14
Noise

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Acronyms/Abbreviations

dBa ..... decibel
FTA ..... Federal Transit Administration
Hz ..... Hertz
NYSDEC ..... New York State Department of Environmental Conservation

14 Noise

This chapter presents the results of the operational noise analysis of the Proposed Action, which considers noise from the proposed light-rail system and vehicular traffic noise associated with access to the proposed stations and park & rides. This chapter also describes the potential noise impacts of the Proposed Action's construction. Measures to avoid, minimize, and mitigate noise impacts are presented. Chapter 15 "Vibration" addresses the assessment of potential vibration impacts associated with the Proposed Action.

14.1 REGULATORY CONTEXT

The noise analysis was conducted following procedures described in the Federal Transit Administration (FTA's) *Transit Noise and Vibration Impact Assessment* (FTA Report No. 0123, September 2018) (FTA Guidance Manual) for rail-related noise and vibration impacts. The FTA Guidance Manual sets forth procedures for analyzing noise and vibration resulting from non-high-speed (i.e., 90 miles per hour or below) rail projects.

Following the procedures set forth in the FTA Guidance Manual, airborne noise impacts can be analyzed using a screening procedure, a general noise assessment, and/or a detailed noise analysis. The screening procedure is performed first to determine whether any noise-sensitive receptors are within distances where impacts are likely to occur. When there are noise-sensitive receptors in locations where impacts are likely to occur, then a general noise assessment is performed to determine locations where noise impacts could occur. If this general assessment indicates that a potential for noise impact does exist, then a detailed noise analysis could be necessary. The FTA's detailed analysis methodology is used to predict impacts and evaluate the effectiveness of mitigation with greater precision than can be achieved with the general noise assessment.

The New York State Department of Environmental Conservation (NYSDEC) "Assessing and Mitigation Noise Impacts" guidance document provides general instructions for evaluation and mitigation of environmental noise for projects in New York State. However, it does not specifically address noise from rail projects, which are typically evaluated based on federal guidance as described above. Additionally, the impact criteria in NYSDEC's guidance is comparable to that of the FTA guidance, and in fact the FTA impact criteria are generally more stringent. As such, evaluation of the Proposed Actions using the FTA guidance provides the most conservative method for identification of potential impacts.

The Proposed Action could divert roadway vehicular traffic. As described in Chapter 13, "Transportation", the potential for traffic diversions due to the Proposed Action was considered during the development of the traffic analysis methodology; however, this aspect of traffic is difficult to predict and model in the future. Therefore, traffic diversion was not considered in the analysis. A review of the GBNRTC's regional travel demand model indicates that potential diversions would not be significant and that traffic would most likely divert to major roadways outside the study area. A

screening analysis was also conducted to determine whether traffic diverted as a result of the Proposed Action could result in noise level increases at any noise receptors that would constitute impacts on those receptors. The FTA noise analysis procedures do not include a methodology to consider diverted vehicular traffic; however, a screening level analysis based on the expected increase in vehicular volumes was used to evaluate the potential for impacts as a result of vehicular traffic diversions.

14.1.1 Noise Fundamentals and Definitions

Quantitative information on the effects of airborne noise on people is well documented. If sufficiently loud, noise could adversely affect people in several ways. For example, noise could interfere with human activities such as sleep, speech communication, and tasks requiring concentration or coordination. Noise could 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.

Sound-pressure levels are measured in units called "decibels" (dBa). The particular character of the noise that we hear is determined by the frequency at which the air pressure fluctuates. Frequency defines the fluctuation of sound pressure in terms of cycles per second. One cycle per second is known as 1 Hertz (Hz). People can hear over a relatively limited range of sound frequencies, generally between 20 Hz and 20,000 Hz, and the human ear does not perceive all frequencies equally well. High frequencies are more easily discerned and therefore more intrusive than many of the lower frequencies.

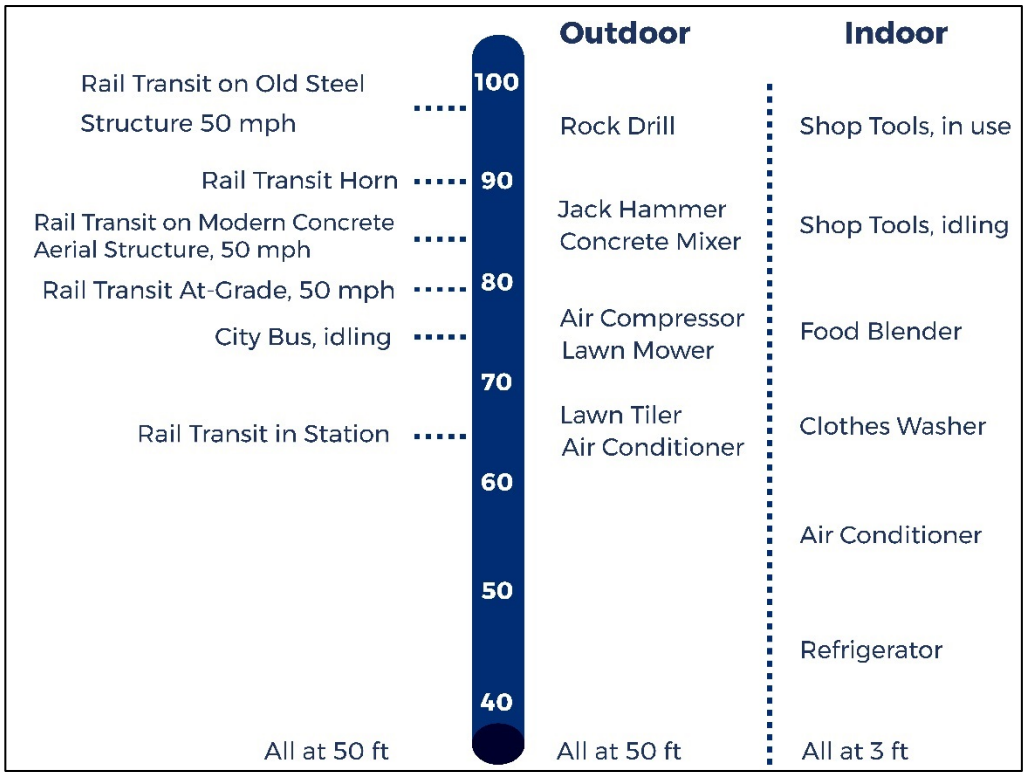
14.1.1.1 "A"-Weighted Sound Level (dBA)

