4.6 NOISE

4.6.1 Introduction

This chapter describes the noise analysis methodology, noise assessment criteria, existing noise levels, noise impacts and mitigation measures.

4.6.1.1 Resource Definition

Noise is defined as unwanted or excessive sound. Sound becomes unwanted when it interferes with normal activities, such as sleep, work, or recreation. Under extreme conditions sound can cause physical harm, such as hearing loss or adverse mental health effects. Although there are no specific state or federal statutes or regulations concerning transit noise, MEPA and NEPA require evaluating noise impacts as part of a proposed project’s potential impacts on the human environment.

How people perceive sound depends on the following measurable physical characteristics of the sound.

- **Intensity**: Sound intensity is often equated to loudness. The sound level magnitude (typically measured in decibels [dB]) is a measure of sound intensity. A 10-decibel increase in intensity is generally perceived as a doubling in loudness.

- **Frequency Content**: Most common sounds are composed of acoustic energy distributed over a variety of frequencies. Acoustic frequencies, commonly referred to as tone or pitch, are typically measured in Hertz (Hz). High-frequency (above 2,000 Hz) sound is typically considered more annoying than low-frequency (below 500 Hz) sound and may also be perceived as louder.

- **Temporal Pattern**: The temporal nature of sound includes factors such as continuity, fluctuation, impulsiveness, and intermittence. Sound with increasing intensity over time is often perceived as louder than sound with decreasing intensity. Impulsive and intermittent sounds are usually perceived as louder than the actual sound level.

Individual human response to noise is subject to considerable variability. There are many factors, both emotional and physical, that contribute to the variation in human reaction to noise. The existence of numerous emotional and physical variables prohibits defining an exact individual or community response for any given noise level. Community noise criteria are therefore based on statistical averages of human response to noise and applicable health criteria.

Sound levels are most often measured using decibels (dB). The dB scale is logarithmic and compresses the audible acoustic pressure levels, which can vary from 20 micropascals (µPa), the reference pressure and threshold of hearing (0 dB), to 20 million µPa, the threshold of pain (120 dB). Because the dB scale is logarithmic, the addition of two sound levels is not linear. To add sound levels in dB, the dB are converted into energy terms, which are then added and converted back to dB.

The human ear does not hear sound energy linearly (on a one-to-one basis); hence, humans do not perceive changes in sound level as equally loud. Research indicates that the following general relationships exist between sound level and human perception:

- A 3 dB increase is a doubling of acoustic energy. Studies have shown that 3 dB is the threshold for people to perceive a change in sound level. The average person will not be able to distinguish a 3 dB difference in sound level in a laboratory condition; and

- A 10 dB increase is a tenfold increase in acoustic energy but is perceived as a doubling in loudness to the average person. The average person will judge a 10 dB change in sound level to be twice or half as loud.

The human ear does not perceive sound levels from every frequency as equally loud. As part of the hearing process, the human ear will attenuate low and high-frequency sounds. To compensate for these phenomena in perception, the A-weighted decibel scale, referred to as dBA, is used to measure and evaluate environmental noise levels. The A-weighted scale adjusts sound pressure levels by frequency, reducing low and high-frequency sound, similar to the way people hear sound. All of the sound levels used to evaluate noise impacts associated with this project are in dBA. Table 4.6-1 illustrates the decibel levels for typical indoor and outdoor sound.

The most commonly used indicators for community noise surveys are the energy-averaged equivalent sound level (Leq) and the day-night averaged sound level (Ldn). This noise analysis uses Ldn and Leq sound levels to evaluate noise. The Leq and the Ldn are the most frequently used metrics in environmental noise analyses. Extensive federal research has concluded that the Leq and Ldn are the best metrics for determining annoyance (impact) to the human environment. The Ldn is currently the predominant noise metric used by most federal agencies, including the FTA, USEPA, Federal Aviation Administration, Department of Housing and Urban Development, and Department of Defense.

The Leq is the steady-state sound level, which in a given period of time (typically one hour) contains the same acoustic energy as the time-varying (fluctuating) sound level during that same period. The Leq averages the background sound levels with short-term transient sound levels. The background sound level does not include noise from transient events (such as aircraft over-flights) and typically fluctuates during the day, week, and year. The 1-hour average Leq is implied throughout this analysis when the term Leq is used. The Ldn noise indicator is a 24-hour average sound level that is derived from hourly Leq values with a 10 dBA penalty on sounds occurring at night (10pm to 7am). The peak hour Leq represents the noisiest hour of the day or night and usually occurs during the peak periods of automobile and truck traffic.

4.6.2 Existing Conditions

4.6.2.1 Methodology

The FTA Transit Noise and Vibration Impact Assessment Guidelines[1] were used to evaluate existing noise conditions. These guidelines specify criteria and define procedures to project transit noise exposure.

The FTA guidelines require that noise-sensitive locations within impact distances to the rail corridor be categorized into three types of noise-sensitive land uses. The three land use categories correlate land use with sensitivity to noise intrusions and reflect the various noise-sensitive land uses, which could be present along the proposed rail corridor. The land use categories are presented in Table 4.6-2.

[1] Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

Table 4.6-1 Typical Indoor and Outdoor Sound Levels

Outdoor Sound Levels	Sound Pressure[1] (μPa)	Sound Level[2] (dBA)	Indoor Sound Levels
Threshold of pain	20,000,000	120	
		115	
	6,324,555	110	Rock band at 5 meters (m)
Jet Over-Flight at 300 m		105	
	2,000,000	100	Inside New York subway train
Gas Lawn Mower at 1 m		95	
	632,456	90	Food blender at 1 m
Diesel Truck at 15 m		85	
Noisy Urban Area—Daytime	200,000	80	Garbage disposal at 1 m
		75	Shouting at 1 m
Gas Lawn Mower at 30 m	63,246	70	Vacuum cleaner at 3 m
Suburban Commercial Area		65	Normal speech at 1 m
	20,000	60	
Quiet Urban Area—Daytime		55	Quiet conversation at 1 m
	6,325	50	Dishwasher next room
Quiet Urban Area—Nighttime		45	
	2,000	40	Empty theater or library
Quiet Suburb—Nighttime		35	
	632	30	Quiet bedroom at night
Quiet Rural Area—Nighttime		25	Empty concert hall
Rustling Leaves	200	20	
		15	Broadcast and recording studios
	63	10	
		5	
Threshold of hearing	20	0	

Source: Highway Noise fundamentals, Federal Highway Administration, 1980

1 Micropascals (μPa) describe pressure levels, which is what sound level monitors measure.

2 A-weighted decibels (dBA) describe pressure logarithmically with respect to the reference pressure level of 20 μPa.

Sound levels were measured using a Larsen Davis 824 Type I sound level meter that meets the American National Standards Institute testing specifications. An acoustic calibrator was used to calibrate the sound level meter. The noise monitoring program was conducted on December 18 and December 30, 2008. Sound level data were collected at various locations adjacent to segments of the proposed alternative during weekday daytime period (10:00 A.M. to 5:00 P.M.) and weekday nighttime period (8:00 P.M. to 1:00 A.M.). The sound level data were collected for approximately 20-minute durations at each monitoring location.

Table 4.6-2 Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric (dBA)	Description of Land Use Category
1	Outdoor Leq(h)[1]	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, and such land uses as outdoor amphitheaters and concert pavilions, as well as National Historic Landmarks with significant outdoor use.
2	Outdoor Ldn	Residences and buildings where people normally sleep. This category includes homes, hospitals and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Outdoor Leq(h)[1]	Institutional land uses with primarily daytime and evening use. This category includes schools, libraries, and churches where it is important to avoid interference with such activities as speech, meditation and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios and concert halls fall into this category. Places for meditation or study associated with cemeteries, monuments, museums. Certain historical sites, parks and recreational facilities are also included.

Leq for the noisiest hour of transit-related activity during hours of noise sensitivity.

Both Leq and Ldn sound levels were used to measure existing noise exposure. The noise metric for the land use Categories 1 and 3 in Table 4.6-2 is Leq. The noise metric for land use Category 2 (typically residences) is Ldn. The Ldn sound levels were calculated based upon daytime and nighttime Leq sound levels following the procedures provided in the FTA Transit Noise and Vibration Impact Assessment guidelines.

4.6.2.2 Existing Noise Levels

Existing noise levels were monitored at selected locations along various segments of the proposed alternatives. The noise monitoring sites were selected to provide background sound levels for similar land uses along the rail alternative corridors. Their selection was based upon land uses, accessibility, and reasonable area coverage. Figure 4.6-1 shows the alternatives, the rail and road segments in each alternative, town boundaries, and noise monitoring locations. The noise monitoring field notes are provided in Appendix 4.6-A.

All but one of the locations monitored was in an area of land use Category 2 (residences and buildings where people normally sleep). The exception was Morton Street in Stoughton on the Stoughton Line, which also has some land uses in Category 3 (institutional uses with primarily daytime and evening use).

Existing daytime sound levels (based on Leq), at the locations monitored, range from a low of about 49 dBA to a high of about 69 dBA. The 69-dBA level occurred at Dean Street in Taunton along the Stoughton Line. This sound level is typical of an area located near Route 44, a busy highway passing through an area with some commercial development. Eighteen of the 30 locations have noise levels equivalent to or below that of a quiet urban area in the daytime. Most of the remaining areas are between that level and the level for a suburban commercial area. Table 4.6-3 presents the land use and the results of the noise monitoring at each location.

