11 PM to 7 AM) of construction would be required for approximately 1 month during construction of the connector tunnels and 2 months for TBM removal and cleanup.

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 20.8 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 4.1 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 19.2 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 3.1 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 21.4 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 18.6 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. The duration of the predicted worst-case noise levels is expected to be approximately 1 month for connector tunnels and 2 months for TBM removal and cleanup in Phase 3 for the first shift (7 AM to 3 PM). Throughout the remainder of Phase 3 the magnitude of noise level increases would be between that of the predicted off-peak construction, which does not exceed the CEQR impact guideline, and that of the worst-case period, which exceeds the CEQR impact guideline.

Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline for the second shift of Phase 3, the duration of the predicted exceedance is the remainder of Phase 3 when 3 PM to 11 PM work would be required. The duration of the predicted worst-case noise levels is expected to be approximately 1 month for connector tunnels and 2 months for TBM removal and cleanup in Phase 3 for the second shift (3 PM to 11 PM).

Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline for the third shift of Phase 3, the duration of the predicted exceedance is the 3 months of Phase 3 when 11 PM to 7 AM work would be required. Throughout the remainder of Phase 3, when no work would take place during the third shift (11 PM to 7 AM), no significant noise level increase would occur during those hours.

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B
Phase 4 is expected to occur over a 4-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 20.7 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-

site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 20.3 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 19.1 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 18.7 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 21.3 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 20.9 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline for every shift during of Phase 3, the duration of the predicted exceedance is the 4 months of Phase 4 during all three shifts (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM). The predicted incremental worst-case noise level is expected to be approximately 1 month out of the approximately 4 months of Phase 4.

Determination of Significance of Noise Impacts

Based on the duration and magnitude of the exceedances of the CEQR impact guideline, as described above, there would be a predicted temporary significant adverse noise impact at this receptor, which is representative of the residence at 217 River Road North immediately north of the east connection site.

The exterior noise level during the period with the highest predicted nighttime noise level increase at this location would be 64.0 dBA $L_{eq(1)}$ during the third shift (11 PM to 7 AM) of Phase 3, an incremental increase of 21.4 dBA over the measured existing value of 42.6 dBA.

In addition, the interior $L_{10(1)}$ noise level, calculated as described in section 2.13-2, "Methodology," at this receptor during the period of the greatest incremental noise increase would be 48.1 dBA with windows open. With windows closed, the interior $L_{10(1)}$ noise level

would be 36.1 dBA—below the 45 dBA CEQR guideline of acceptability (see section 2.13-1.2) for the 11 PM to 7 AM period.

Receptor 8^{E} – Residence at 219 River Road North Immediately North of the East Connection Site

At receptor 8^{E}, representing 219 River Road North a residential location along River Road immediately north of the east connection site, the *CEQR Technical Manual* impact criteria is predicted to be exceeded during the following:

- Phase 1: Site Preparation during the first shift (7 AM to 3 PM);
- Phase 2: Shaft Construction during the first shift (7 AM to 3 PM) and second shift (3 PM to 11 PM);
- Phase 3: Bypass Tunnel Excavation during the first shift (7 AM to 3 PM), second shift (3 PM to 11 PM), and third shift (11 PM to 7 AM); and
- Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B during the first shift (7 AM to 3 PM), second shift (3 PM to 11 PM), and third shift (11 PM to 7 AM).

Provided below is a description of work and work hours, and a summary of the expected magnitude and duration of the CEQR impact criteria exceedance, by phase and shift.

Phase 1: Site Preparation

Phase 1: Site Preparation is expected to occur over a 10-month period, during which one shift would occur (7 AM to 3 PM).

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 21.2 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 1, noise levels were also determined for off-peak construction. For the off-peak period of Phase 1 at this location, the increase at this receptor is predicted to be 19.7 dBA during the first shift (7 AM to 3 PM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline of 5 dBA for the first shift of Phase 1, the duration of the predicted exceedance is the approximately 10 months of Phase 1 when 7 AM to 3 PM work would be required. The duration of the predicted incremental worst-case noise levels is expected to be approximately 4 months out of the approximately 10 months of Phase 1.