To bring a uniform noise measurement that simulates people's perception of loudness and annoyance, the decibel measurement is weighted[1] to account for those frequencies most audible to the human ear. This is known as the A-weighted sound level (dBA), and because of the weighting based on human perception, it is the most often used descriptor of noise levels where community noise is the issue. As shown in Figure 14-1, the threshold of human hearing is defined as 0 dBA; very quiet conditions (e.g., a library) are approximately 40 dBA; levels between 50 dBA and 70 dBA define the range of normal daily activity; levels above 70 dBA are considered noisy, and then loud, intrusive, and deafening as the scale approaches 130 dBA. For most people to perceive an increase in noise, it must be at least 3 dBA. At 5 dBA, the change will be readily noticeable. An increase of 10 dBA is generally perceived as a doubling of loudness.

Combinations of different sources are not additive in an arithmetic manner, due to the decibel scale's logarithmic nature. For example, two noise sources—a vacuum cleaner operating at approximately 72 dBA and a telephone ringing at approximately 58 dBA—do not combine to create a noise level of 130 dBA, the equivalent of a military jet or air raid siren (see Figure 14-1). In fact, the noise produced by the telephone ringing could be masked by the noise of the vacuum cleaner and not be heard. The logarithmic combination of these two noise sources would yield a noise level of 72.2 dBA.

[1] A-weighted sound levels represent the overall noise at a receiver that is adjusted in frequency to approximate typical human hearing sensitivity. This is expressed as A-weighted decibels (dBA) and is the basic noise unit for transit noise analyses.

Figure 14-1. Common Noise Levels



Source: Federal Transit Administration. 2018. *Transit Noise and Vibration Impact Assessment*
Note: A 10 dBA increase in level appears to double the loudness, and a 10 dBA decrease halves the apparent loudness.

14.1.1.2 Effects of Distance on Noise

Noise varies with distance. For example, highway traffic 50 feet away from a receptor (such as a person listening to the noise) typically produces sound levels of approximately 70 dBA. The same highway noise measures 66 dBA at a distance of 100 feet, assuming soft ground conditions (such as grass). This decrease is known as "drop-off." The outdoor drop-off rate for a line source, such as a railway, is a decrease of approximately 4.5 dBA (for soft ground) for every doubling of distance between the noise source and receptor. For hard ground (such as concrete), the outdoor drop-off rate is 3 dBA for line sources. Assuming soft ground, for a point source, such as a stationary piece of construction equipment (e.g., a drill rig), the outdoor drop-off rate is a decrease of approximately 7.5 dBA for every doubling of distance between the noise source and receptor (for hard ground the outdoor drop-off rate is 6 dBA for point sources).

14.1.1.3 Noise Descriptors Used in Impact Assessment

The sound-pressure level unit of dBA describes a noise level at just one moment, but because 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 were a steady, unchanging sound (i.e., as if it were averaged over that time period). For this condition, a descriptor called the "equivalent sound level" (L_{eq}) can be computed. L_{eq} is the constant sound level that, in a given situation and period (e.g., 1 hour, denoted by $L_{eq(1)}$, or 24 hours, denoted as $L_{eq(24)}$) conveys the same sound energy as the actual time-varying sound.

A descriptor for cumulative 24-hour exposure is the day-night ***average*** sound level, abbreviated as L_{dn}. This is a 24-hour measurement that accounts for the moment-to-moment fluctuations in A-weighted noise levels due to all sound sources, combined. Mathematically, the L_{dn} noise level is the energy average of all $L_{eq(1)}$ noise levels over a 24-hour period, where nighttime noise levels (10 p.m. to 7 a.m.) are increased by 10 dBA before averaging because of increased noise sensitivity during nighttime when people are typically sleeping.

Following guidance in the FTA Guidance Manual, either the maximum $L_{eq(1)}$ sound level or the L_{dn} sound level is used for operational noise impact assessment, depending on land use category as described in Section 14.1.2. Also as specified in the FTA Guidance Manual, the 8-hour equivalent level (i.e., the $L_{eq(8)}$), and the 30-day average L_{dn} are used for construction noise impact assessment as described in the following section.

14.1.2 Operational Noise Impact Criteria

The FTA Guidance Manual defines noise criteria based on the specific type of land use that would be affected, with explicit operational noise impact criteria for three land use categories. These impact criteria are based on either peak 1-hour L_{eq} or 24-hour L_{dn} values. Table 14-1 describes the land use categories defined in the FTA Guidance Manual and provides noise metrics used for determining operational noise impacts. As described in Table 14-1, Categories 1 and 3—which include land uses that are noise-sensitive, but where people do not sleep—require examination using the 1-hour L_{eq} descriptor for the noisiest peak hour. Category 2, which includes residences, hospitals, and other locations where nighttime sensitivity to noise is very important, requires examination using the 24-hour L_{dn} descriptor.

Table 14-1. FTA's Land Use Category and Metrics for Transit Noise Impact Criteria