Table 4.6-3 Existing Noise Levels at Monitoring Locations

ID	Location	Land Use Category[1]	Daytime Leq[2]	Nighttime Leq[2]	Ldn[3]
	New Bedford Main Line				
	Berkley				
1	Cotley Street	2	51.6	45.6	48.6
	Lakeville				
2	Gunner's Way	2	48.7	35.6	43.6
	New Bedford				
3	Welby Road	2	51.8	44.1	52.1
4	Earle & Davis Streets	2	55.6	47.6	55.6
	Fall River Secondary				
	Freetown				
5	Simpson & Green Lanes	2	55.3	41.2	44.2
	Fall River				
6	Rolling Green Apartments	2	55.5	43.8	46.8
7	Cory Street (west of RR)	2	57.2	52.1	55.1
	Stoughton Line				
	Stoughton				
10	Brock Street	2	59.4	42.4	50.4
11	Plain Street	2	62.6	-	60.6
12	Morton Street	2&3	63.5	50.9	58.9
	Easton				
13	Elm Street	2	61.8	48.8	56.8
14	Pond Street	2	55.8	38.8	46.8
15	Bridge Street	2	57.3	44.2	52.2
16	Short Street	2	56.7	49.5	57.5
17	Purchase Street	2	55.9	49.7	57.7
18	Prospect Street	2	60.9	54.8	62.8
	Raynham				
19	Elm Street (MP 15.40)	2	55.5	52.0	55.0
20	Carver Street	2	62.9	57.0	60.0
21	Britton Street	2	56.5	-	54.5
22	King Phillip Street	2	59.3	53.4	56.4
	Taunton				
23	Dean Street	2	68.8	61.7	64.7

1 See Table 4.6-2
2 The 1-hour average Leq dBA
3 The day-night averaged sound level dBA

4.6.3 Analysis of Impacts and Mitigation

4.6.3.1 Introduction

This section identifies the noise impacts that may result from implementing each of the proposed South Coast Rail alternatives (including railroad or highway alignments, train or bus stations, and maintenance/layover facilities).

The noise evaluation followed FTA guidance for the noise analysis procedures, identifying noise-sensitive receptor locations, noise impact criteria, measuring existing sound levels, calculating future sound levels, establishing impact thresholds, identifying noise impacted locations, and determining potential noise mitigation measures. The noise evaluation included the analysis of train noise (operations and train horn noise at grade-crossings) for the No-Build (Enhanced Bus), Stoughton Electric, Stoughton Diesel, Whittenton Electric, and Whittenton Diesel alternatives. The noise evaluation also analyzed train noise at the proposed train station and at the proposed overnight layover facilities. Specifically, the noise analysis establishes existing sound levels, calculated project-generated sound levels, developed the distances from the train tracks to moderate and severe noise impacts along the rail alternatives, identified impacted residences, and recommends noise mitigation measures.

For locations where noise impacts were identified, mitigation measures, such as noise barriers and sound-proofing, were identified to mitigate for significant adverse effects. In addition, potential noise mitigation measures for construction activities were identified.

The Secretary of the Executive Office of EEA issued a Certificate on the ENF on April 3, 2009.[2] Included in the certificate are a number of requirements defining the scope of the Draft EIR. The following outlines the requirements for the evaluation of noise impacts.

- The DEIR should include an analysis of noise impacts associated with the project alternatives, for locations along the rail and bus routes, and at station sites.
- The DEIR should evaluate measures to avoid and minimize noise impacts, including plantings and other noise barriers. The noise analysis in the DEIR should discuss consistency with applicable state and federal guidelines and regulations.
- The noise analysis should include an assessment of impacts to wildlife which is discussed in Chapter 4.14, *Biodiversity, Wildlife, and Vegetation*.

The Secretary's Certificate on the DEIR[3] included the following requirements for the analysis of noise and vibration.

- "The FEIR should include a detailed evaluation of those locations that will experience moderate and severe noise impacts as a result of the project and commitments to specific mitigation measures."

[2] Massachusetts Executive Office of Energy and Environmental Affairs. Certificate of the Secretary of Energy and Environmental Affairs on the Environmental Notification Form. April 3, 2009.

[3] Massachusetts Executive Office of Energy and Environmental Affairs. Certificate of the Secretary of Energy and Environmental Affairs on the Draft Environmental Impact Report. July 29, 2011.

- "The evaluation should address noise impacts relating to all aspects of the project including train operations and horn noise, and noise associated with stations and layover facilities."
- "MassDOT should consult with MassDEP and the Interagency Coordinating Group for guidance on development of the noise mitigation plan."
- "The FEIR should include a detailed mitigation plan with commitments to an appropriate level of mitigation for project-related noise impacts."
- "The FEIR should document how the project will comply with MassDEP … Noise Policy."
- "The FEIR should compare the estimated vibration levels to existing conditions and describe the actual change that will be experienced. This additional information should be provided for residential impacts along the Stoughton route as well as for historic buildings."
- "The FEIR should include a mitigation plan with clear and specific commitments to address vibration impacts and an explanation of the reduction in VdB levels expected."

Subsequent to the DEIS/DEIR, the MassDOT updated the noise impact analysis for the Stoughton Electric Alternative to take into account design refinements, changes to the operations plan and to provide a more detailed noise impact assessment and mitigation plan as requested by Executive Office of EEA in the Secretary's Certificate on the DEIR. The noise impact and mitigation analyses for the Stoughton Diesel Alternative and the Whittenton (Diesel and Electric) Alternatives remain the same as presented in the DEIS/DEIR.

The following sections discuss the noise evaluation methodology, potential noise impacts by elements, construction noise, and potential noise impacts by alternative. Section 4.6.3.3 describes the background noise as well as the noise impact results for the South Coast Rail elements. Section 4.6.3.4 reviews the potential temporary construction impacts and related mitigation. Section 4.6.3.5 presents a summary of the impacts by each alternative. Section 4.3.3.6 identifies the type and location of the measures required to mitigate potential significant noise impacts.

4.6.3.2 Impact Assessment Methodology

The noise analysis identified potential noise impacts by comparing the existing sound levels to projected future sound levels. The existing sound levels were based upon a noise monitoring program. The FTA Transit Noise and Vibration Impact Assessment Guidelines[4] were used to evaluate existing noise conditions. These guidelines specify criteria and define procedures to project transit noise exposure. Detailed technical documentation of the noise impact assessment for the Stoughton Diesel Alternative and the Whittenton Alternatives is provided in Appendix 4.6-B (the documentation remains the same as was provided in the DEIS/DEIR).

The projected future sound levels were calculated using the FTA rail spreadsheet model. The results were compared to the FTA noise impact criteria discussed below to predict if noise impacts would occur. Once the future noise levels from the proposed project and the potential impacts were assessed, a determination of the need, feasibility, reasonableness, and effectiveness of mitigation measures was conducted. Appendix 4.6-C provides the updated impact assessment and mitigation analysis documentation for the Stoughton Electric Alternative.

[4] Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006.

The FTA guidelines require that noise-sensitive locations within impact distances to the rail corridor be categorized into the three types of noise-sensitive land uses (see Table 4.6-2)

Noise Impact Criteria

The FTA noise impact criteria are founded on well-documented research on community reaction to noise and are based on change in noise exposure using a sliding scale. Although higher levels of transit noise are allowed in neighborhoods with high levels of existing noise, smaller increases in total noise exposure are allowed with increasing levels of existing noise.

The Day-Night Sound Level (Ldn) is used to characterize noise exposure for residential areas (Category 2). For other noise sensitive land uses, such as parks and school buildings (Categories 1 and 3), the maximum 1-hour "equivalent" sound level (Leq) during the facility's operating period is used (see Section 4.6.1.1).

The relationship between impact assessment and the three impact categories is as follows. There are two levels of impact (severe and moderate) included in the FTA criteria, as summarized below:

- **No Impact**: If the project noise exposure is less than the No Impact criteria, no commuter rail impacts are predicted.
- **Moderate Impact**: In this range of noise impact, the change in the cumulative noise level is noticeable to most people but may not be sufficient to cause strong, adverse reactions from the community. In this transitional area, other project-specific factors must be considered to determine the magnitude of the impact and the need for mitigation. These factors include the existing noise level, the predicted level of increase over existing noise levels, the types and numbers of noise-sensitive land uses affected, the noise sensitivity of the properties, the effectiveness of the mitigation measures, community views, and the cost of mitigating noise to more acceptable levels. Moderate noise impact means that commuter rail service is predicted to increase noise exposures at sensitive land uses adjacent to the track.
- **Severe Impact**: Project-generated noise in the severe impact range can be expected to cause a significant percentage of people to be highly annoyed by the new noise and represents the most compelling need for mitigation. Noise mitigation will normally be specified for severe impact areas unless there are truly extenuating circumstances that prevent it. Severe impact means that commuter rail service is predicted to substantially increase noise exposures at sensitive land uses adjacent to the track.

The noise impact criteria are represented by the curves in Figure 4.6-2, also shown in *Transit Noise and Vibration Impact Assessment.*[5] In addition to graphic curves, the noise impact criteria can also be quantified through the use of mathematical equations included in Appendix B.3 of *Transit Noise and Vibration Impact Assessment*.[6] These equations reflect the curves shown in Figure 4.6-2, thus enabling the use of spreadsheets to facilitate the analysis of many sites. As described in *Transit Noise and Vibration Impact Assessment*,[7] the noise impact criteria are based on a comparison of the existing outdoor noise levels and the future outdoor noise levels from a proposed project. They incorporate both absolute criteria, which consider activity interference caused by the transit project alone, and relative

[5] Ibid.
[6] Ibid.
[7] Ibid.

criteria, which consider annoyance caused by the change in the noise environment caused by the transit project.

The horizontal axis of the graph in Figure 4.6-2 is the existing noise exposure and the vertical axis shows the additional noise exposure from the transit project that would cause either moderate or severe impact. The scale on the left vertical axis applies to the more noise-sensitive land uses in Categories 1 and 2 as described earlier. The scale on the right vertical axis applies to Category 3 land uses, which are less noise-sensitive than Categories 1 and 2. The future noise exposure would be the combination of the existing noise exposure and the additional noise exposure caused by the transit project. Because sound levels represent energy, their values cannot be simply added and are combined logarithmically.

