

Noise and Vibration Assessment For the FEC Amtrak High Speed Rail Study

From West Palm Beach to Jacksonville, Florida

ETDM # 11860

Prepared for:

**FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT FOUR
3400 W. Commercial Boulevard
Fort Lauderdale, Florida 33309-3421**



July 19, 2010

Noise and Vibration Assessment For the FEC Amtrak High Speed Rail Study

From West Palm Beach to Jacksonville, Florida

ETDM # 11860

Prepared for:

**FLORIDA DEPARTMENT OF TRANSPORTATION
DISTRICT FOUR
3400 W. Commercial Boulevard
Fort Lauderdale, Florida 33309-3421**

Prepared By:
Bernard Kinney Associates, Inc.
7548 South US-1, Box 375
Port Saint Lucie, Florida 34952

Prepared For:
Stanley Consultants, Inc.
1641 Worthington Road, Suite 400
West Palm Beach, Florida 32817

Bernard Kinney Jr., INCE

July 19, 2010



Bernard Kinney Associates, Inc.
Environmental Noise Consultants



Stanley Consultants INC.

Executive Summary

The purpose of the FEC Amtrak High Speed Rail Noise and Vibration Assessment is to update the findings related to noise and vibration contained in the Programmatic Environmental Assessment, dated October 1, 2009. The noise and vibration study limits of the project extend from West Palm Beach to Jacksonville, Florida. The Florida Department of Transportation (FDOT) proposes to add four Amtrak Passenger Trains (2 northbound and 2 southbound trains per day) on the Florida East Coast (FEC) Corridor and new Amtrak Stations as part of the proposed improvements. The FEC Corridor currently operates 24 freight trains daily, with most service at night.

The methodology included measuring existing noise and vibration levels at the following locations:

- The Amtrak Station and the FEC Freight Corridor located in West Palm Beach, Florida
- The Amtrak high speed mainline located in Indiantown, Florida on CSX tracks.
- The FEC Freight Corridor high speed mainline located in Vero Beach, Florida
- The Amtrak and FEC Freight Corridor mainline located in Jacksonville, Florida

Analysis of the noise and vibration conditions was conducted for the existing conditions and for the proposed new Amtrak services and followed FTA and FRA requirements. The monitoring and predicted distances evaluated were 70 feet from the track centerline.

The overall summary of the noise and vibration findings are the Amtrak Passenger Trains will not induced higher noise or vibration levels to cause a change in the impact rating along the corridor. The existing freight creates a moderate to severe rating per FTA and the FRA criteria and that rating will not change with the implementation of four additional Amtrak Passenger Trains.

Noise Impact Summary

Based upon the FTA criteria contained in this assessment, moderate to severe noise impacts already exist for the transit events evaluated and it is expected that these impacts will continue to exist with or without the proposed project improvements. For most of the proposed conditions, the four proposed Amtrak Passenger Trains will generate 5 dBA less noise than the existing FEC Corridor freight trains. For the proposed condition where the Amtrak Passenger Trains travel at speeds of up to 79 mph, the train will produce 1 dBA more noise than the existing FEC Corridor freight trains. The existing FEC Corridor freight train operations evaluated generate greater noise impacts (up to 5 dBA) when compared to the existing Amtrak Passenger Trains and the freight train impacts will continue to exist with or without the project.

The proposed high speed Amtrak Passenger Trains will operate at speeds of up to 90 mph and will not produce any additional noise impacts beyond the moderate to severe level for single hourly events when compared to the similar FEC Corridor freight train events that were evaluated. However, for the case of two high speed Amtrak Passenger Trains traveling in the same hour, a noise level increase of 2 dBA can be expected when compared to a single FEC Corridor freight train event and a 3 dBA decrease in the noise level can be expected when compared to two FEC Corridor freight train events in the same hour.

While the transit event impacts evaluated are only relative when a direct comparison is made between each type of event, the addition of the four Amtrak Passenger Trains will generate four additional moderate to severe noise impacts daily under the proposed study corridor conditions.

However, the impacts are not expected to generate a significant increase in noise since there are already up to 24 freight trains operating daily on the study corridor, mostly during the nighttime hours. It is expected that the four daily Amtrak Passenger Trains will generate these types of impacts at all locations within close proximity to the study corridor and within the vicinity of the new Amtrak Stations which are being proposed between West Palm Beach and Jacksonville, Florida. The measured noise levels in this assessment were established at a distance of 70 feet from the existing study corridor.