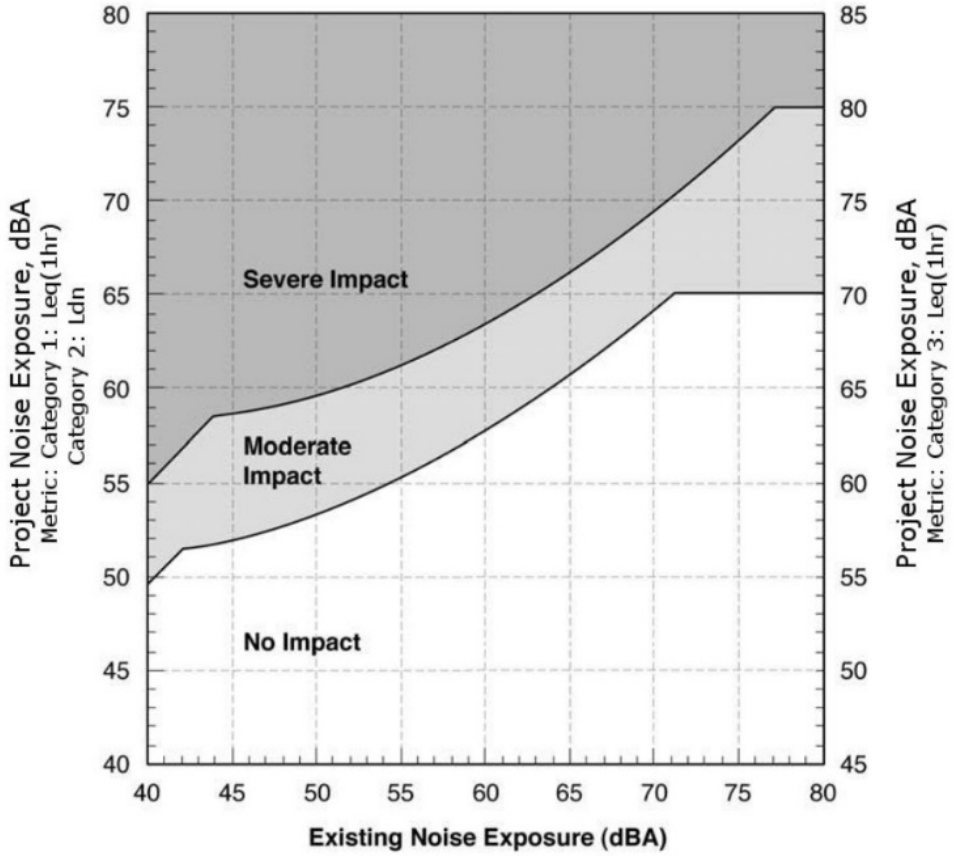
Land Use Category	Land Use Type	Noise Metric, dBA	Description of Land Use Category
1	High Sensitivity	Outdoor $L_{eq(1hr)}$*	Land where quiet is an essential element of its intended purpose. Example land uses include preserved land for serenity and quiet, outdoor amphitheaters and concert pavilions, and national historic landmarks with considerable outdoor use.
2	Residential	Outdoor L_{dn}	This category is applicable to all residential land use and buildings where people normally sleep, such as hotels and hospitals.
3	Institutional	Outdoor $L_{eq(1hr)}$*	This category is applicable to institutional land uses with primarily daytime and evening use. Example land uses include schools, libraries, theaters, and churches where it is important to avoid interference with such activities as speech, meditation, and concentration on reading material.

Source: Federal Transit Administration. 2018. *Transit Noise and Vibration Impact Assessment*
* $L_{eq(1hr)}$ for the loudest hour of project-related activity during hours of noise sensitivity.

Figure 14-2 shows the FTA's noise impact criteria for transit projects, as presented in the FTA Guidance Manual. The FTA impact criteria are keyed to the noise level generated by a project (called "project noise exposure") in locations of varying existing noise levels. Two types of impacts—moderate and severe—are defined for each land use category, depending on existing noise levels. Thus, where existing noise levels are 40 dBA, for land use Categories 1 and 2, the respective L_{eq} and L_{dn} noise exposure from a project would create moderate impacts if they were above approximately 50 dBA and would create severe impacts if they were above approximately 55 dBA. For Category 3, a project noise exposure level above approximately 55 dBA would be considered a moderate impact, and above approximately 60 dBA would be considered a severe impact. The difference between

"severe impact" and "moderate impact" is that a severe impact indicates a change in noise level that a significant percentage of people would find annoying, while a moderate impact indicates a change in noise level that is noticeable to most people but not necessarily sufficient to result in strong adverse reactions from the community. Severe impacts are generally considered to constitute adverse impacts, whereas moderate impacts require further consideration to evaluate whether they would constitute adverse impacts.

Figure 14-2. FTA Noise Impact Criteria for Transit Projects



Source: Federal Transit Administration. 2018. *Transit Noise and Vibration Impact Assessment*

14.1.3 Construction Noise Impact Criteria

The local noise ordinances in Buffalo, Amherst, and Tonawanda do not provide specific criteria for evaluation of construction noise levels. The Buffalo and Amherst codes only reference construction noise in order to prohibit construction activity during nighttime hours. Construction associated with the Proposed Action would occur during daytime hours, which is consistent with this prohibition. As such, the guidelines presented in the FTA Guidance Manual are used for evaluation of construction noise.

The FTA Guidance Manual provides noise impact thresholds for construction in the daytime (defined as 7 a.m. to 10 p.m.) and nighttime (defined as 10 p.m. to 7 a.m.). Separate impact thresholds are specified for various types of land use (e.g., residential, commercial, and industrial), depending on each use's sensitivity to noise, although the land use categories for the construction noise impact thresholds are not the same as the FTA land use categories for the operational noise impact criteria

as described earlier. Table 14-2 shows the impact thresholds for construction. Because construction of the Proposed Action would occur during daytime hours, the daytime noise impact criteria have been used for this analysis.

Table 14-2. FTA Construction Noise Impact Criteria

Land Use	$L_{eq.equip(1hr)}$, dBA	
	Day	Night
Residential	90	80
Commercial	100	100
Industrial	100	100

Source: Federal Transit Administration. 2018. *Transit Noise and Vibration Impact Assessment*

14.2 METHODOLOGY

14.2.1 Operational Impacts

For the analysis of operational airborne noise, the following procedure was used:

1. Identify noise-sensitive land uses (e.g., residential, religious, university) within the screening distance from the Proposed Action alignment and selection of representative noise receptor sites.
2. Determine existing noise levels at the selected receptor sites by performing field measurements and using acoustical fundamentals. For sites at which direct access to conduct noise level measurements was not available, noise levels were estimated in accordance with FTA procedures.
3. Determine cumulative future noise levels from sources with the Proposed Action at each receptor site using FTA general assessment methodology. The cumulative future noise levels incorporate the effects of noise reduction measures, which are included in the Proposed Actions described in Section 14.5.
4. Determine the Proposed Action noise exposure at each receptor site (i.e., noise only from Proposed Action-generated sources), using the future noise levels for the Proposed Action.
5. Compare the Proposed Action noise exposure to the FTA criteria to identify potential impacts.
6. Consider the amount of diverted vehicular traffic associated with the Proposed Action to determine the potential for traffic noise impacts at receptors.