As described in *Transit Noise and Vibration Impact Assessment*,[8] the two curves in Figure 4.6-2 defining the FTA impact criteria allow increasing project noise levels as existing noise increases up to a point, beyond which impact is determined based on project noise alone. Below the lower curve in Figure 4.6-2, a proposed project is considered to have no noise impact since, on average, the introduction of the project will result in an insignificant increase in the number of people highly annoyed by the new noise. The curve defining the onset of noise impact stops increasing at 65 dB for Category 1 and 2 land use, a standard limit for an acceptable living environment defined by a number of federal agencies. Project noise above the upper curve is considered to cause Severe Impact since a significant percentage of people would be highly annoyed by the new noise. This curve flattens out at 75 dB for Category 1 and 2 land use, a level associated with an unacceptable living environment. As indicated by the right-hand scale on Figure 4.6-2, the project noise criteria are 5 dB higher for Category 3 land uses since these types of land use are considered to be slightly less sensitive to noise than the types of land use in Categories 1 and 2. Between the two curves the proposed project is judged to have Moderate Impact. Although the curves in Figure 4.6-2 are defined in terms of the project noise exposure and the existing noise exposure, it is the increase in the cumulative noise—when project noise is added to existing noise—that is the basis for the criteria.

To illustrate this point, Figure 4.6-3 shows the noise impact criteria for Category 1 and 2 land use in terms of the allowable increase in the cumulative noise exposure. The horizontal axis is the existing noise exposure and the vertical axis is the increase in cumulative noise level caused by the transit project. The measure of noise exposure is Ldn for residential areas and Leq for land uses that do not have nighttime noise sensitivity. Since Ldn and Leq are measures of total acoustic energy, *any* new noise source in a community would cause an increase, even if the new source level is less than the existing level. As shown in Figure 4.6-3, the criterion for Moderate Impact allows a noise exposure increase of 10 dBA if the existing noise exposure is 42 dBA or less but only a 1 dBA increase when the existing noise exposure is 70 dBA.

The procedure for assessing impact is to determine the existing noise exposure and the predicted project noise exposure at a given site, in terms of either Ldn or Leq(h) as appropriate, and to plot these levels on Figure 4.6-2. The location of the plotted point in the three impact ranges is an indication of the magnitude of the impact.

[8] Ibid.

Figure 4.6-2 FTA Noise Impact Criteria

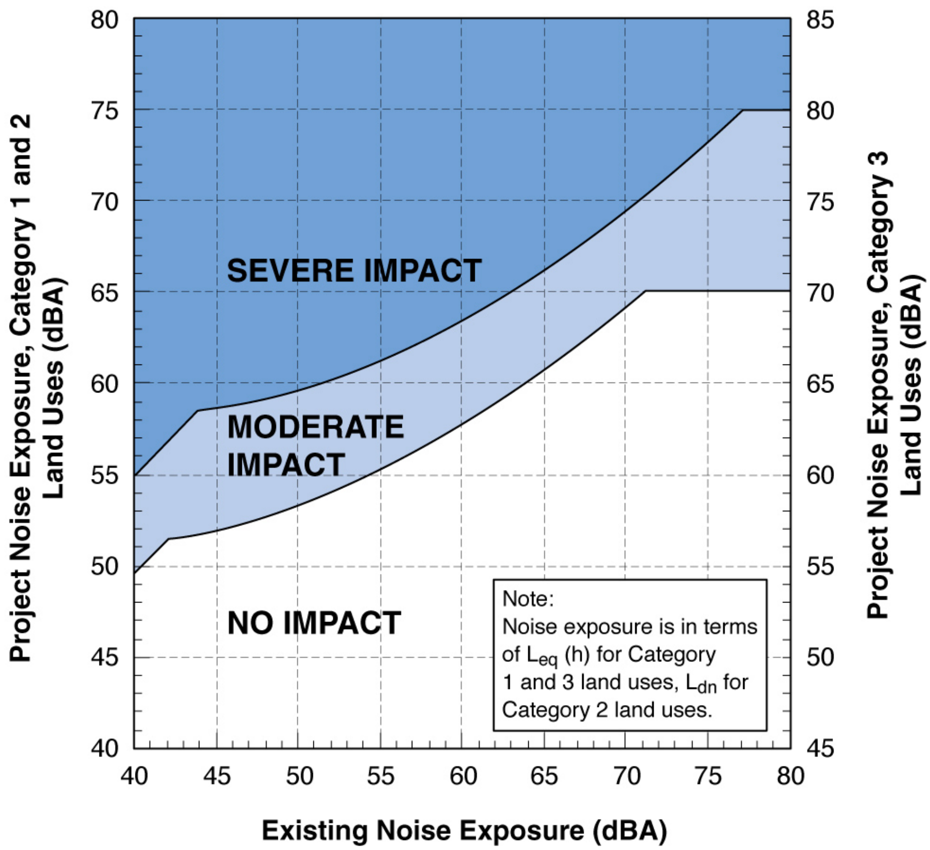
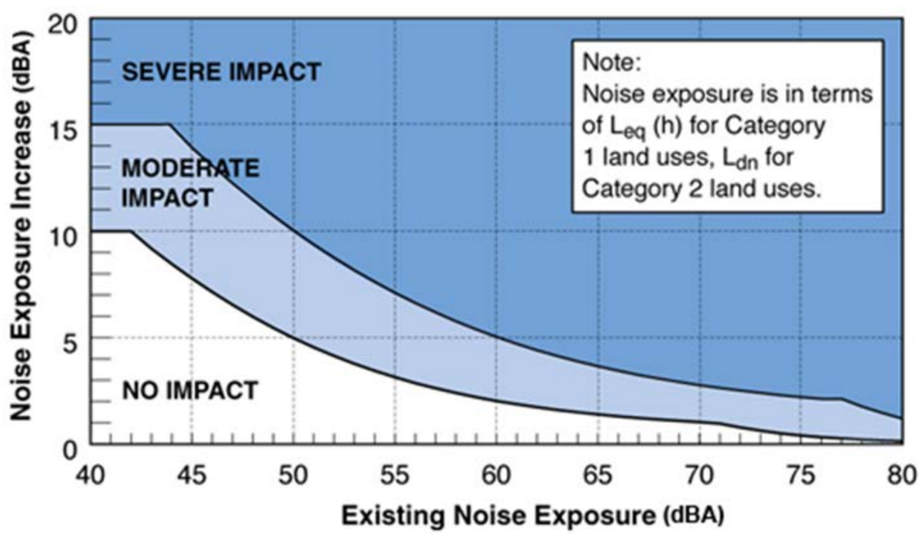


Figure 4.6-3 Increase in Cumulative Noise Levels Allowed by FTA Criteria



As described in *Transit Noise and Vibration Impact Assessment*,[9] when the existing level of ambient noise increases, the allowable level of transit noise also increases, but the total amount that community noise exposure is allowed to increase is reduced. A project noise exposure that is less than the existing noise exposure can thus still result in an impact, especially where existing noise exposure is already high.

In certain cases, according to *Transit Noise and Vibration Impact Assessment*,[10] only the cumulative form of the noise criteria as shown in Figure 4.6-3 should be used. These cases involve projects where changes are proposed to an existing transit system, as opposed to a new project in an area previously without transit. Such changes might include operations of a new type of vehicle, modifications of track alignments within existing transit corridors (such as moving the existing commuter rail lines for the South Coast Rail project, or changes in facilities that dominate existing noise levels. In these cases, the existing noise sources change as a result of the project, and so it is not possible to define project noise separately from existing noise.

Another condition cited in *Transit Noise and Vibration Impact Assessment*[11] includes a commuter rail corridor where the existing noise along the alignment is dominated by diesel locomotive-hauled trains and where the project involves replacement of some of the diesel-powered locomotives with electric trains operating at increased frequency of service and higher speeds on the same tracks. In this case, the existing noise can be determined and a new future noise can be calculated, but it is not possible to describe what constitutes the "project noise." For example, if the existing noise dominated by trains was measured to be an Ldn of 63 dBA at a particular location, and the new combination of diesel and electric trains is projected to be an Ldn of 65 dBA, the change in the noise exposure caused by the project would be 2 dB. Referring to Figure 4.6-3, a 2 dB increase with an existing noise exposure of 63 dBA would be rated as a Moderate Impact. Normally the project noise is added to the existing noise to come up with a new cumulative noise, but in this case, the existing noise was dominated by a source that changed because of the project, so it would be incorrect to add the project noise to the existing noise.

A similar example would be a rail corridor where a track is added and grade crossings are closed, potentially resulting in a change in train location and horn operation. In this case the "project noise" results from moving some trains closer to some receivers, away from others, and elimination of horns, and the *change* in noise level is more readily determined than the noise from the actual project elements.

Noise generated by train operations depends on the type and number of locomotives and rail cars, the type of rail and track structure, the speed of the train, and the condition of rail and train wheels. The noise assessment is based on the following assumptions, which have a direct effect on the noise exposure resulting from the rail operations:

- Each train contains either one diesel or electric locomotive and eight coaches.
- The train speeds were based on the proposed track charts for each alternative. Diesel and electric locomotives were assumed to have a maximum speed of 70 and 100 mph, respectively.

[9] Ibid.
[10] Ibid.
[11] Ibid.

- The track is continuously welded (without joints that create impact noise) and is secured to concrete ties mounted on rock ballast.
- The train wheels are true (without flat spots) and the rail is smooth (without corrugations).
- Train warning horns will be used on a routine basis at all grade-crossings.

Future noise levels from the commuter trains are projected based on the existing measured noise levels at sensitive locations and changes to the alignment. Since future noise levels are based on existing noise levels, where appropriate, the projections include all operations from MBTA commuter trains, Amtrak trains, and freight rail activity. With this modeling approach, the projections include the contributions from several factors, such as train speed, presence of special trackwork or other site-specific conditions.

The existing and future commuter train noise levels depend on different sound propagation conditions caused by changes to the commuter rail alignment and modification to any special trackwork. The relative contributions of noise from trains on both tracks and from locomotives versus rail cars are included in this modeling. Future noise levels from the proposed South Coast Rail trains are based on reference noise levels (discussed below), site-specific conditions such as the terrain, intervening objects such as building rows, and operational plans including the number of cars in a train, speed, and headways.