Vibration Summary

The existing FEC Corridor freight train operations currently generate ground-borne vibration impacts of up to 6 VdB over the FRA criteria for Category 2 Land Uses and Special Buildings. Based upon the FRA criteria contained in this assessment, the expected ground-borne vibration impacts, from the four proposed Amtrak Passenger Trains, on the existing FEC Corridor, will exceed Category 2 Land Uses by up to 4 VdB under the existing project conditions and these impacts will continue to exist with or without the project. The vibration impacts will occur for the Amtrak Passenger Trains traveling at speeds of up to 79 mph. Under the proposed project conditions, the Amtrak Passenger Trains will travel at speeds of up to 90 mph and additional vibration impacts of up to 1 VdB are expected for the higher speed Amtrak Passenger Trains.

While the transit event impacts evaluated are only relative when a direct comparison is made between each type of event, the addition of the four Amtrak Passenger Trains will generate four additional ground-borne vibration impacts daily under the proposed study corridor conditions. However, the impacts are not expected to generate a significant increase in vibration since there are already up to 24 freight trains operating daily on the study corridor, mostly during the nighttime hours. It is expected that the four daily Amtrak Passenger Trains will generate these types of impacts at all locations within close proximity to the study corridor and within the vicinity of the new Amtrak Stations which are being proposed between West Palm Beach and Jacksonville, Florida. Additionally, the vibration impacts can be expected within 200 feet from the proposed study corridor for Category 2 Land Uses and Special Buildings. Special Building locations such as churches and historical buildings / locations may require additional consideration. The measured ground-borne vibration levels in this assessment were established at a distance of 70 feet from the existing study corridor.

Table of Contents

1.0	OVERVIEW	1
2.0	INVENTORY OF NOISE AND VIBRATION SENSITIVE SITES	1
	2.1 West Palm Beach Amtrak Station.....	1
	2.2 West Palm Beach FEC Corridor.....	1
	2.3 Indiantown Amtrak High Speed Mainline / Track Crossing.....	5
	2.4 Vero Beach FEC High Speed Mainline.....	5
	2.5 Jacksonville Amtrak and FEC Double Track Mainline / Track Crossing.....	5
3.0	MEASUREMENT OF EXISTING NOISE CONDITIONS	7
	3.1 Methodology.....	7
	3.2 Equipment Specifications.....	9
	3.3 Meterological Conditions.....	10
	3.4 Field Measurement Data.....	13
	3.5 Interpretation of Measurement Data.....	13
4.0	PREDICTIONS OF NOISE FROM THE PROJECT	14
	4.1 Noise Contours for the Amtrak Stations.....	22
	4.2 Noise Contours for the FEC Corridor.....	25
5.0	NOISE CRITERIA	28
	5.1 Typical Transit and Background L _{dn} Sound Levels.....	28
	5.2 Land Use Categories and Metrics for Transit Noise Impact Criteria.....	29
	5.3 Noise Impact Criteria for Transit Projects	29
	5.4 Noise Levels Defining Impact for Transit Projects.....	30
	5.5 City of West Palm Beach Noise Ordinance.....	31
	5.6 Jacksonville Noise Ordinance.....	31
6.0	NOISE IMPACT SUMMARY	34
7.0	MEASUREMENT OF EXISTING VIBRATION CONDITIONS	35
	7.1 Methodology.....	35
	7.2 Equipment Specifications.....	36
	7.3 Meterological Conditions.....	37
	7.4 Field Measurement Data.....	37
	7.5 Interperation of Measurement Data.....	37

Table of Contents (Continued)

8.0	PREDICTIONS OF VIBRATION FROM THE PROJECT.....	38
9.0	VIBRATION CRITERIA.....	44
	9.1 Typical Ground – Borne Vibration Levels.....	44
	9.2 Ground – Borne Vibration and Noise Impact Criteria.....	45
	9.3 Ground – Borne Vibration and Noise Impact Criteria for Special Buildings.....	46
10.0	VIBRATION IMPACT SUMMARY.....	49