14.2.2 Construction Impacts

The airborne noise associated with construction of the Proposed Action was analyzed using the general analysis procedures described in the FTA Guidance Manual to the extent possible based on the conceptual construction information available. Construction-related noise was calculated by assuming that the two loudest pieces of construction equipment that would operate simultaneously would do so continuously for one hour during the daytime (7:00 a.m. to 10 p.m.) period. Table 14-3 lists the equipment that could be used for construction of the Proposed Action, along with associated noise emission levels at a distance of 50 feet.

Using the FTA's construction noise analysis procedures, a quantified general assessment was conducted to evaluate the potential for construction-related (e.g., tunnel and shaft construction, track construction, station construction, and construction of the rail storage facility north of I-990) noise impacts at sensitive receptors near areas of construction for the Proposed Action. The projected construction noise levels at each receptor were then compared to the FTA construction noise impact criteria to determine the potential for construction noise impacts. This methodology provides a conservative estimate of potential impacts.

Table 14-3. Construction Equipment Noise Emission Levels

Equipment	L_{max}, dBA
Air Compressor	80
Backhoe	80
Ballast Equalizer	82
Ballast Tamper	83
Compactor	82
Concrete Mixer	85
Concrete Pump	82
Concrete Vibrator	76
Crane	80[1]
Dozer	85
Generator	82
Grader	85
Impact Wrench	85
Loader	80
Paver	85
Pneumatic Tool	85
Pump	77
Rock Drill	80[1]
Roller	85
Saw	76
Scarifier	83
Scraper	85
Shovel	82
Spike Driver	77
Tie Cutter	84
Tie Handler	80
Tie Inserter	85
Truck	84

Source: Federal Transit Administration. 2018. *Transit Noise and Vibration Impact Assessment*
[1] Proposed Action-specific low-noise commitments.

14.2.3 Noise Measurement Locations

Fifteen noise measurement locations were chosen to represent noise-sensitive locations within the screening distances that the FTA Guidance Manual specifies. These measurement locations were selected to represent the existing conditions for noise-sensitive locations that would have the greatest potential to experience noise-level increases resulting from the Proposed Action. The locations are representative of existing land uses in the study area and were chosen to provide geographic coverage of the areas where noise impacts could occur.

14.2.4 Noise Survey

Following the categories and descriptors outlined in Table 14-1, 1-hour peak L_{eq} noise levels were collected for Category 1 and Category 3 receptors. The train operation schedule for the Proposed Action alignment would be comparable to the current train operation schedule for the existing alignment. Based on the existing train operation schedule, the peak hours for the Proposed Action operations were determined to be between 7 a.m. and 10 a.m. Therefore, the 1-hour peak L_{eq} noise levels for Category 1 and Category 3 receptors were collected between 7 a.m. and 10 a.m. For Category 2 receptors where examination of the 24-hour L_{dn} descriptor is required, 24-hour continuous measurements were collected where site access could be obtained for the full 24-hour survey. At Category 2 receptors with limited site access, 1-hour measurements were collected during the AM, midday (between the morning and afternoon roadway-traffic peak hours), and late-night (between midnight and 5:00 a.m.) time periods to calculate the existing L_{dn} based on the guidelines in Appendix E of the FTA Guidance Manual.

Noise measurements were taken using Brüel & Kjær Type 2250, 2250L, 2260, and 2270 Noise Level Meters; Brüel & Kjær Sound Level Calibrators Type 4231; and Brüel & Kjær Type 4189 1/2-inch microphones. Instruments were mounted at a height of approximately 5 feet above the ground. The meters were calibrated before and after readings using Brüel & Kjær Type 4231 sound level calibrators using the appropriate adaptors. The sound meters digitally recorded the data and displayed the data 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}.[2, 3] Windscreens were used during all sound measurements except for calibration. The measurement procedures conformed to the requirements of ANSI Standard S1.13-2005.