Phase 2: Shaft Construction
Phase 2: Shaft Construction, which would include some overlap with Phase 1: Site Preparation activities, is expected to occur over a 23-month period, during which two shifts would occur (7 AM to 3 PM and 3 PM to 11 PM).

First Shift (7 AM to 3 M). The magnitude of the increase during the worst-case period at this receptor is predicted to be 24.3 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 16.4 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 22.9 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 2, noise levels were also determined for off-peak construction. For the off-peak period of Phase 2 at this location, the increase at this receptor is predicted to be 14.7 dBA during the second shift (3 PM to 11 PM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline during the first shift (7 AM to 3 PM) and second shift (3 PM to 11 PM) of Phase 2, the duration of the predicted exceedance is the approximately 23 months of Phase 2 when 7 AM to 11 PM work would be required. The duration of the predicted incremental worst-case noise levels is expected to be approximately 2 months out of the approximately 23 months of Phase 2 for both shifts.

Phase 3: Bypass Tunnel Excavation
Phase 3: Bypass Tunnel Excavation, which would include the inundation plug construction, is expected to occur over a 40-month time period. During the period when the inundation plug work is occurring, two shifts would generally occur (7 AM to 3 PM and 3 PM to 11 PM). Drilling work undertaken on the inundation plugs would occur in two shifts of 8 hours. (This work would last approximately 13 months if the contractor employs three drill rigs. The duration could be longer if only one or two rigs are employed on site during this phase; however, the general nature of the work would not change.) A third shift (11 PM to 7 AM) of construction would be required for approximately 1 month during construction of the connector tunnels and 2 months for TBM removal and cleanup.

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 20.8 dBA, which exceeds the CEQR impact guideline of 5 dBA. It

was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 4.2 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 19.2 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 3.3 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 21.4 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 3, noise levels were also determined for off-peak construction. For the off-peak period of Phase 3 at this location, the increase at this receptor is predicted to be 18.3 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. The duration of the predicted worst-case noise levels is expected to be approximately 1 month for connector tunnels and 2 months for TBM removal and cleanup in Phase 3 for the first shift (7 AM to 3 PM). Throughout the remainder of Phase 3 the magnitude of noise level increases would be between that of the predicted off-peak construction, which does not exceed the CEQR impact guideline, and that of the worst-case period, which exceeds the CEQR impact guideline.

Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline for the second shift (3 PM to 11 PM) of Phase 3, the duration of the predicted exceedance is the remainder of Phase 3 when 3 PM to 11 PM work would be required. The duration of the predicted worst-case noise levels is expected to be approximately 1 month for connector tunnels and 2 months for TBM removal and cleanup in Phase 3 for the second shift (3 PM to 11 PM).

Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline for the third shift (11 PM to 7 AM) of Phase 3, the duration of the predicted exceedance is the 3 months of Phase 3 when 11 PM to 7 AM work would be required. Throughout the remainder of Phase 3, when no work would take place during the third shift (11 PM to 7 AM), no significant noise level increase would occur during those hours.

Phase 4: Bypass Tunnel Lining, Project 1 Demobilization, and Preparation for Project 2B
Phase 4 is expected to occur over a 4-month time period. During that time period, three shifts would occur (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM).

First Shift (7 AM to 3 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 22.1 dBA, which exceeds the CEQR impact guideline of 5 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the first shift (7 AM to 3 PM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 21.8 dBA during the first shift (7 AM to 3 PM).

Second Shift (3 PM to 11 PM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 20.4 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the second shift (3 PM to 11 PM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 20.1 dBA during the second shift (3 PM to 11 PM).