List of Figures

Figure 1	Amtrak & FEC Site Monitoring Location Map.....	2
Figure 2	West Palm Beach Amtrak Station - Mainline.....	3
Figure 3	West Palm Beach Amtrak Station - Track Crossing.....	3
Figure 4	West Palm Beach FEC Corridor - Mainline.....	4
Figure 5	West Palm Beach FEC Corridor - Track Crossing.....	4
Figure 6	Indiantown Amtrak High Speed Mainline / Track Crossing.....	5
Figure 7	Vero Beach FEC High Speed Mainline.....	6
Figure 8	Jacksonville Amtrak and FEC Double Track- Mainline.....	6
Figure 9	Jacksonville Amtrak and FEC Double Track- Track Crossing.....	7
Figure 10	Noise Contours for the West Palm Beach Amtrak Station-Mainline.....	22
Figure 11	Noise Contours for the West Palm Beach Amtrak Station-Track Crossing.....	23
Figure 12	Noise Contours for the Jacksonville Amtrak Station-Mainline.....	23
Figure 13	Noise Contours for the Jacksonville Amtrak Station-Track Crossing.....	24
Figure 14	Noise Contours for the Indiantown High Speed -Mainline.....	24
Figure 15	Noise Contours for the West Palm Beach FEC Train Corridor-Track Crossing....	25
Figure 16	Noise Contours for the West Palm Beach FEC Train Corridor-Mainline.....	26
Figure 17	Noise Contours for the Jacksonville FEC Train Corridor-Track Crossing.....	26
Figure 18	Noise Contours for the Jacksonville FEC Train Corridor-Mainline.....	27
Figure 19	Noise Contours for the Vero Beach FEC Train Corridor-High Speed Mainline....	27
Figure 20	Typical Transit and Background L _{dn} Sound Levels.....	28
Figure 21	Land Use Categories and Metrics for Transit Noise Impact Criteria.....	29
Figure 22	Noise Impact Criteria for Transit Projects.....	29
Figure 23	Noise Levels Defining Impact for Transit Projects.....	30
Figure 24	Typical Ground – Borne Vibration Levels.....	44
Figure 25	Ground – Borne Vibration and Noise Impact Criteria.....	45
Figure 26	Ground – Borne Vibration and Noise Impact Criteria for Special Buildings.....	46

List of Tables

Table 1	Measurement Locations for the Existing Noise and Vibration Conditions.....	9
Table 2	Noise and Vibration Measurement Instrumentation.....	10
Table 3	Meteorological Conditions.....	11
Table 4	Summary of Existing Noise Levels for the Amtrak Passenger Trains	18
Table 5	Summary of Existing Noise Levels for the FEC Corridor Freight Trains	19
Table 6	Summary of Predicted Noise Exposure Levels of the Amtrak Passenger Trains..	20
Table 7	Summary of the FTA Rail Noise Model Predicted Results	21
Table 8	Summary of the FTA Noise Level Impact Criteria for Amtrak Passenger Trains ..	32
Table 9	Summary of the FTA Noise Level Impact Criteria for FEC Corridor Freight Trains	33
Table 10	Summary of Existing Vibration Levels for the Amtrak Passenger Trains	41
Table 11	Summary of Existing Vibration Levels for the FEC Corridor Freight Trains... ..	42
Table 12	Summary of Predicted Vibration Levels of the Amtrak Passenger Trains.....	43
Table 13	Summary of the FRA Vibration Impact Criteria for the Amtrak Passenger Trains.	47
Table 14	Summary of the FRA Vibration Impact Criteria for FEC Corridor Freight Trains...	48

List of Appendices

Appendix A - Programmatic Environmental Assessment for Noise and Vibration, October 2009
Appendix B - Noise and Vibration Monitoring Equipment
Appendix C - Existing Amtrak and FEC Railway Track Conditions
Appendix D - City of West Palm Beach Noise Ordinance
Appendix E - Jacksonville Noise Ordinance

1.0 OVERVIEW

The purpose of the FEC Amtrak High Speed Rail Noise and Vibration Assessment is to update the findings related to noise and vibration contained in the Programmatic Environmental Assessment, dated October 1, 2009 which is presented in **Appendix A**. The Florida Department of Transportation (FDOT) proposes to add four Amtrak Passenger Trains (2 northbound and 2 southbound trains per day) on the Florida East Coast (FEC) corridor. The FEC Corridor currently operates 24 freight trains daily, with most service at night. The limits of the study extend from West Palm Beach to Jacksonville, Florida. The proposed improvements include the construction of new Amtrak Stations, and a crossover track from the South Florida Rail Corridor (SFRC) Railway to the FEC Railway in North Palm Beach, Florida. This is known as the Northwood Crossover, as part of the proposed improvements. The SFRC currently serves CSX trains, Tri-Rail Commuter trains and Amtrak.

This assessment documents the existing noise and vibration impacts associated with the freight and Amtrak Passenger Trains. Representative existing noise levels for existing passenger trains were obtained by utilizing existing sites in West Palm Beach on the SFRC and on the FEC corridor in Jacksonville. The results presented identify if future noise and vibration impacts are likely to occur along the corridor and at the existing and proposed Amtrak Stations.

2.0 INVENTORY OF NOISE AND VIBRATION SENSITIVE SITES

Existing noise and vibration levels were measured at the following locations which are depicted in the Amtrak & FEC Site Monitoring Location Map, **Figure 1**.