14.3 EXISTING CONDITIONS

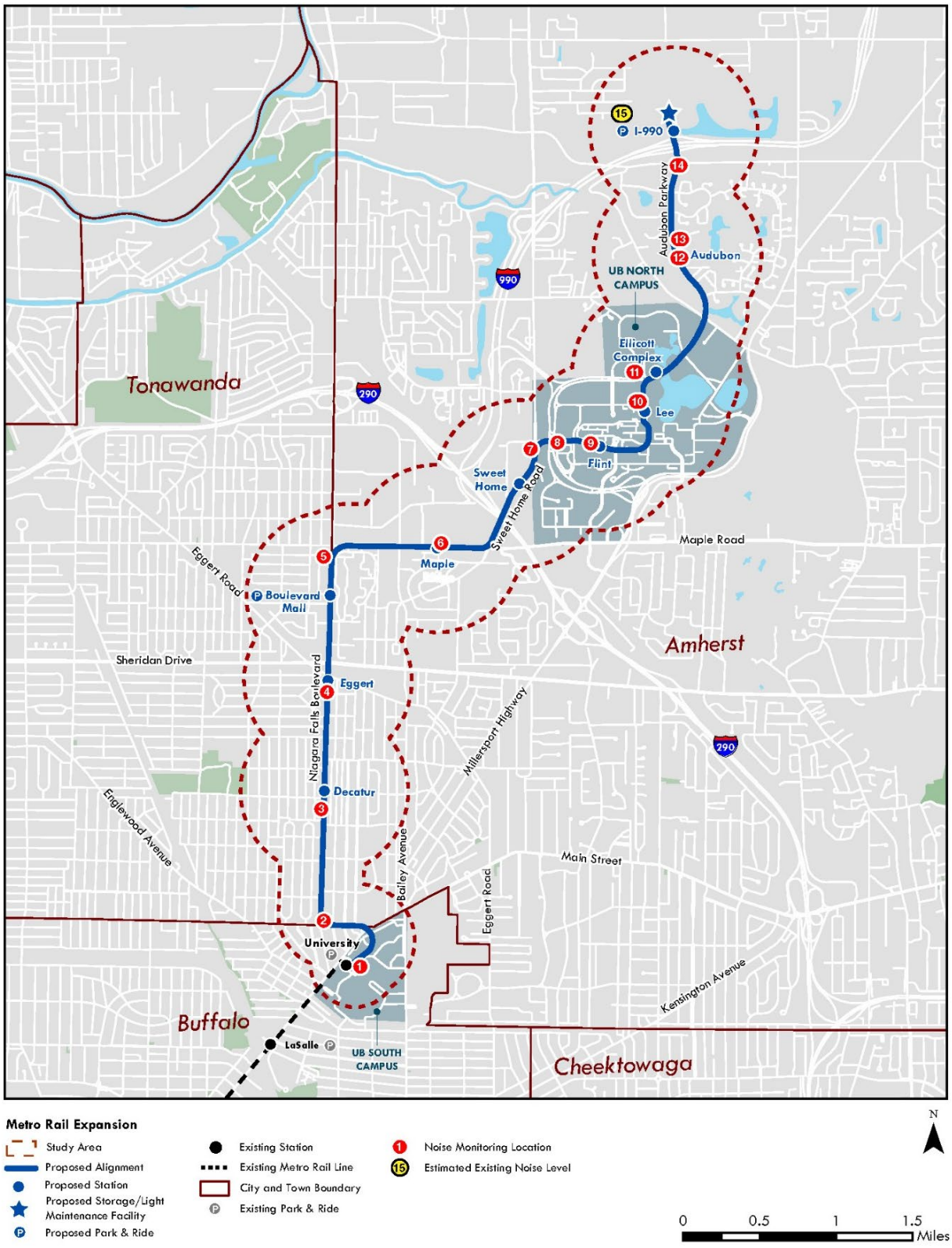
Twenty-two receptor sites were selected to represent noise-sensitive locations that could experience noise-level increases resulting from the Proposed Action. The receptors are representative of existing land uses in the study area and were chosen to provide geographic coverage of the areas where noise impacts could occur. The 22 receptor locations were selected at the closest developed land uses to the new surface tracks, storage facility, substations, and each of the construction work areas. For this reason, each studied receptor would be more likely to experience noise impacts from Proposed Action activities than other sites in their general locations. Table 14-4 lists and Figure 14-3 shows the locations of the 22 receptor sites.

[2] L_1 = noise level exceeded for 1 percent of the time of the measurement duration; L_{10} = 10 percent of the time; L_{50} = 50 percent of the time.
[3] L_{90} is taken to be the ambient or background noise level.

Table 14-4. Noise Receptor Locations

Receptor Site		Land Use Represented	FTA Land Use Category	Noise Descriptor
3a	345 Niagara Falls Boulevard	Residential	2	L_{dn}
3t	316 Niagara Falls Boulevard	Residential	2	L_{dn}
3f	248 Niagara Falls Boulevard	Residential	2	L_{dn}
3i	Trinity United Methodist Church	Religious	3	L_{eq}
4a	315 Curtis Parkway	Residential	2	L_{dn}
5a	51 Wrexham Court North	Residential	2	L_{dn}
5h	1343 Brighton Road	Residential	2	L_{dn}
6	Sweet Home Middle School	School	3	L_{eq}
6e	324 Homecrest Drive	Residential	2	L_{dn}
6j	380 Homecrest Drive	Residential	2	L_{dn}
7a	100 Villas Drive	Residential	2	L_{dn}
8a	Hadley Village 112	Residential	2	L_{dn}
9a	Park Hall, University at Buffalo (UB) North Campus	University	3	L_{eq}
10	Davis Hall, UB North Campus	University	3	L_{eq}
10c	Lockwood Memorial Library, UB North Campus	University	3	L_{eq}
11a	Greiner Hall, UB North Campus	Residential	2	L_{dn}
12	Audubon Branch Amherst Public Library	Library	3	L_{eq}
12a	Skinnersville Cemetery, Frontier Road	Cemetery	3	L_{eq}
13a	2 Partridge Run	Residential	2	L_{dn}
14	Amherst Chapel/Funeral Home	Religious	3	L_{eq}
14a	300 Dodge Road	Residential	2	L_{dn}
14h	Muir Woods Future Residential Development	Future Residential	2	L_{dn}

Figure 14-3. Noise Receptor Locations



Source: Erie County, 2019

Noise measurements were conducted at survey locations to represent each of the receptors in Table 14-4. Table 14-5 lists and Figure 14-3 shows the noise measurement sites.

Table 14-5. Noise Measurement Locations

Receptor Site		Land Use Represented	FTA Land Use Category	Noise Descriptor
3	512 Niagara Falls Boulevard	Residential, Religious	2, 3	L_{dn}, L_{eq}
4	900 Niagara Falls Boulevard	Religious	3	L_{eq}
5	1328 Niagara Falls Boulevard	Residential	2	L_{dn}
6	Sweet Home Middle School, 4150 Maple Road	School	2	L_{dn}
7	100 Villas Drive East	Residential	3	L_{eq}
8	Hadley Village 110	Residential	2	L_{dn}
9	Cooke Hall, Putnam Way	University	3	L_{eq}
10	Davis Hall, White Road	University	3	L_{eq}
11	Greiner Hall - UB North Campus, John James Audubon Pkwy & Core Road	Residential	2	L_{dn}
12	BECPL Audubon Branch - Amherst Public Library, 350 John James Audubon Pkwy	Library, Cemetery	3	L_{eq}
13	Town of Amherst Court, 400 John James Audubon Pkwy	Residential	2	L_{dn}
14	Amherst Memorial Chapel, 281 Dodge Road	Residential, Religious	2, 3	L_{dn}, L_{eq}

Notes: See Figure 14-3 for locations.