Third Shift (11 PM to 7 AM). The magnitude of the increase during the worst-case period at this receptor is predicted to be 22.7 dBA, which exceeds the CEQR impact guideline of 3 dBA. It was determined that the noise level increase would be primarily a result of the operation of on-site equipment and the particularly low existing noise levels at this location. Since the *CEQR Technical Manual* guideline is predicted to be exceeded at this receptor during the third shift (11 PM to 7 AM) during the worst-case period of Phase 4, noise levels were also determined for off-peak construction. For the off-peak period of Phase 4 at this location, the increase at this receptor is predicted to be 22.4 dBA during the third shift (11 PM to 7 AM).

Duration of Predicted Exceedances. Since both the predicted worst-case noise level and off-peak noise level exceed the CEQR impact guideline for every shift during Phase 3, the duration of the predicted exceedance is the 4 months of Phase 4 during all three shifts (7 AM to 3 PM, 3 PM to 11 PM, and 11 PM to 7 AM). The predicted incremental worst-case noise level is expected to be approximately 1 month out of the approximately 4 months of Phase 4.

Determination of Significance of Noise Impacts
Based on the duration and magnitude of the exceedances of the CEQR impact guideline, as described above, there would be a predicted temporary significant adverse noise impact at this receptor, which is representative of the residence at 219 River Road North immediately north of the east connection site.

The exterior noise level during the period with the highest predicted nighttime noise level increase at this location would be 65.3 dBA $L_{eq(1)}$ during the third shift (11 PM to 7 AM) of Phase 3, an incremental increase of 22.7 dBA over the measured existing value of 42.6 dBA. In addition, the interior $L_{10(1)}$ noise level, calculated as described in section 2.13-2, "Methodology," at this receptor during the period of the greatest incremental noise increase would be 49.4 dBA with windows open. With windows closed, the interior $L_{10(1)}$ noise level would be 37.4 dBA—below the 45 dBA CEQR guideline of acceptability (see section 2.13-1.2) for the 11 PM to 7 AM period.

2.13-5 CONCLUSIONS

2.13-5.1 WEST OF HUDSON

The maximum allowed sound pressure values for residential districts between the hours of 7 PM and 7 AM specified by the Town of Newburgh Code is expected to be exceeded near the west connection site with the construction of Project 1. However, under existing conditions the measured existing noise levels in the west of Hudson study area can exceed the Town of Newburgh Code limits during the applicable time periods.

Construction of Project 1 would result in predicted temporary significant adverse noise impacts at the exterior of two residences. These temporary significant adverse noise impacts would be expected to occur primarily during the third shift, between the hours of 11 PM and 7 AM, when there are very low existing ambient noise levels expected in these locations. The predicted noise level increases, which were up to 6.6 dBA above existing levels, could occur for approximately 5 to 6 years. However, at these residences the interior $L_{10(1)}$ noise levels during construction of Project 1 would be acceptable (less than 45 dBA) even with windows open for the 11 PM to 7 AM period.

2.13-5.2 EAST OF HUDSON

The maximum allowed sound pressure values for residential districts between sunset and 8 AM specified by the current Town of Wappinger Noise Code is expected to be exceeded near the east connection site with the construction of Project 1. However, under existing conditions the measured existing noise levels in the east of Hudson study area can exceed the Town of Wappinger Noise Code limits during the applicable time periods.

Construction of Project 1 would result in predicted exceedances of the CEQR impact noise guideline. These predicted incremental noise levels at the exterior of residences were up to 25 dBA above existing levels and are expected to occur primarily at residences adjacent to the east connection site. Based on the duration and magnitude of the predicted exceedances, there would be predicted temporary significant adverse noise impacts at these locations. However, for locations where a predicted temporary significant adverse noise impact would occur near the east connection site, the interior $L_{10(1)}$ noise levels during construction of Project 1 would be acceptable (less than 45 dBA) with windows closed for the 11 PM to 7 AM period. ✷