Commuter Rail Operations

Noise-sensitive locations along the proposed commuter rail corridors were identified from MassGIS, aerial photography, and field survey. The majority of the noise-sensitive buildings within 1,000 feet of the rail corridor are residences (Land Use Category 2). Numerous schools, places of worship, and libraries (Land Use Category 3) were identified near the rail line. No amphitheaters, concert pavilions, or National Historic Landmarks with significant outdoor use (Land Use Category 1) were identified within 1,000 feet of the rail corridor.

Existing noise exposure at sensitive receptors along the proposed commuter rail corridor varies from 45 to 70 Ldn for the No-Build Alternative. The corridor passes through urban, suburban, and rural areas that have existing noise exposures that range from quiet to moderately noisy. These existing noise exposures are dominated by noise from nearby roadways. Existing noise exposures above 60 Ldn generally result from traffic volume adjacent to the rail corridor and/or from current train activity on the rail corridor. Both occur at locations that are within 150 feet of the existing track.

Impact distances from the rail line were calculated based upon the existing sound levels, train generated sound levels, and distances to noise impacts based upon FTA's noise impact criteria.[12] The FTA's noise impact criteria (see Figures 4.6-2 and 4.6-3) establish the noise impact sound levels (thresholds) based upon the existing sound levels for each receptor location. The noise analysis calculates the distances to the noise impact sound levels based upon the train activity at the receptor locations. The MassGIS mapping identifies the number of receptor locations within the distances of noise impacts. These calculations were conducted for both moderate and severe noise impacts. Table 4.6-4 summarizes the calculated noise impact distances for various existing sound levels.

[12] Federal Transit Administration, Transit Noise and Vibration Impact Assessment, figures 3-1 and 3-2: "Noise Levels Defining Impact for Transit Projects", FTA-VA-90-1003-06, May 2006.

Table 4.6-4 Noise Impact Distances (Feet), by Existing Noise Level (dBA)

Existing Sound Level (Ldn)	Distance to Impact Level (Feet) Severe Closer than (ft.)	Moderate Between (ft.)	No Impact farther than (ft.)
50-54	225	225-450	450
55-59	120	120-400	400
60	115	115-225	225
61	100	100-200	200
62	100	100-200	200
63	75	75-175	175
64	75	75-175	175
65	65	65-150	150
66	55	55-135	135
67	55	55-135	135
68	50	50-115	115
69	45	45-100	100
70	45	45-100	100

Horn Issues and Considerations

In 1996, the U.S. Congress passed the Swift Act, which requires that railroads sound whistles at all grade crossings. The Act provided an exception for grade crossings that are equipped with supplemental safety measures, such as extended barriers, medians, one-way streets, or four quadrant gates. For analysis purposes, it was assumed that the horns will be sounded one-quarter mile prior to all public grade crossings for each of the rail alternatives. This horn is required as a safety measure by the Federal Railroad Administration, Department of Transportation.[13]

4.6.3.3 Impacts of Alternatives by Element

No-Build (Enhanced Bus) Alternative

The No-Build Alternative would not include any change in existing train activity but would include an enhancement of the current bus service along existing roads and highways. It was assumed that the limited increase in bus service would occur along major roadways (I-93 and Route 24) and commuter parking areas. The low volumes of increased buses on these roadways would have a minimal effect on the sound levels within the study area.

The FTA Guidelines require that noise impacts are based on the comparison between existing sound levels and future build sound levels. The assumption that the 2030 No-Build sound levels are equal to the existing sound levels provides a uniform and conservative basis for comparison to the Build Alternatives. Furthermore, sound levels in the area that measurements were conducted are not anticipated to change significantly (1 to 3 dBA) over the next 20 years. Therefore it is conservative to assume that the 2030 No-Build sound levels are equal to the existing sound levels and this assumption does not affect the determination of potential noise impacts. Therefore the existing (2009) sound levels

[13] Federal Railroad Administration, Department of Transportation13, Title 49, Chapter II: PART 222—Use of Locomotive Horns at Public Highway Rail Grade Crossings.

were assumed for the future (2030) No-Build Alternative. Table 4.6-5 presents a summary of the sound levels for the No-Build (Enhanced Bus) Alternative.

Southern Triangle Study Area (Common to All Rail Alternatives)

Portions of the rail elements within the southern part of the South Coast Rail study area are common to all the rail alternatives. These rail elements form a triangular shape between the Fall River Secondary and the New Bedford Main Line, and are therefore referred to as the Southern Triangle. The Fall River Secondary extends from Myricks Junction to Fall River. The New Bedford Main Line extends from Weir Junction to New Bedford. The following sections describe the environmental consequences related to the noise impacts that may result from the South Coast Rail project. The northern elements of the South Coast Rail study area are encompassed by the other rail Build Alternatives described in subsequent sections.

Fall River Secondary Rail Segment

The existing Fall River Secondary freight track would be upgraded to Federal Rail Administration (FRA) Class 5[14] for the South Coast Rail project. Public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. The existing freight service using the Fall River Secondary is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line and two new traction power facilities would need to be constructed for the electric alternatives. Two new stations would be constructed in Fall River (Battleship Cove and Fall River Depot) and one new station would be constructed in Freetown (Freetown). One new layover facility would be constructed in Fall River, at the Weaver's Cove East site. Potential noise impacts to land uses resulting from constructing the new stations and layover facilities along the Fall River Secondary are considered in the Stations and Layover Facilities sections, respectively.

As shown in Table 4.6-6, electric train operations for the Fall River Secondary would result in 466 moderate and 135 severe impacts to residential receptors. The majority of these would occur in Fall River, in the Cory and Durfee Street neighborhoods. The diesel operations would have greater impacts than electric commuter rail along the Fall River Secondary, with 570 moderate and 181 severe impacts (Table 4.6-7). Train horns along this corridor would add 98 moderate and 164 severe impacts (Table 4.6-8). Mapping of the noise impacts associated with the Fall River Secondary segment is provided as follows:

- Diesel alternatives train pass-by noise impact areas and horn noise impacts for both diesel and electric alternatives: Figures 4.6-4a through 4.6-4c.
- Updated train pass-by noise impacts for electric alternatives: Figures 4.6-4a through 4.6-4c.

[14] 49 CFR 213.9 Classes of Track: Operating Speed Limits

Table 4.6-5 Noise Levels–No-Build Alternative

Segment/ Municipality/ Receptor Location	Land Use Category	No-Build Sound Level	Segment/ Municipality/ Receptor Location	Land Use Category	No-Build Sound Level	Segment/ Municipality/ Receptor Location	Land Use Category	No-Build Sound Level
Fall River Secondary			**New Bedford Main Line**			**Northeast Corridor**		
Berkley			***Taunton***			***Dedham***		
Grove Street	2	55	Ingell Street	2	57	Hooper Road (Existing Barrier)	2	69
Mill street	2	45	Hart Street	2	63			
Adams Lane	2	45	Plain Street	2	55			
						Westwood		
			Berkley			University Ave (Funeral Institute of the North East)	3	69
Freetown			Cotley Street	2	49			
Richmond Road	2	60	Padelford Street	2	55			
Colonial Drive	2	45	Myricks Street (Route 79)	2	60	***Canton***		
Richmond Road	2	60				I-95 - Industrial	2	70
Forge Road	2	55	***Lakeville***			Chapman Street	2	70
Elm & Walnut Streets	2	55	Malbone Street	2	55	Norfolk Street	2	68
Simpson & Green Lanes	2	44	Howland Road	2	55	High Street	2	63
High Street	2	55	Gunner's Way	2	44			
Copicut Road	2	55				***Sharon***		
			Freetown			Rhodes Avenue	2 & 3	64
			Chace Road	2	60	Upland Road (Route 27)	2 & 3	63
Fall River			Chipaway Road	2	60	Flintlock Road - Deborah Sampson Park	2	62
Rolling Green Apartments	2	47				Chase Drive	2 & 3	63
North Main St (FRCC to Route 79)	2 & 3	60	***New Bedford***			Burnt Bridge Road	2	67
Cory Street (west of RR)	2 & 3	55	Welby Road	2	52			
Durfee Street (Route 6A to I-195)	2 & 3	55	Tarkiln Place	3	52	***Foxborough***		
			Worcester Street	2	55	East Street	2 & 3	65
			Earle & Davis Streets	2	56	Summer Street	2	65
			Hayden/McFadden School	2 & 3	65			
			Purchase Street	2 & 3	65			

Table 4.6-6 Noise Levels–Southern Triangle, Electric Alternatives, Fall River Secondary

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Berkley					
Myricks Street (Route 79)	2	60	66	10	1
Mill Street	2	45	60	3	3
Adams Lane	2	45	66	8	1
Subtotal				**21**	**5**
Freetown					
Richmond Road (Bryant to Beechwood)	2	60	65	4	1
Colonial Drive	2	45	58	7	0
Richmond Road (Colonial to Forge)	2	60	67	1	1
Forge Road	2	55	64	9	5
Elm & Walnut Street	2	55	65	11	3
Simpson & Green Lanes	2	44	69	15	6
High Street	2	55	63	10	3
Copicut Road	2	55	58	3	0
Subtotal				**60**	**19**
Fall River					
Rolling Green Apts.	2	47	65	53	13
North Main Street (FRCC to Rt. 79)	2	60	67	41	5
Cory Street (west of RR)	2	55	70	151	55
Durfee Street (Route 6A – I-195)	2	55	69	140	38
Subtotal				**385**	**111**
Total				**466**	**135**

Table 4.6-7 Noise Levels–Southern Triangle, Diesel Alternatives, Fall River Secondary