Noise measurements were conducted at each of the receptors in Table 14-4. Data from the surveys were used to determine existing noise levels according to the FTA guidelines, using the noise level descriptor for each receptor's land use category per Table 14-1. At Receptors 3, 5, 7, 8, 11, and 14, 24-hour continuous noise-level measurements were conducted (Table 14-6). At Receptors 6, 9, 10, and 12, 1-hour duration measurements were conducted during the AM peak time period, which represents the peak period of operations and peak (i.e., worst-case) period of noise production for the Proposed Action, because this is when highest hourly volume of trains would be expected to occur. For the remaining Receptors 4 and 13, 1-hour duration noise measurements were conducted during the AM, midday, and late-night time periods, as per FTA guidance. Noise levels from these three measurements were combined to estimate the existing L_{dn} following the guidelines in Appendix E of the FTA Guidance Manual. Noise level measurements were conducted March 25–28, 2019.

Table 14-6 shows the existing noise levels for each receptor site. These values were calculated following the procedures described previously. Existing noise levels at all receptors include noise generated by vehicular traffic including trucks and buses on adjacent roadways and aircraft overflights. Additional noise sources that contributed to existing noise levels included UB bus traffic at Receptors 1, 10, and 11; pedestrian foot traffic at Receptors 1, 6, 7, 8, 9, 10, 11, 12, and 13; and nearby mechanical equipment at Receptors 3, 5, and 10.

Table 14-6. Existing Noise Levels

	Receptor Site	Measurement Type	FTA Land Use Category	Noise Descriptor	Existing Noise Level (dBA)	
					Leq	Ldn
1	Foster Hall, Buffalo, NY	1 hour AM Peak	3	Leq	56	N/A
2	159 Niagara Falls Blvd, Buffalo, NY	24 hour	2	Ldn	N/A	61
3	512 Niagara Falls Blvd, Buffalo, NY	24 hour	2, 3	Ldn, Leq	70	70
4	900 Niagara Falls Blvd, Buffalo, NY	1 hour AM, MD, LN Peak	2	Ldn	61	58[2]
5	1328 Niagara Falls Blvd, Tonawanda, NY	24 hour	2	Ldn	59	59[1]
6	Sweet Home Middle School, 4150 Maple Rd, Amherst, NY	1 hour AM Peak	2, 3	Ldn, Leq	62	60[2]
7	100 Villas Drive East, Amherst, NY	24 hour	2	Ldn	58	60
8	Hadley Village 110, Buffalo, NY	24 hour	2	Ldn	58	60[1]
9	Cooke Hall, Putnam Way, Buffalo, NY	1 hour AM Peak	3	Leq	56	N/A
10	Davis Hall, White Rd, Amherst, NY	1 hour AM Peak	3	Leq	56	N/A
11	Greiner Hall - UB North Campus, John James Audubon Pkwy & Core Road, Buffalo, NY	24 hour	2	Ldn	54	56
12	BECPL Audubon Branch - Amherst Public Library, 350 John James Audubon Pkwy, Buffalo, NY	1 hour AM Peak	3	Leq	54	N/A
13	Town of Amherst Court, 400 John James Audubon Pkwy, Buffalo, NY	1 hour AM, MD, LN Peak	3	Ldn	N/A	53[2]
14	Amherst Memorial Chapel, 281 Dodge Rd, Getzville, NY	24 hour	2. 3	Ldn, Leq	60	60
15	Residences north of Route 990 on Marine Drive	N/A	2	Ldn	50[2]	50[2]

Notes: Field measurements were conducted March 25–28, 2019.

1 Use of noisy landscaping equipment near this location during the noise measurement contaminated a portion of the measurement time. Audio recordings were utilized to exclude contaminated hours, noise levels during which were estimated based on data measured in the preceding or following hours to calculate the Ldn.

2 Ldn estimated using Federal Transit Administration's *Transit Noise and Vibration Impact Assessment Manual*, Table 4-17 and Appendix E.

14.4 PROPOSED ACTION

14.4.1 Operational Effects

The Proposed Action would extend the existing Metro Rail light rail system from Buffalo into Amherst and Tonawanda, and would consist of an underground (tunnel) section from the existing UB South Campus station to a tunnel portal on Niagara Falls Boulevard between Kenilworth and Princeton Avenues, followed by at-grade track construction along the remainder of the Proposed Action alignment, except for an underground section at the intersection of Maple Road and Sweet Home Road. Potential sources of noise included in the Proposed Action would be operation of rail on the surface track sections, audible signals at roadway crossings, audible signals on rail vehicles used at tunnel portals, substations, station parking lots, and the proposed light maintenance/storage facility north of I-990. The potential effects of these sources were examined in the noise analysis described below.

The noise exposure associated with the Proposed Action was calculated based on the contribution of each of the noise source elements described previously. The combined noise exposure at each receptor area within the screening distances from Proposed Action elements was determined and compared to FTA's noise impact criteria based on land use category and existing noise level to identify potential impacts. Table 14-7 shows the noise levels and incremental change in noise levels for the Proposed Action. Noise levels for the Proposed Action shown in Table 14-7 are the sum of the rail noise components (i.e., surface railway, crossing signals, train signals, substations, and light maintenance/storage facility), and the non-rail noise component (which is assumed to be the existing level). The noise exposure is the level of noise that would be produced by operation of the Proposed Action and is compared to the impact criteria to determine whether the Proposed Action could result in a noise impact.

As shown in Table 14-7, the noise generated by the Proposed Action at Receptors 3t, 3i, 5a, 5h, 6, 6e, 6j, 9a, 10, 11a, 12, 12a, 14, 14a and 14h would not constitute a moderate or a severe impact according to FTA noise impact criteria. Additionally, incremental changes in noise levels between the Proposed Action and existing conditions would be up to 4 dBA at these receptors, which would be imperceptible to less than readily noticeable. Consequently, the Proposed Action would not result in any adverse noise impacts at these receptor sites.

As shown in Table 14-7, the noise generated by the Proposed Action at Receptors 3a, 3f, 4a, 7a, and 8a would be considered moderate impacts according to FTA noise impact criteria. However, the incremental change from existing noise levels that would occur at these receptors would be between 1 and 3 dBA. A change in noise level of 3 dBA is barely perceptible. Consequently, the Proposed Action would not result in any adverse noise impacts and not require mitigation at these receptor sites.