- The SFRC Amtrak Station located at 201 South Tamarind Avenue, West Palm Beach, Florida
- The FEC corridor located between Palm Street and Alabama Ave., West Palm Beach, Florida
- The SFRC Amtrak high speed mainline located at 17650 SW SR 710, Indiantown, Florida
- The FEC high speed mainline located on N. Old Dixie Highway, Vero Beach, Florida
- The Amtrak and FEC double track mainline located at 5863 Soutel Drive, Jacksonville, Florida

2.1 West Palm Beach Amtrak Station

Existing noise and vibration measurements were recorded at the West Palm Beach Amtrak Station located at 201 South Tamarind Avenue, West Pam Beach, Florida. This station is on the CSX Railway segment known as the South Florida Rail Corridor (SFRC). At this location, the Tri-Rail commuter train shares the same corridor which is double tracked. Noise and vibration measurements were recorded at the mainline track south of the Amtrak Station and the track crossing located south of the station at the intersection of Okeechobee Boulevard and Tamarind Avenue. This station currently serves Amtrak Passenger Trains 98, 92, 91, and 97. The West Palm Beach Amtrak Station Noise and Vibration Measurement Locations are shown in **Figures 2 and 3**.

2.2 West Palm Beach FEC Corridor

Existing noise and vibration measurements were recorded at the West Palm Beach FEC Railway corridor located between Palm Street and Alabama Avenue, West Palm Beach, Florida. Noise and vibration measurements were recorded at the mainline track and the track crossing. This location has a single track which serves the existing freight train operations. The West Palm Beach FEC Corridor Noise and Vibration Measurement Locations are shown in **Figures 4 and 5**.