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Berkley					
Grove Street	2	55.0	64	2	0
Mill street	2	45.0	65	4	5
Adams Lane	2	45.0	68	7	3
			Totals	**13**	**8**
Freetown					
Richmond Road (Bryant to Beechwood)	2	60.0	68	4	1
Colonial Drive	2	45.0	62	12	1
Richmond Road (Colonial to Forge)	2	60.0	68	2	2
Forge Road	2	55.0	68	17	6
Elm & Walnut Streets	2	55.0	68	9	3
Simpson & Green Lanes	2	44.2	68	15	5
High Street	2	55.0	65	23	3
Copicut Road	2	55.0	58	2	0
			Totals	**84**	**21**
Fall River					
Rolling Green Apartments	2	46.8	68	60	13
North Main Street (FRCC to Route 79)	2 & 3	60.0	68	42	17
Cory Street (west of RR)	2 & 3	55.1	68	180	66
Durfee Street (Route 6A to I-195)	2 & 3	55.1	68	191	56
			Totals	**473**	**152**
Totals				**570**	**181**

Table4.6-8 Train Horn Noise Impact Summary–Southern Triangle, Fall River Secondary

Municipality	At Grade Crossing	Number of Impacts Moderate	Severe
Fall River	Golf Service Road - South	7	5
Freetown	Copicut Road	1	1
Freetown	Elm Street	58	99
Freetown	Forge Road - South	7	22
Freetown	High Street	6	12
Freetown	Richmond Road - North	9	5
Freetown	Richmond Road - South	10	20
	Total	**98**	**164**

New Bedford Main Line Rail Segment

The existing New Bedford Main Line freight track would be upgraded to FRA Class 5 for the South Coast Rail project. Public at-grade road/railroad crossings that would remain open would be reconfigured and/or improved to meet current safety standards. The existing freight service using the New Bedford Main Line is diesel-powered; no electrical infrastructure is present. New catenary supports and wires would need to be constructed along the length of the line, and four or five traction power facilities (depending upon the alternative selected) would need to be constructed for the electric alternatives. Two new train stations would be constructed in New Bedford (Whale's Tooth and King's Highway), and one new train station would be constructed in Taunton (Taunton Depot). One new layover facility would be constructed at the Wamsutta site. Potential direct impacts to land uses resulting from the constructing the new stations and layover facility along the New Bedford Main Line are considered in the Stations and Layover Facilities sections, respectively.

As shown in Table 4.6-9, electric train operations for the New Bedford Main Line segment would result in 236 moderate and 47 severe impacts to residential receptors. The majority of these would occur in Taunton and New Bedford, in the Plain Street, Welby Road, and Worcester Street neighborhoods. The diesel operations would have lower impacts, with 185 moderate and 35 severe impacts (Table 4.6-10). Train horns along this segment would add 93 moderate and 76 severe impacts (Table 4.6-11).

Mapping of the noise impacts associated with the New Bedford Mainline is provided as follows:

- Diesel alternatives train pass-by noise impact areas and horn noise impacts for both diesel and electric alternatives: Figures 4.6-5a through 4.6-5e.

- Updated train pass-by noise impacts for electric alternatives: Figures 4.6-5a through 4.6-5e.

Table 4.6-9 Noise Levels–Southern Triangle, Electric Alternative, New Bedford Main Line

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Taunton					
Ingell Street	2	57	64	6	2
Hart Street	2	63	68	16	4
Plain Street	2	55	62	10	6
Subtotal				**32**	**12**
Berkley					
Cotley Street	2	49	64	16	6
Padelford Street	2	55	66	4	3
Subtotal				**20**	**9**
Lakeville					
Malbone Street	2	55	63	1	1
Howland Road	2	44	59	8	1
Gunner's Way	2	55	65	18	6
Subtotal				**27**	**8**
Freetown					
Chace Road	2	60	61	2	0
Chipaway Road	2	60	67	12	6
Subtotal				**14**	**6**
New Bedford					
Welby Road	2	52	59	31	0
Worcester Street	2	55	65	73	10
Earle & Davis Streets	2	56	62	30	2
Hayden/McFadden	2	65	64	9	0
Subtotal				**143**	**12**
Total				**236**	**47**

Table 4.6-10 Noise Levels–Southern Triangle, Diesel Alternative, New Bedford Main Line

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Taunton					
Ingell Street	2	56.5	67	6	2
Hart Street	2	62.5	69	16	4
Plain Street	2	55.0	67	31	15
			Totals	**53**	**21**
Berkley					
Cotley Street	2	48.6	64	11	3
Padelford Street	2	55.0	67	3	2
Myricks Street (Route 79)	2	60.0	67	4	1
			Totals	**18**	**6**
Lakeville					
Malbone Street	2	55.0	64	0	1
Howland Road	2	55.0	66	12	2
Gunner's Way	2	43.6	59	9	0
			Totals	**21**	**3**
Freetown					
Chace Road	2	60.0	61	2	0
Chipaway Road	2	60.0	68	0	2
			Totals	**2**	**2**
New Bedford					
Welby Road	2	52.1	58	22	0
Tarkiln Place	3	52.1	53	0	0
Worcester Street	2	55.0	66	52	2
Earle & Davis Streets	2	55.6	62	8	1
Hayden/McFadden School	2 & 3	65.0	68	9	0
Purchase Street	2 & 3	65.0	N/A	0	0
			Totals	91	3
Totals				**185**	**35**

Note: N/A – Not applicable since no residential uses are located within impact zones.

Table 4.6-11 Train Horn Noise Impact Summary–Southern Triangle, New Bedford Main Line

		Number of Impacts	
Town	**At Grade Crossing**	**Moderate**	**Severe**
Berkley	Cotley Street	12	11
Berkley	Myricks Street	18	18
Berkley	Padelford Street	7	6
Freetown	Braley Road	5	18
Freetown	Chace Road	9	4
Freetown	East Chipaway Road	7	7
Lakeville	Malbone Street	11	6
New Bedford	Nash Road	8	0
New Bedford	Tarkiln Hill Road	16	6
	Total	**93**	**76**

Stoughton Electric Alternative

The Stoughton Electric Alternative would comprise a portion of the Northeast Corridor, the entire Stoughton line, and the Southern Triangle elements. This alternative would use the Northeast Corridor from South Station to Canton Junction. From Canton Junction, the existing Stoughton Line would be used to the existing Stoughton Station. From there, commuter rail service would be extended, reconstructing a railroad on an out-of-service railroad bed, south through Raynham Junction to Weir Junction in Taunton. This alignment joins the New Bedford Main Line at Weir Junction, the northern end of the Southern Triangle. This evaluation focuses on the existing and extended Stoughton Line segment.

The existing Stoughton Line commuter rail track from Canton Junction to Stoughton Station would be upgraded to FRA Class 5 for the Stoughton Electric Alternative. New track would be placed on the out-of-service railroad bed from Stoughton Station south to Weir Junction. The existing public at-grade road/railroad crossings would be reconfigured and/or improved to meet current safety standards. The improved track and at-grade road/railroad crossings would also reduce sound levels generated by train activities.

As shown in Table 4.6-12 and Figures 4.6-6h-l, electric train operations for the Stoughton Line segment would result in 404 moderate and 159 severe impacts to residential receptors. The majority of these would occur in Easton and Raynham, in the Elm Street (Easton), Bridge Street, and Elm Street (Raynham) neighborhoods. Train horns along this segment would add 437 moderate and 457 severe impacts (see below).

Table 4.6-12 Noise Levels–Stoughton Line, Stoughton Electric Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Stoughton					
Brock Street	2	50	69	44	1
Plain Street	2	61	71	24	12
Morton Street	2	59	70	16	8
Subtotal				**84**	**21**
Easton					
Elm Street	2	57	67	57	17
Oliver Street	2	52	64	5	4
Pond Street	2	47	62	13	3
Main Street	2	62	70	10	11
Bridge Street	2	52	67	94	52
Short Street	2	58	67	16	12
Depot Street/123	2	65	67	1	1
Purchase Street	2	58	64	16	4
Prospect Street	2	63	63	6	0
Subtotal				**218**	**104**
Raynham					
Elm Street (MP 15.40)	2	55	68	16	8
Carver Street	2	60	65	5	1
Britton Street	2	55	68	20	6
King Phillip Street	2	56	69	23	8
Subtotal				**64**	**23**
Taunton					
Longmeadow Street	2	59	70	20	5
Dean Street	2	65	69	18	6
Subtotal				38	11
Total				**404**	**159**

Stoughton Diesel Alternative

The Stoughton Diesel Alternative alignment comprises same components as the Stoughton Electric Alternative with the exception of the locomotive power source. Due to lower operating speeds of diesel trains (and thus lower noise levels) the diesel operations would have slightly lower noise impacts than the electric operations, with 330 moderate and 128 severe impacts (See Table 4.6-13 and Figures 4.7h-l). Table 4.6-14 summarizes the horn noise impacts along the Stoughton Line for the diesel and electric alternatives.

Table 4.6-13 Noise Levels–Stoughton Line, Stoughton Diesel Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Stoughton					
Brock Street	2 & 3	50.4	66	13	1
Plain Street	2	60.6	69	31	15
Morton Street	2	58.9	66	12	5
			Totals	**56**	**21**
Easton					
Elm Street	2 & 3	56.8	67	52	16
Oliver Street	2	51.8	64	4	3
Pond Street	2 & 3	46.8	61	12	1
Main street	2 & 3	61.5	69	6	7
Bridge Street	2	52.2	69	81	34
Short Street	2 & 3	57.7	69	1	7
Depot Street/Route 123	2 & 3	65.2	69	2	0
Purchase Street	2	57.7	64	9	3
Prospect Street	2 & 3	62.9	63	3	0
			Totals	**170**	**71**
Raynham					
Elm Street	2	55.0	69	52	16
Carver Street	2	60.0	65	1	1
Route 138	2 & 3	63.4	N/A	0	0
Britton Street	2	54.5	69	10	6
King Phillip Street	2	56.4	69	18	8
			Totals	**81**	**31**
Taunton					
Longmeadow Street	2	59.0	69	15	3
Dean Street	2 & 3	64.7	69	8	2
			Totals	**23**	**5**
Totals				**330**	**128**

Note: N/A – Not applicable since no residential uses are located within impact zones.