Table 14-7. Noise Levels with the Proposed Action (in dBA)

Receptor Site		FTA Land Use Category	Existing Noise Level	FTA Impact Thresholds [1]		Proposed Action Noise Exposure	Proposed Action Total Noise Level	Proposed Action Noise Increment over Existing	Impact[2]?
				Moderate	Severe				
3a	345 Niagara Falls Boulevard	2	70	64	69	66	71	1	Moderate
3t	316 Niagara Falls Boulevard	2	70	64	69	62	70	0	No Impact
3f	248 Niagara Falls Boulevard	2	70	64	69	65	71	1	Moderate
3i	Trinity United Methodist Church	3	70	69	74	60	70	0	No Impact
4a	315 Curtis Parkway	2	58	57	62	58	61	3	Moderate
5a	51 Wrexham Court North	2	59	57	63	56	61	2	No Impact
5h	1343 Brighton Road	2	59	57	63	50	59	0	No Impact
6	Sweet Home Middle School	3	62	64	69	56	63	1	No Impact
6e	324 Homecrest Drive	2	60	58	63	56	61	1	No Impact
6j	380 Homecrest Drive	2	60	58	63	54	61	1	No Impact
7a	100 Villas Drive	2	60	58	63	60	63	3	Moderate
8a	Hadley Village 112	2	60	58	64	59	63	3	Moderate
9a	Park Hall, University of Buffalo North Campus	3	56	61	67	58	60	4	No Impact
10	Davis Hall, University of Buffalo North Campus	3	56	61	67	56	59	3	No Impact
10c	Lockwood Memorial Library, University of Buffalo North Campus	3	56	61	67	61	62	6	Moderate
11a	Greiner Hall, University of Buffalo North Campus	2	56	56	62	55	59	3	No Impact
12	Audubon Branch Amherst Public Library	3	54	60	66	50	56	2	No Impact
12a	Skinnersville Cemetery, Frontier Road	3	54	60	66	56	59	5	No Impact
13a	2 Partridge Run	2	53	54	60	57	58	5	Moderate
14	Amherst Chapel/Funeral Home	3	60	63	69	48	61	1	No Impact
14a	300 Dodge Road	2	60	58	63	55	61	1	No Impact
14h	Muir Woods Future Residential Development	3	60	58	63	49	60	0	No Impact

1 Impact criteria are based on the existing noise level, as shown in Figure 14-2.

2 The noise exposure for the Proposed Action is compared to the FTA moderate impact and severe impact thresholds to determine whether a moderate impact and/or severe impact are predicted to occur; severe impacts are considered adverse impacts and moderate impacts could be considered adverse impacts, depending on-site-specific context.

At Receptor 10c, which represents Lockwood Memorial Library on the UB North Campus, operation of the surface tracks would result in Proposed Action generated noise that would exceed the FTA thresholds for moderate impacts but not the threshold for severe impacts (see Table 14-7). The incremental change from existing noise levels at Receptor 10c would be 6 dBA, which would be considered a readily noticeable difference. The Proposed Action's total noise level of 62 dBA would be moderate and generally consistent with a noise-sensitive use.[4] Furthermore, the library building has insulated glass windows and a masonry façade that would provide at least 25 to 30 dBA window/wall attenuation of exterior noise sources thereby much reducing the rail-related noise at the interior of the library. As a result, the predicted noise levels at this receptor, while considered a moderate impact under FTA criteria, would not constitute an adverse impact.

At Receptor 13a, operation of the surface tracks would result in a Proposed Action noise exposure (i.e., Proposed Action generated noise) that would exceed the FTA threshold for moderate impacts but not the threshold for severe impacts (see Table 14-7). This receptor represents residences along the east side of John James Audubon Parkway between Dodge Road and the Amherst Police station. Of these receptors, those within 172 feet of the surface tracks and embedded track at grade-crossings would experience noise exposure in the moderate impact category and noise level increments (i.e., the difference from existing noise levels) between 4 and 6 dBA. Such noise levels would be perceived as readily noticeable[5] as compared to existing levels at these receptors. Consequently, the Proposed Action would result in an adverse impact at residences within 172 feet of the surface tracks along John James Audubon Parkway between Dodge Road and the Amherst Police station. Figure 14-4 shows this area of expected impact.

The volume of traffic that would be expected to be diverted by the Proposed Action (e.g., as a result of disallowed turns off of roadways along the railway) would be low, i.e., less than approximately 100 vehicles per day on any roadway segment. This is less than 25% of the total traffic volumes on the roadway segments in question, and consequently would not have the potential to result in any appreciable change in noise levels. Consequently, diverted traffic associated with the Proposed Action would not have the potential to result in any adverse noise impacts.

14.4.2 Construction Effects

Construction of the Proposed Action would include extension of the existing rail tunnel (including tunnel blasting, cut-and-cover tunnel construction, and tunnel shaft construction), construction of a new tunnel portal, at-grade track construction, station construction, construction of an electrical substation, and construction of a light maintenance/storage facility north of I-990. Chapter 19, "Construction Effects" provides more detail on construction methods. During construction, on-site equipment at the construction staging areas would result in construction-related noise in the surrounding areas. In addition, construction-related vehicles (e.g., delivery trucks, dump trucks) traveling to and from the construction work areas would also result in noise along the truck routes.

[4] New York State Department of Environmental Conservation's "Assessing and Mitigating Noise Impacts" guidance manual suggests 65 dBA as an acceptable threshold for residential use, which would be comparably noise-sensitive to a library.

Figure 14-4. Residential Adverse Impacts

Source: ESRI World Imagery, 2019

The potential construction noise effects were examined using the methodology described previously along with assumptions on the potential layout of the construction staging sites; types, numbers, and usage of equipment on the construction sites; and potential worst-case truck volumes traveling on truck routes to and from the staging areas. For each construction work area, the distance from the construction work area at which construction noise would fall below the FTA noise evaluation criteria was determined. Receptors within this impact zone would experience noise levels that exceed these evaluation criteria and thus would have the potential to experience construction noise impacts. Outside of these zones, construction noise levels would be lower. While construction noise could be audible at outside of these zones at times, it would not be considered an impact. Table 14-8 shows the construction noise analysis results.