Figure 1 – Amtrak & FEC Site Monitoring Location Map



Figure 2 – West Palm Beach Amtrak Station - Mainline

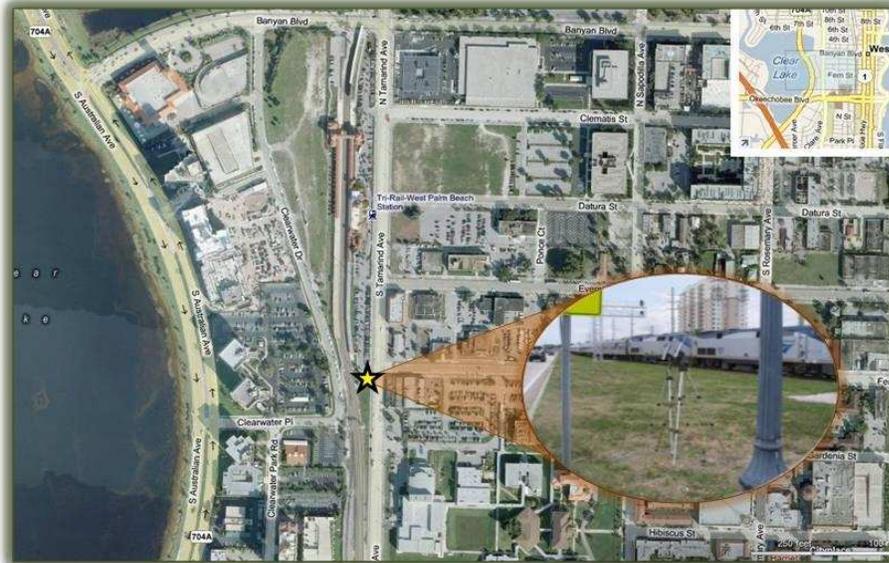


Figure 3 – West Palm Beach Amtrak Station – Track Crossing

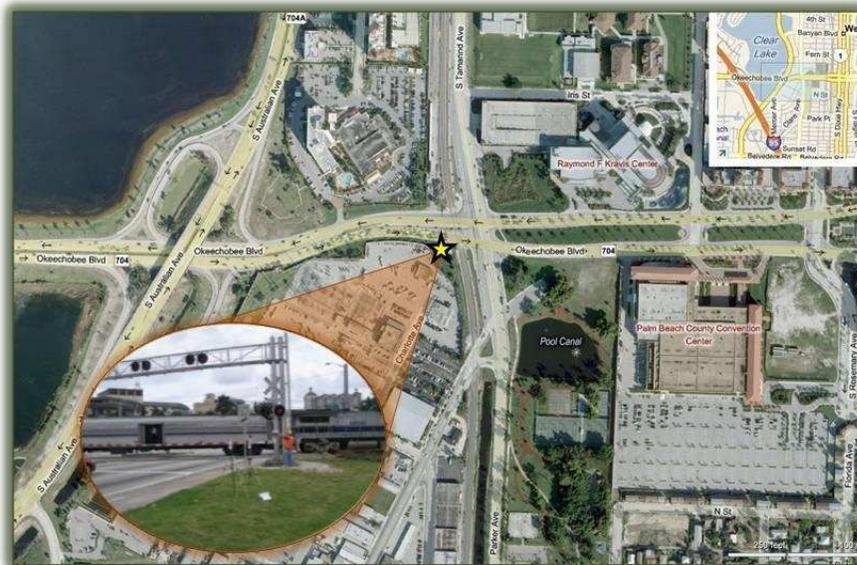


Figure 4 – West Palm Beach FEC Corridor – Mainline

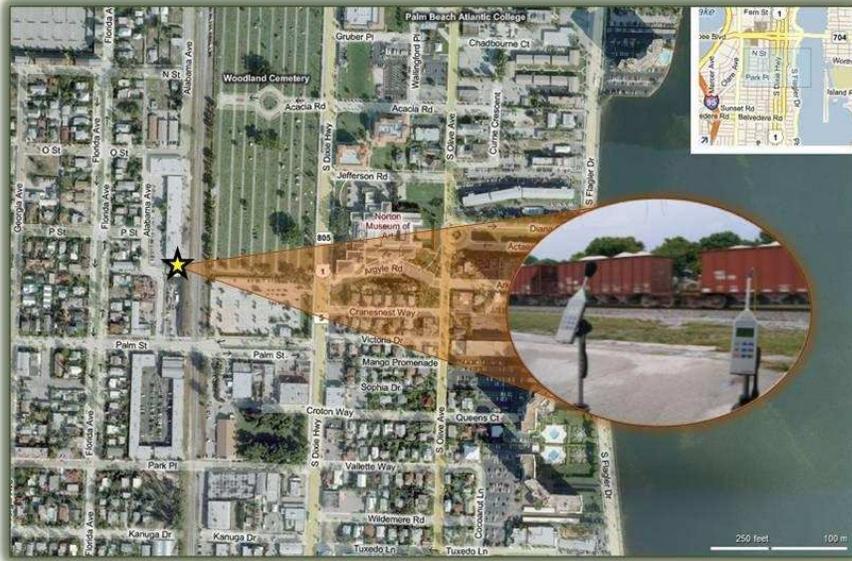
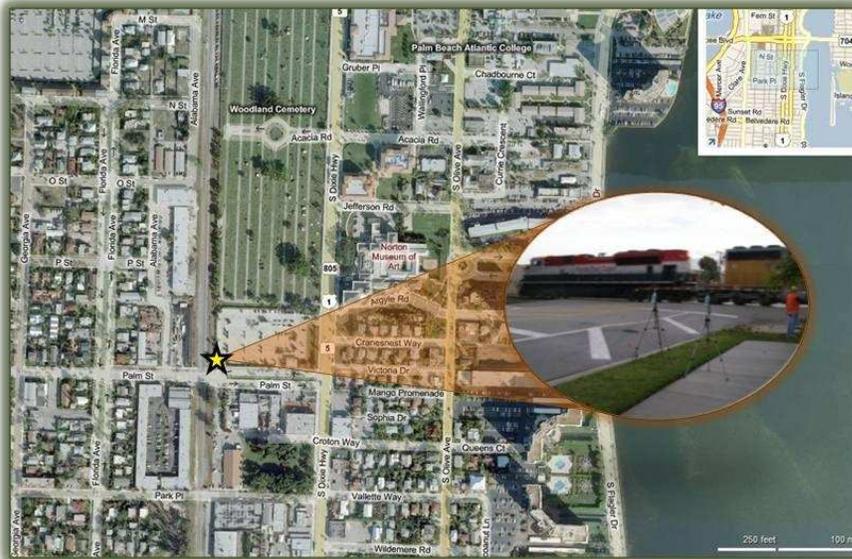


Figure 5 – West Palm Beach FEC Corridor – Track Crossing



2.3 Indiantown Amtrak High Speed Mainline / Track Crossing

Existing noise and vibration measurements were recorded at 17650 SW SR 710, Indiantown, Florida. This location on SR 710 is midway between the West Palm Beach Amtrak Station and the Okeechobee City Amtrak Station. For the purposes of the assessment, high speed Amtrak noise and vibration measurements were recorded at the mainline track / track crossing location. This track location currently serves Amtrak Passenger Trains 98, 92, 91, and 97. The Indian Town Amtrak High Speed Mainline Noise and Vibration Measurement Locations are shown in **Figure 6**.