Table 4.6-14 Train Horn Noise Impact Summary–Stoughton Alternatives

		Number of Impacts	
Municipality	**At Grade Crossing**	**Moderate**	**Severe**
Easton	Country Club	4	4
Easton	Depot Street - Route 123	24	17
Easton	Easton DPW	54	55
Easton	Foundry Street - Route 106	3	3
Easton	Gary Lane	12	10
Easton	Oliver Street	48	64
Easton	Prospect Street	12	15
Easton	Purchase Street	28	27
Easton	Short Street	15	21
Raynham	Britton Street	19	25
Raynham	Carver Street	10	9
Raynham	East Brittania Street	0	1
Raynham	King Phillip Street	14	29
Stoughton	Brock Street	57	47
Stoughton	Plain Street	32	48
Stoughton	Wyman Street	69	54
Taunton	Dean Street - Route 44	21	15
Taunton	Longmeadow Road	15	13
	Total	**437**	**457**

Whittenton Electric Alternative

The Whittenton Electric Alternative is a modification of the Stoughton Electric Alternative alignment described previously. At Raynham Junction, the route would divert to the southwest, following the out-of-service Whittenton Branch. This alignment would connect with the Attleboro Secondary at Whittenton Junction in Taunton, and then continue on toward the southeast to connect with the New Bedford Main Line at Weir Junction. The southernmost portion of the Stoughton Line (from Raynham Junction to Weir Junction) would not be used under this alternative. This evaluation focuses on the Whittenton Branch and Stoughton segment components; other components of this alternative (Southern Triangle Fall River Secondary and Southern Triangle New Bedford Main Line) are described in the section on the Southern Triangle study area.

As shown in Table 4.6-15 and Table 4.6-16 and Figures 4.6-7a-b, electric train operations would result in 171 moderate and 35 severe impacts to residential receptors for the Whittenton segment and 359 moderate and 164 severe impacts to residential receptors for the Stoughton segment. Train horns along the Whittenton segment would add 460 moderate and 708 severe impacts with an additional 368 moderate and 374 severe impacts along the Stoughton segment (see Tables 4.6-19 and 4.6-20).

Table 4.6-15 Noise Levels–Whittenton Branch, Whittenton Electric Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Raynham					
Britton Street / King Philip Street	2	55.0	67	14	2
			Totals	**14**	**2**
Taunton					
Redwood Drive	2	55.0	67	19	3
Third Avenue	2 & 3	65.0	63	0	0
Warren Street	2 & 3	55.0	62	14	0
West Britannia Street	2	55.0	58	2	0
Edwards Avenue	2	45.0	64	17	6
Danforth Street	2	55.0	63	22	4
Horton Street	2	44.4	68	27	5
Tremont Street (Route 140)	2 & 3	65.0	68	5	0
Winthrop Street	2 & 3	65.0	65	10	3
Webster Street	2 & 3	56.4	65	31	11
Weir Street & Somerset Avenue (Route 138)	2 & 3	65.0	65	10	1
			Totals	**157**	**33**
Totals				**171**	**35**

Note: This table represents the Whittenton Branch and the Attleboro Secondary from Whittenton Junction to Weir Junction.

Whittenton Diesel Alternative

The Whittenton Diesel Alternative is identical to the Whittenton Electric Alternative with the exception of the locomotive power source. As shown in Tables 4.6-17 and 4.6-18, diesel operations would result in 194 moderate and 42 severe impacts along the Whittenton segment and 279 moderate and 109 severe impacts along the Stoughton segment. As mentioned in the previous section, train horns along the Whittenton segment would add 460 moderate and 708 severe impacts with an additional 368 moderate and 374 severe impacts along the Stoughton segment (See Tables 4.6-19 and 4.6-20).

Table 4.6-16 Noise Levels–Stoughton Line, Whittenton Electric Alternative

			Moderate Impact		Severe Impact	
Municipality/ Receptor Location	Land Use Category	Existing Sound Level	Impact Threshold	Number of Impacts	Impact Threshold	Number of Impacts
Stoughton						
Brock Street	2 & 3	50.4	53.5	4	59.7	1
Plain Street	2	60.6	58.1	34	63.7	17
Morton Street	2	58.9	57.2	16	62.9	8
Subtotal				**54**		**26**
Easton						
Elm Street	2 & 3	56.8	56.1	73	56.8	25
Oliver Street	2	51.8	54.0	5	51.8	4
Pond Street	2 & 3	46.8	52.4	10	46.8	3
Main street	2 & 3	61.5	58.6	10	61.5	11
Bridge Street	2	52.2	54.1	92	52.2	52
Short Street	2 & 3	57.7	56.5	15	57.7	12
Depot Street/Route 123	2 & 3	65.2	61.0	1	65.2	1
Purchase Street	2	57.7	56.6	16	57.7	4
Prospect Street	2 & 3	62.9	59.4	6	62.9	0
Subtotal				**228**		**112**
Raynham						
Elm Street	2	55.0	55.3	73	61.2	25
Carver Street	2	60.0	57.8	4	63.4	1
Route 138	2 & 3	63.4	59.8	0	65.2	0
Subtotal				**77**		**26**
Total				**359**		**164**

Table 4.6-17 Noise Levels–Whittenton Branch, Whittenton Diesel Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Raynham					
Britton Street / King Philip Street	2	55.0	68	15	2
			Totals	**15**	**2**
Taunton					
Redwood Drive	2	55.0	68	21	3
Third Avenue	2 & 3	65.0	64	0	0
Warren Street	2 & 3	55.0	63	18	0
West Britannia Street	2	55.0	60	3	0
Edwards Avenue	2	45.0	64	20	6
Danforth Street	2	55.0	64	26	4
Horton Street	2	44.4	69	28	7
Tremont Street (Route 140)	2 & 3	65.0	67	5	0
Winthrop Street	2 & 3	65.0	66	16	3
Webster Street	2 & 3	56.4	66	30	16
Weir Street & Somerset Avenue (Route 138)	2 & 3	65.0	66	12	1
			Totals	**179**	**40**
Totals				**194**	**42**

Note: This table represents the Whittenton Branch and the Attleboro Secondary from Whittenton Junction to Weir Junction

Stations

Noise at the proposed South Coast Rail train stations would be dominated by trains approaching and departing the stations. The other minor noise sources include automobiles, which are associated with the patron arrivals and departures, bus idling in the bus loading zones, and P.A. systems in the platform area (if any are constructed) are not expected to contribute to the overall sound levels and impacts. Trains would idle at the train stations for a brief period to discharge and pick-up passengers. As a result, the dominant noise source around the train stations would be from approaching and departing trains. The sound level results and impacts of receptor locations near train stations are summarized in Tables 4.6-6 through 4.6-20.

For the Stoughton Electric Alternative, the impact analysis results take into account the relocation of the Stoughton Station as described in Chapter 3. Impact analysis results for the Stoughton Diesel Alternative have not been updated since the DEIS/DEIR and thus reflect the original Stoughton Station location. Similarly, the noise impact analyses for the Whittenton Diesel and Electric Alternatives do not take into account the relocation of the Stoughton Station or the change in the Downtown Taunton Station location to Dana Street. However, given that noise in the vicinity of stations is dominated by train operations, not the stations themselves, the station location changes would not substantially change noise impacts from those presented in the DEIS/DEIR for the purposes of comparing alternatives.

Table 4.6-18 Noise Levels – Stoughton Line, Whittenton Diesel Alternative

Municipality/ Receptor Location	Land Use Category	Existing Noise Exposure	Project Noise Exposure	Number of Moderate Impacts	Number of Severe Impacts
Stoughton					
Brock Street	2 & 3	50.4	66	13	1
Plain Street	2	60.6	69	31	15
Morton Street	2	58.9	66	12	5
			Totals	**56**	**21**
Easton					
Elm Street	2 & 3	56.8	67	52	16
Oliver Street	2	51.8	64	4	3
Pond Street	2 & 3	46.8	61	12	1
Main street	2 & 3	61.5	69	6	7
Bridge Street	2	52.2	69	81	34
Short Street	2 & 3	57.7	69	1	7
Depot Street/Route 123	2 & 3	65.2	69	2	0
Purchase Street	2	57.7	64	9	3
Prospect Street	2 & 3	62.9	63	3	0
			Totals	**170**	**71**
Raynham					
Elm Street	2	55.0	69	52	16
Carver Street	2	60.0	65	1	1
Route 138	2 & 3	63.4	N/A	0	0
			Totals	**53**	**17**
Totals				**279**	**109**

Table 4.6-19 Train Horn Noise Impact Summary–Whittenton Branch of Whittenton Alternative

		Number of Impacts	
Municipality	**At Grade Crossing**	**Moderate**	**Severe**
Taunton	Cohannet Street	38	67
Taunton	Danforth Street	34	31
Taunton	Harrison Avenue	60	112
Taunton	Oak Street	34	22
Taunton	Porter Street	26	46
Taunton	Somerset Avenue	66	93
Taunton	Tremont Street	43	29
Taunton	Warren Street	10	39
Taunton	Weir Street	63	65
Taunton	West Brittania Street	10	24
Taunton	Whittenton Street	27	102
Taunton	Winthrop Street	49	78
	Total	**460**	**708**

Table 4.6-20 Train Horn Noise Impact Summary–Stoughton Line of Whittenton Alternative

		Number of Impacts	
Municipality	**At Grade Crossing**	**Moderate**	**Severe**
Easton	Country Club	4	4
Easton	Depot Street - Route 123	24	17
Easton	Easton DPW	54	55
Easton	Foundry Street - Route 106	3	3
Easton	Gary Lane	12	10
Easton	Oliver Street	48	64
Easton	Prospect Street	12	15
Easton	Purchase Street	28	27
Easton	Short Street	15	21
Raynham	Carver Street	10	9
Stoughton	Brock Street	57	47
Stoughton	Plain Street	32	48
Stoughton	Wyman Street	69	54
	Total	**368**	**374**

Layover Facilities

Noise at the proposed South Coast Rail layover facilities would be dominated by trains idling diesel locomotives (under the diesel alternatives only). Diesel trains that remain at the layover facilities for 1 hour or longer would be shut down and attached to electrical power, as needed. The other minor noise sources on site are not expected to contribute to the overall sound levels and impacts. Distances to moderate and severe impact at the layover facilities were calculated based on the Source Reference Level of 109 dBA at 50 feet from the center of the site for layover tracks, based on Table 5-5 of *Transit*

Noise and Vibration Impact Assessment.[15] This analysis revealed one moderate impact at the proposed Weaver's Cove facility. The existing sound levels, the project sound levels, and the number of impacts are shown in Table 4.6-21 and Figures 4.6-4b and 4.6-5e.