Table 14-8. General Construction Noise Assessment

Construction Activity/Location	Construction Noise Impact Zone (feet)	Receptors in Zone?
Tunnel Cut-and-Cover	40	No
Main Street Shaft Construction	35	No
Kenmore Ave/Niagara Falls Boulevard Staging Area	40	No
Typical At-Grade Track Work	40	No
Station Construction	38	Yes
Substation Construction	40	Yes
Light Maintenance/Storage Facility Construction	40	No
Truck Routes	35	No

14.4.2.1 Tunnel Construction

Construction of the underground segments of the Proposed Action alignment would consist of tunnel blasting as well as cut-and-cover construction. It would include shaft construction and would make use of an empty lot at the northeast corner of Kenmore Avenue and Niagara Falls Boulevard as a staging area.

Tunnel blasting would consist of approximately one to 2 blasts per day followed by spoils removal. Because the blasts would occur underground without line of sight to any receptors and would occur so infrequently, this activity would not result in any noise impacts. The spoils removal would be achieved by use of trucks, which are discussed below.

Cut-and-cover tunnel construction would progress along the Proposed Action alignment from approximately Kenmore Avenue at Capen Boulevard to the tunnel portal on Niagara Falls Boulevard between Kenilworth and Princeton Avenues. Additionally, it would occur at the underground segment near Sweet Home Road and Maple Road. As shown in Table 14-8, with the noise reduction commitments included in the Proposed Action, construction noise would not exceed the FTA construction noise impact criteria at a distance greater than 40 feet from this construction, and as a result, no receptors would experience noise levels that would constitute an impact from this construction.

14.4.2.2 At-Grade Track, Station, and Substation Construction

Construction of at-grade track would progress along the Proposed Action alignment in multiple phases, resulting in three separate periods of potential construction noise. However, as shown in Table 14-8, with the noise reduction commitments included in the Proposed Action, construction

noise would not exceed the FTA construction noise impact criteria at a distance greater than 40 feet from this construction, which would not include any noise receptors (i.e., residences). Consequently, at-grade track construction would not result in noise impacts.

Station and substation construction would each be expected to occur over the course of less than 1 year. As shown in Table 14-8, with the noise reduction commitments included in the Proposed Action, construction noise would not exceed the FTA construction noise impact criteria at a distance greater than 38–40 feet from this construction. For some station or substation locations, there could be residences within these distances. As a result, noise from station or substation construction could result in slight exceedances of the construction noise impact criteria during the most noise-intensive construction activities. However, due to the short duration of station and substation construction and the small magnitude of potential noise level exceedances, noise from construction of stations and substations would not constitute significant noise impacts.

14.4.2.3 Light Maintenance/Storage Facility

Construction of the light maintenance/storage facility north of I-990 would occur over the course of approximately 4 years. As shown in Table 14-8, with the noise reduction commitments included in the Proposed Action, construction noise would not exceed the FTA construction noise impact criteria at a distance greater than 40 feet from this construction, and as a result, no receptors would experience noise levels that would constitute an impact from this construction.

14.4.2.4 Construction Truck Routes

Construction trucks would typically utilize major roadways (e.g., Main Street, Niagara Falls Boulevard, Audubon Parkway) to access construction work areas. As shown in Table 14-8, construction trucks would not result in noise levels exceeding the FTA construction noise impact criteria at a distance greater than 35 feet from the travel lane. Because the roadways that would be used by construction trucks are wide roadways, construction trucks would not come within this distance to residences, and thus would not result in construction noise impacts.

14.5 MITIGATION

The measures described in this section have been incorporated into the Proposed Action to avoid, minimize, and mitigate the potential for noise impacts. The noise analysis has incorporated them into the assumptions on which conclusions about the location and magnitude of potential impacts are based.

14.5.1 Operational Effects

The Proposed Action would include the deployment of an all-new fleet of rail vehicles to operate along the existing light rail line as well as the newly introduced rail line extension. These vehicles would include rail skirts that break the line of sight between the wheel-rail contact point and adjacent noise receptors (e.g., residences). The new rail vehicles would also include signals to be used at the entrance/exit of tunnel portals that produce a level not greater than 83 dBA at a distance of 50 feet.

Furthermore, to reduce noise in the residential areas along the Proposed Action alignment north of the proposed Ellicott station, speed would be limited to 28mph, and warning bells would not be used

at at-grade crossings, however gates and flashing warning signals would be located at at-grade crossing to improve the safety of the crossing and reduce probability of vehicles stopping on the LRT tracks

Additional noise reduction measures, including wayside noise barriers and removal of at-grade crossings, were considered and determined to be either not feasible, or not provide additional benefit beyond the measures included in this evaluation.

14.5.2 Construction Effects

Construction of the Proposed Action would not occur during nighttime hours (i.e., 10 p.m. to 7 a.m.) on a regular basis. This would include the movement of construction trucks on roadways passing residences. In general, trucks would be routed to avoid passing by noise-sensitive land uses (e.g., residences, schools, religious uses, open space, etc.) wherever possible. Additionally, auger drill rigs, rock drills, and cranes used in construction of the Proposed Action would be required to produce noise levels not greater than 80 dBA at a distance of 50 feet.

14.5.3 Summary

After conducting the general noise analysis according to FTA analysis guidance, and incorporating the mitigation measures described above, the potential for adverse noise impacts was identified at residences within 172 feet of the surface tracks along John James Audubon Parkway between Dodge Road and the Amherst Police station. The noise analysis found that at other receptors, noise resulting from operation of the Proposed Action could result in noticeable levels of noise, but the noise would not exceed FTA noise impact criteria, would result in noise level increases that would be imperceptible to barely perceptible, and/or would be reduced by building attenuation at interior spaces such that it would not rise to the level of an adverse impact.

The potential for adverse construction noise impacts was identified at receptors within 40 feet of substation or station construction along the Proposed Action alignment. The construction noise analysis found that at other receptors, noise resulting from construction of the Proposed Action could result in noticeable levels of noise, but the noise would not exceed FTA construction noise impact criteria, would occur over only a limited period of time, and/or would occur infrequently such that it would not rise to the level of an adverse impact.