Figure 6 – Indiantown Amtrak High Speed – Mainline / Track Crossing



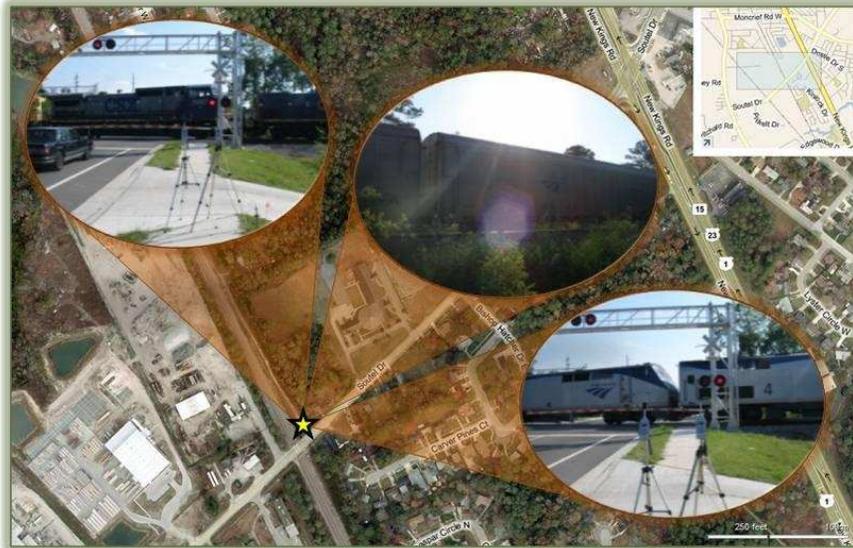
2.4 Vero Beach FEC High Speed Mainline

Existing noise and vibration measurements were recorded at the Vero Beach FEC high speed mainline located on N. Old Dixie Highway between Walton Road and Michigan Street, Vero Beach, Florida. At this location, there is a single track which currently serves the existing freight train operations which mostly occur at night. For the purposes of the assessment, noise and vibration measurements were recorded at the mainline track. The Vero Beach FEC High Speed Mainline Noise and Vibration Measurement Locations are shown in **Figure 7**.

2.5 Jacksonville Amtrak and FEC Double Track Mainline / Track Crossing

Existing noise and vibration measurements were recorded at 5863 Soutel Drive, Jacksonville, Florida. This location is located approximately 2.5 miles north of the Jacksonville Amtrak Station. At this location, there is a double track which is shared by the Amtrak Passenger Trains and the FEC freight trains. This track location currently serves Amtrak Passenger Trains 98, 92, 91, and 97. This location also serves the FEC freight train operations which mostly occur at night. The Jacksonville Amtrak and FEC Double Track Noise and Vibration Measurement Locations are shown in **Figure 8 and 9**.

Figure 9 – Jacksonville Amtrak and FEC Double Track – Track Crossing



3.0 MEASUREMENT OF EXISTING NOISE CONDITIONS

3.1 Methodology

The Federal Railroad Administration (FRA) has established specific guidelines for the assessment of transit noise projects which is contained in the guidance document titled “High Speed Ground Transportation Noise and Vibration Impact Assessment”, dated October 2005. The purpose of this noise assessment is to supplement the findings contained in the Programmatic Environmental Assessment dated October 1, 2009. The primary goal of this assessment is to determine if there will be a noise impact from the addition of four Amtrak Passenger Trains on the existing FEC Corridor. The FEC Corridor currently operates 24 freight trains daily, with most service at night. The Amtrak Passenger Trains currently operate during the daytime hours, with the exception of the Jacksonville Amtrak Station which has nighttime passenger train service, making a total of four daily trips between Miami and Jacksonville, Florida. For the purposes of this assessment, it has been determined that both daytime and nighttime noise impacts could occur for the proposed Amtrak Passenger Train service on the FEC Corridor.

The FRA guidelines suggest the following methodology components for new projects:

Existing Conditions

- Identification of noise sensitive receivers in the vicinity of the project.
- Estimate the existing noise exposure

The guidelines for noise measurements to characterize existing noise exposure for both residential and non residential land uses include:

- For non-residential land uses, noise measurements should be 30-60 minutes in duration and should take place on at least two non successive weekdays.
- For residential land uses, noise measurements are to take place over a full 24 hours at the receiver for one or more weekday periods when nighttime impacts are expected to occur. If only daytime impacts are expected to occur, single hourly noise measurements can be used in the assessment. The hourly noise measurements recorded were estimated to predict the 24 hour noise level following the procedures in the FTA Manuel which is presented below.
- Use judgment in positioning the measurement microphone
- Undertake all measurements in accordance with good engineering practice, following the guidelines contained in ASTM and ANSI Standards.

The noise measurements should be recorded during the hour of the day when the transit events are expected to be at a maximum (worst case condition for the transit events.)

The existing condition noise measurements were taken over a full hour at each measurement location during the noisiest hour of transit-related activity during hours of noise sensitivity and the approximate 24 hour noise level was estimated using the procedures contained in the "Transit Noise and Vibration Impact Assessment", dated May 2006. (Appendix D – Determining Existing Noise).