Table 4.6-21 Layover Facilities Sound Levels and Impacts

			Moderate Impact		Severe Impact	
Layovers Location	**Noise Exposure at 50 feet (Ldn)**	**Existing Noise Exposure (Ldn)**	**Ldn**	**Number of Impacts**	**Ldn**	**Number of Impacts**
Fall River - Weaver's Cove East	79.8	55	55.3	1	61.2	0
New Bedford - Wamsutta Site	79.8	60	57.8	0	63.4	0

Assumptions: A Source Reference Level of 109 dBA at 50 feet from the center of the site for layover tracks was used based on Table 5-5 of Transit Noise and Vibration Impact Assessment.
All facilities are assumed to have one train idling per hour (day and night).

4.6.3.4 Temporary Construction-Period Impacts and Mitigation

Temporary noise impacts could result from construction activities associated with utility relocation, grading, excavation, track work and installation of systems components. Such impacts may occur in residential areas and at other noise-sensitive land use located within several hundred feet of the alignment. The potential for noise impact would be greatest at locations near pile driving operations for bridges and other structures, and at locations close to any nighttime construction activities.

Track Improvements

The South Coast Rail project may create noise impacts as a result of track and bridge reconstruction activities. Construction activities would increase sound levels in adjacent areas; however, these sound level increases would be temporary and would move with construction activities. The particular types of construction equipment or activities are not defined at this stage of the design. Therefore, construction impacts cannot be quantitatively assessed at this time.

Since rail replacement activities, which include grading, ballast, and rail construction, would continuously move along the corridor, noise from these activities would only occur for several weeks at any one location. Bridge and grade crossing reconstruction activities would occur for a slightly longer duration, since these activities require more time. None of the noise impacts associated with track improvements would be permanent.

Station Construction

Station construction activities may increase noise exposures in adjacent areas during some phases of the construction. However, these increases would be temporary. Since particular construction equipment and activities are not defined at this stage of design, construction impacts cannot be quantitatively assessed at this time.

MassDOT has indicated that every reasonable attempt would be made to minimize construction noise impacts. Construction noise control is accomplished by the use of quiet equipment and procedures. Noise guidelines would be incorporated into construction documents and would conform to local, state,

[15] *Transit Noise and Vibration Impact Assessment*, Federal Transit Administration, May 2006

and federal statutes. Specific noise control measures would be reviewed during detailed engineering design and be negotiated as part of the construction permitting process. Noise specifications would be enforced through a program of field inspection and compliance review.

Mitigation for Construction-Period Impacts

MassDOT has indicated that every reasonable attempt would be made to minimize construction noise impacts. Construction noise control is accomplished by the use of quiet equipment with enclosed engines and/or high-performance mufflers and quieting procedures such as locating stationary construction equipment as far as possible from noise-sensitive sites. Noise guidelines would be incorporated into the construction documents and conform with local, state, and federal statutes. Specific noise control measures would be reviewed during detailed engineering design and be negotiated as part of the construction permitting process. Noise specifications would be enforced through a program of field inspection and compliance review.

Most of the track and bridge reconstruction would occur during the normal workday. Under special circumstances, where road or rail traffic interruptions have to be minimized, night work may occur. During these conditions, unusually noisy activities would be scheduled during daytime hours to minimize noise impacts to residential areas during periods of rest and sleep.

The station construction work would occur during the normal workday. Under special circumstances, when night work may occur, unusually noisy activities would be scheduled during daytime hours to minimize noise impacts to residential areas during periods of rest and sleep.

4.6.3.5 Summary of Impacts by Alternative

Table 4.6-22 summarizes the total number of moderate and severe noise impacts by alternative for the operations of the rail line. All of the severe noise impact locations were evaluated for noise mitigation measures.

The Stoughton Electric alternative (Stoughton, Southern Triangle - Fall River, and Southern Triangle - New Bedford segments) would result in 1,106 moderate and 341 severe impacts to residential receptors. The diesel operations would have similar impacts, with 1,085 moderate and 344 severe impacts.

The Whittenton Electric alternative (Stoughton partial, Whittenton, Southern Triangle - Fall River, and Southern Triangle - New Bedford segments) would result in 1,232 moderate and 381 severe impacts to residential receptors. The diesel operations would have lower impacts, with 1,228 moderate and 367 severe impacts.

Severe noise impacts typically result from the close proximity to locomotive and rail car noise and from locomotive warning horns, which must be sounded one-quarter mile prior all public grade crossings. Severe noise impacts result from Ldn noise exposure increases of 2 to 6 dBA (depending on existing). It should be noted that the majority of train horn impacts would occur at the same locations where rail operation impacts would occur. The train horn, however, is a uniquely different noise than the operations and was evaluated separately. A summary of these results can be found in Table 4.6-23. All of the severe noise impact locations were evaluated for noise mitigation measures.

Table 4.6-22 Summary of Projected Noise Impacts for South Coast Rail Alternatives

	Electric Alternative			Diesel Alternative		
Alternative	**Moderate Impacts**	**Severe Impacts**	**Total**	**Moderate Impacts**	**Severe Impacts**	**Total**
Stoughton						
Stoughton Line	404	159	563	330	128	458
Southern Triangle - Fall River Secondary	466	135	601	570	181	751
Southern Triangle - New Bedford Main Line	236	47	283	185	35	220
Total	**1,106**	**341**	**1,447**	**1,085**	**344**	**1,429**
Whittenton						
Stoughton Line*	359	164	523	279	109	388
Whittenton Branch/Attleboro Secondary	171	35	206	194	42	236
Southern Triangle - Fall River Secondary	466	135	601	570	181	751
Southern Triangle - New Bedford Main Line	236	47	283	185	35	220
Total	**1,232**	**381**	**1,613**	**1,228**	**367**	**1,595**

* Excludes the portion of the Stoughton Line that is bypassed by the Whittenton Alternative (south of Raynham Junction).

Table 4.6-23 Summary of Projected Train Horn Noise Impacts for South Coast Rail Alternatives

Alternative	Moderate Impacts	Severe Impacts	Total
Stoughton			
Stoughton	437	457	894
Southern Triangle - Fall River	98	164	262
Southern Triangle - New Bedford Main Line	93	76	169
Total	**628**	**697**	**1,325**
Whittenton			
Stoughton*	368	374	742
Whittenton	460	708	1,168
Southern Triangle - Fall River	98	164	262
Southern Triangle - New Bedford Main Line	93	76	169
Total	**1,019**	**1,322**	**2,341**

* Excludes the portion of the Stoughton line that is bypassed by the Whittenton Alternative (south of Raynham Junction).

Train horns along the Stoughton Alternative would have 628 moderate and 689 severe impacts. The Whittenton Electric Alternative would result in the train horns producing 1,019 moderate and

1,322 severe impacts. The Whittenton alternative results in the highest railroad grade crossing noise impacts.

4.6.3.6 Mitigation

Overview of MBTA Train Pass-by Noise Mitigation Policy

The need for noise mitigation in a specific location is determined based on the magnitude of the impacts and consideration of other factors such as feasibility, cost-effectiveness, and community views. The Corps does not have mitigation evaluation criteria for commuter rail projects and therefore relies on the guidance of the federal agency with special expertise in this area, the FTA. The FTA guidance requires consideration of mitigation for severe impacts and outlines the available mitigation options. FTA allows transit providers to develop local agency-specific noise mitigation policies detailing the analysis process and criteria for their projects. MBTA has developed a noise mitigation policy consistent with the FTA guidance, the details of which are described below.

The MBTA is committed to providing noise mitigation to the locations that meet or exceed the Severe Noise Impact Level. Noise mitigation measures would be provided to the extent that it is reasonably cost-effective. Where noise levels are projected to occur above the Severe Noise Impact Level, the MBTA may consider a reduced level of noise mitigation that is proportional to the level of impact over the threshold level and which, again is reasonably cost-effective.

The Severe Noise Impact Level is reached when the projected noise level from the project significantly exceeds the ambient noise level. These noise impacts are measured at the outside of the building, at the corner or wall closest to the tracks, at 5 feet above the ground. Where sensitive land uses such as residences (as defined in the FTA guidelines) are impacted at the Severe Noise Impact Level, the MBTA would provide noise barriers or other noise measures designed to reduce the noise impact, if cost-effective. Such measures would be considered cost-effective by the MBTA if the total cost of the wall or other measure is less than $30,000 per dwelling unit, and the wall is found to be effective in reducing noise levels below the impact threshold.

The MBTA would initially evaluate the severe impact locations to determine if a noise barrier can be provided. Where noise barriers are not cost-effective by the above standard, or where noise barriers cannot provide a sufficient level of noise reduction, the MBTA would consider providing funding for building noise mitigation. The cost-effectiveness limit for building noise mitigation would be $5,000 per dwelling unit per decibel of noise impact projected above the Severe Noise Impact Level (not to exceed $30,000 total). Thus, for example, if a dwelling unit is expected to have noise impacts 3 decibels (using the Ldn metric) above the Severe Noise Impact Level, the building noise mitigation measures would be funded not to exceed $15,000 in cost for that dwelling unit.

The $5,000 per dwelling unit per decibel figure was calculated by dividing the $30,000 total cost-effectiveness limit by 6 decibels, which is the typical difference between the “impact” threshold and “severe” impact level according to the FTA Manual.