The procedure is used to convert the measured hourly L_{eq} to L_{dn} with the applicable equation:

- For measurements between 7am and 7pm: $L_{dn} = L_{eq} - 2$
- For measurements between 7pm and 10pm: $L_{dn} = L_{eq} + 3$
- For measurements between 10pm and 7am: $L_{dn} = L_{eq} + 8$

The measurement sites selected for the Amtrak Passenger Train service were 70 feet from the SFRC railway centerline near the West Palm Beach and Jacksonville Amtrak Stations and the Indiantown High Speed Mainline Location. The measurement sites selected for the FEC Corridor freight train operations were 70 feet from the railway centerline near the West Palm Beach and Jacksonville, FEC Corridor and the Vero Beach, Florida High Speed Mainline Location.

Based upon the data presented in the Programmatic Environmental Assessment, dated October 1, 2009, the potential areas of moderate impacts, when measured from the FEC Railway centerline, is 66 feet for land uses with nighttime sensitivity and 91 feet for land uses where quiet is important. For the purposes of the noise assessment, a distance of 70 feet from the nearest railway centerline was selected in order to determine the noise level differences and impacts from the Amtrak Passenger Trains and the FEC Corridor freight trains. At this distance, there was better probability of establishing a noise impact, from the transit sources, without the influence of other noise sources from the surrounding areas. The Measurement Locations for the Existing Noise and Vibration Conditions are presented in **Table 1**.

Table 1			
Measurement Locations for the Existing Noise and Vibration Conditions			
Site Location	Transit Event	Railway Centerline Distance (Ft.)	Site Reference
WPB Amtrak Station	Passenger Train	70	Figure 2,3
WPB FEC Corridor	Freight Train	70	Figure 4,5
Indiantown Amtrak Mainline	Passenger Train	70	Figure 6
Vero Beach FEC Mainline	Freight Train	70	Figure 7
Jacksonville Amtrak Mainline	Passenger Train	70	Figure 8,9
Jacksonville FEC Mainline	Freight Train	70	Figure 8,9

3.2 Equipment Specifications

The noise measurement procedures utilized in the noise assessment are presented below and represent the general procedures used for the purposes of the recorded measurement of noise:

- The instrumentation was calibrated before and after each series of measurements with the manufacturer’s specified calibrator.
- The instrumentation and the manufacturer’s specified calibrator received an annual calibration by the manufacturer’s authorized representative.
- The instruments wind screen was properly fitted on the instruments microphone.
- The instrumentation was properly fitted on the instrument tri-pod and was positioned approximately five feet above the ground surface and away from obstructions and reflective surfaces.
- The instruments batteries were changed daily or as necessary.

Noise measurements were recorded for a one hour period and represented the $L_{eq(h)}$ noise metric. All noise measurements were reported in whole numbers, decibels, A-weighted, so as not to imply a level of accuracy that is not attainable. Each hourly noise measurement represented the hour of maximum transit noise exposure and is used for land uses involving daytime activities. The Noise and Vibration Measurement Instrumentation is presented in **Table 2**. The Noise and Vibration Monitoring Equipment is presented in **Appendix B**.

Table 2				
Noise and Vibration Measurement Instrumentation				
Instrument Type	Manufacturer	Serial #	Annual Calibration	Calibration Laboratory
SC310 Type 1 SLM / RTA (NOISE)	CESVA	T219252	2/19/2010	SCANTEK, INC.
PA13 Preamplifier (NOISE)	CESVA	1095	2/19/2010	SCANTEK, INC.
C130 Microphone (NOISE)	CESVA	8160	2/19/2010	SCANTEK, INC.
CB-5 Calibrator (NOISE)	CESVA	033195	9/8/2009	SCANTEK, INC
SC310 Type 1 SLM / RTA (VIBRATION)	CESVA	T220298	9/18/2009	SCANTEK, INC.
PA1001 Preamplifier (VIBRATION)	CESVA	211	5/23/2010	SCANTEK, INC.
WILCOXON RESEARCH VELOCITY TRANSDUCER (VIBRATION)	WILCOXON	10755	5/23/2010	SCANTEK, INC.

3.3 Meteorological Conditions

The meteorological conditions were recorded for each series of measurements or measurement periods. A summary of the meteorological conditions recorded during the noise and vibration assessment is presented in **Table 3**.