The owners of properties that are affected by noise above the Severe Noise Impact Level, and who may be eligible for building noise mitigation under these guidelines, would be consulted during the design phase of the project. The MBTA would permit these homeowners to identify preferred building noise mitigation measures for their property from a list of potential measures that would be provided by the MBTA. The list would include measures such as window replacement or sound insulation in the house, provided that the MBTA noise consultants determine that such measures are reasonably effective as noise reducing techniques in the context of the specific location involved. Where a homeowner elects to have work done on his or her property, he or she would be responsible for selecting the contractor and obtaining necessary permits, and the MBTA would pay the contractors bills from its own funds (thus avoiding the need for the homeowner to come "up front" with cash resources) up to the specified dollar limit for the particular location and noise condition involved. The list of eligible measures may also include reduced-height noise barriers or similar measures, subject to the cost-effectiveness limit, in cases where a homeowner judges that notwithstanding the lack of effectiveness of the reduced height structure, the homeowner prefers the psychological "space" created by the structure over the actual noise reduction achieved.

Similarly, homeowners in this category may elect, singly or in concert with other similarly affected homeowners, to install measures that may not reduce exterior noise levels, or may not be fully effective in reducing interior noise levels. Some of these mitigation measures, such as air conditioning (to allow residents to keep their windows closed when sleeping) may in fact increase both exterior and interior noise levels. As a result, however, there can be no guarantee that any particular level of noise reduction would be achieved based upon measures selected by the homeowner.

The MBTA's role would be limited to evaluating potential noise mitigation and paying for the installation of appropriate noise mitigation treatments. The homeowner would obtain guarantees for equipment or for workmanship from their contractors, and future replacement or maintenance would be the responsibility of the homeowner. Homeowners would be expected to enter into letter agreements with the MBTA acknowledging this understanding as a condition of proceeding with the installation of noise mitigation measures under these Guidelines.

Stoughton Electric Alternative Proposed Noise Mitigation Plan

This section presents a summary of the proposed noise mitigation measures for the severe noise impacts associated with the Stoughton Electric Alternative. Subsequent to the DEIS/DEIR, MassDOT conducted a noise impact analysis that re-evaluated the noise impacts associated with the changes in rail operations of the Stoughton Electric Alternative and identified severe noise impact locations. MassDOT's Noise Mitigation Plan evaluated the noise mitigation measures for these severe noise impact locations. The severe noise impact locations were evaluated to identify the potential noise mitigation measures, either noise barriers or building insulation in accordance with the MBTA noise mitigation policy described above. The location of the noise impact locations and proposed noise barriers are presented in Figures 4.6-4d through 4.6-4h; 4.6-5f through 4.6-5i; and 4.6-6a through 4.6-6g . A listing of the severe noise impact locations and their proposed noise mitigation measures are presented in Appendix 4.6-C. The following is a summary of the proposed noise mitigation measures by municipality.

Stoughton

The noise analysis identified 21 severely impacted noise sensitive receivers (Figures 4.6-6a-c). An evaluation of constructing a noise barrier indicated that due to the low density of these receptors, a noise barrier was not cost-effective for this area. Building insulation is the most cost-effective noise mitigation for the severely impacted noise sensitive receivers in Stoughton due to the distance between those noise impact locations.

Easton

The noise analysis identified 104 severely impacted noise sensitive receivers. The analysis determined that a noise barrier is the most cost-effective mitigation measure for the 23 severely impacted noise sensitive receivers located in the Center Street area (Figures 4.6-6b and 4.6-6d). The proposed noise barrier would be located parallel to Center Street and extend approximately from Main Street to Bridge Street. A noise barrier is also cost-effective for the 25 severe noise impacted locations located on Baldwin Street (Figures 4.6-6b and 4.6-6d). The proposed noise barrier would be located parallel to Baldwin Street and extend approximately from Bridge Street to Parker Terrace. Building insulation is the most cost-effective noise mitigation for the remainder of severely impacted noise sensitive receivers in Easton due to the distance between those noise impact locations.

Raynham

The noise analysis identified 23 severely impacted noise sensitive receivers (Figure 4.6-6f). Noise barriers are not cost-effective for the severe noise impact locations in Raynham due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in Raynham.

Taunton

The noise analysis identified 23 severely impacted noise sensitive receivers (Figures 4.6-5f and 4.6-6g). Noise barriers are not cost-effective for the severe noise impact locations in Taunton due to the location and distance between the receivers. Building insulation is the most cost effective noise mitigation for all severely impacted noise sensitive receivers in Taunton.

Berkley

The noise analysis identified 14 severely impacted noise sensitive receivers (Figures 4.6-4d and 4.6-5f). Noise barriers are not cost-effective for the severe noise impact locations in Berkley due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in Berkley.

Lakeville

The noise analysis identified 8 severely impacted noise sensitive receivers (Figures 4.6-5f and 4.6-5g). Noise barriers are not cost-effective for the severe noise impact locations in Lakeville due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in Lakeville.

Freetown

The noise analysis identified 25 severely impacted noise sensitive receivers (Figures 4.6-5g, 4.6-5h, and 4.6-4d). Noise barriers are not cost-effective for the severe noise impact locations in Freetown due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in Freetown.

New Bedford

The noise analysis identified 12 severely impacted noise sensitive receivers (Figure 4.6-5i). Noise barriers are not cost-effective for the severe noise impact locations in New Bedford due to the location and distance between the receivers. Building insulation is the most cost-effective noise mitigation for all severely impacted noise sensitive receivers in New Bedford.

Fall River

The noise analysis identified 111 severely impacted noise sensitive receivers (Figures 4.6-4d through 4.6-4h). The analysis determined that a noise barrier is the most cost-effective mitigation for the 16 severely impacted noise sensitive receivers located on the west side of the track in the Murray Street area (Figures 4.6-4f and 4.6-4g). The proposed noise barrier would extend approximately from Brightman Street to Cory Street. A noise barrier is also cost effective for the 14 severely impacted noise sensitive receivers located on the east side of the track in the Almy Street area (Figures 4.6-4f and 4.6-4g). The proposed noise barrier would extend approximately from Cory Street to President Avenue. Building insulation is the most cost-effective noise mitigation for the remainder of severely impacted noise sensitive receivers in Fall River.

Summary – Mitigation Commitments

The noise analysis identified four severely impacted noise sensitive areas that met MBTA's policy for a noise barrier. The noise analysis showed that a noise barrier would be the most cost-effective mitigation measure at the following locations:

- Barrier #1. Center Street area from Main Street to Bridge Street in Easton. This barrier would be approximately 1,700 feet long and cost $510,000. 23 residences with severe impacts would benefit, resulting in a cost of $22,174 per benefited residence.

- Barrier #2. Baldwin Street area from Bridge Street to Parker Terrace in Easton. This barrier would be approximately 1,700 feet long and cost $510,000. 24 residences with severe impacts would benefit, resulting in a cost of $21,250 per benefited residence.

- Barrier #3. Murray Street area from Brightman Street to Cory Street in Fall River. This barrier would be approximately 1,000 feet long and cost $300,000. 15 residences with severe impacts would benefit, resulting in a cost of $20,000 per benefited residence.

- Barrier #4. Almy Street area from Cory Street to President Avenue in Fall River. This barrier would be approximately 1,100 feet long and cost $330,000. 14 residences with severe impacts would benefit, resulting in a cost of $23,571 per benefited residence.

In total, 5,500 linear feet of noise barriers costing $1.65 million are proposed for the Stoughton Electric Alternative. The design details of the proposed noise barriers would continue to be refined in the final design process.

For the remaining severely impacted sensitive receptor locations, building insulation is the most cost-effective noise mitigation for reducing the noise impact associated with the rail operations along the Stoughton Electric Alternative.

Noise Mitigation for Other Alternatives

A detailed Noise Mitigation Plan has not been developed for the Stoughton Diesel, Whittenton Electric or Whittenton Diesel Alternatives. However, these alternatives result in noise impacts in many of the same locations as the Stoughton Electric Alternative and therefore noise barriers similar to those described for the Stoughton Electric Alternative would likely be feasible. As with the Stoughton Electric Alternative, building insulation would be used to address severe impacts in locations where noise barriers are not cost effective.

Train Horn Noise Mitigation

An option for reducing train horn noise impacts under FRA regulations (49 CFR Parts 222 and 22) would be to establish "quiet zones" at grade crossings. In a quiet zone, train operators would sound horns only in emergency situations rather than as a standard operational procedure because of safety improvements made to the at-grade crossings. Establishing a quiet zone requires cooperative action among the municipalities along the rail right-of-way, freight railroads and appropriate federal, state and local agencies. The municipalities are key participants as they must initiate the request to establish the quiet zone through application to FRA. In addition, to meet safety criteria, improvements are required at grade crossings; these may include modifications to the streets, raised medians, warning lights, four-quadrant gates and other devices. The FRA regulation also authorizes the use of automated wayside horns at crossings with flashing lights and gates as a substitute for the train horn. While activated by the approach of trains, these devices are pole-mounted at the grade crossings, thereby limit the horn noise exposure area to the immediate vicinity of the grade crossing. Although the establishment of quiet zones or the use of wayside horns would be very effective noise mitigation measure (eliminating all or nearly all horn noise impacts), considerable design analysis and coordination efforts would be required to determine if these measures are feasible. For NEPA purposes, the establishment of quiet zones is the recommended noise mitigation measure for horn noise impacts. However, this mitigation measure is dependent on actions by local governments in conjunction with numerous other government agencies and cannot be implemented by MassDOT or the Corps.

Unavoidable Noise Impacts

After the proposed noise mitigation measures (noise walls or building noise insulation) have been finalized, noise impacts may still be present. Noise walls can provide a maximum of approximately 10 dBA noise reduction, and usually protect only the yards and ground level floors. Building noise insulation (soundproofing) can provide 10 to 15 dBA of additional exterior-to-interior noise reduction, but does not mitigate exterior noise and the building's windows must remain closed to maintain effectiveness.