Table 3				
Meteorological Conditions				
Site Location	Date / Time	Temperature	Relative Humidity	Wind Speed
WPB Amtrak Station # 98 Mainline Track Site	6/6/10 10:00-11:00am	88 °F	29.86 in.	< 1 mph
WPB Amtrak Station # 92 Mainline Track Site	6/6/10 1:10-2:10pm	93 °F	29.83 in.	2-3 mph
WPB Amtrak Station # 91 Track Crossing Site	6/6/10 3:50-4:50pm	93 °F	29.80 in.	4-5 mph
WPB Amtrak Station # 97 Track Crossing Site	6/6/10 5:00- 6:00pm	89 °F	29.77 in.	4-5 mph
WPB FEC Corridor Track Crossing Site	6/3/10 7:03-8:03pm	76 °F	29.78 in.	< 1 mph
WPB FEC Corridor Track Crossing Site	6/3/10 8:25-9:25pm	76 °F	29.79 in.	< 1 mph
WPB FEC Corridor Track Crossing Site	6/3/10-6/4/10 11:13pm- 12:13am	73 °F	29.80 in.	3-4 mph
WPB FEC Corridor Track Crossing Site	6/4/10 12:20- 1:20am	73 °F	29.80 in.	3-4 mph
WPB FEC Corridor Mainline Site	6/4/10 7:00-8:00pm	78 °F	29.80 in.	< 1 mph
WPB FEC Corridor Mainline Site	6/4/10 10:00-11:00pm	73 °F	29.86 in.	< 1 mph
WPB FEC Corridor Mainline Site	6/4/10-6/5/10 11:05pm- 12:05am	73 °F	29.86 in.	< 1 mph
WPB FEC Corridor Mainline Site	6/5/10 12:20- 1:20am	73 °F	29.86 in.	< 1 mph

Table 3				
Meteorological Conditions				
Site Location	Date / Time	Temperature	Relative Humidity	Wind Speed
Amtrak Indiantown # 98 Mainline Track Site – HS	6/7/10 11:02am- 12:02pm	89 °F	29.81 in.	< 1 mph
Amtrak Indiantown # 92 Mainline Track Site – HS	6/7/10 1:27-2:27pm	92 °F	29.80 in.	2-3 mph
Amtrak Indiantown # 91/97 Mainline Track Site – HS	6/7/10 3:50-4:50pm	89 °F	29.77 in.	1-2 mph
FEC Corridor-Vero Beach Mainline Track Site – HS	6/8/10 6:29-7:29pm	86 °F	29.87 in.	3-5mph
FEC Corridor-Vero Beach Mainline Track Site – HS	6/8/10 10:37-11:37pm	75 °F	29.91 in.	1-2 mph
Amtrak Jacksonville # 98 Track Crossing Site – HS	6/9/10 5:00-6:00pm	92 °F	29.91 in.	2-3 mph
Amtrak Jacksonville #52 Track Crossing Site – HS	6/9/10 6:36-7:36pm	84 °F	29.89 in.	3-4 mph
Amtrak Jacksonville # 92 Track Crossing Site – HS	6/9/10 10:38-11:38pm	75 °F	29.95 in.	1-2 mph
Amtrak Jacksonville #53 Mainline Track Site – HS	6/10/10 5:05-6:05am	68 °F	29.87 in.	< 1 mph
Amtrak Jacksonville #91 Mainline Track Site – HS	6/10/10 6:15-7:15am	68 °F	29.87 in.	< 1 mph
Amtrak Jacksonville #97 Mainline Track Site – HS	6/10/10 9:00-10:00am	75 °F	29.91 in.	1-2 mph
FEC Corridor Jacksonville Track Crossing Site – HS	6/9/10 8:35-9:35pm	78 °F	29.89 in.	3-4 mph
FEC Corridor Jacksonville Mainline Track Site – HS	6/10/10 8:00-9:00pm	69 °F	29.89 in.	< 1 mph

3.4 Field Measurement Data

The Summary of the Existing Noise Levels for the Amtrak Passenger Trains is presented in **Table 4**. The Summary of the Existing Noise Levels for the FEC Corridor Freight Trains is presented in **Table 5**. The measured noise levels in this assessment were established at a distance of 70 feet from the existing study corridor. The data presented for the noise assessment has evaluated the existing transit noise levels from the Amtrak Passenger Trains under the following conditions:

- Mainline approach and departure from the Amtrak Station
- Track crossing approach and departure from the Amtrak Station
- High speed mainline approach and departure from the Amtrak Station
- Horn noise from the Amtrak Passenger Trains during approach and departure from the Amtrak Station at Jacksonville and Indiantown only. There was no train horn in West Palm Beach.

The data presented for the noise assessment has evaluated the existing transit noise levels from the FEC Corridor Freight Trains under the following conditions:

- Mainline track approaching the track crossing
- Track crossing locations
- High speed mainline locations
- Horn noise from the FEC Corridor freight trains on approach to the track crossing

3.5 Interpretation of Measurement Data

The Summary of the Existing Noise Levels for the Amtrak Passenger Trains is presented in **Table 4** and provides the basis for establishing the ambient noise conditions during the noisiest hour of transit-related activity during hours of noise sensitivity.

West Palm Beach Amtrak Station existing condition noise levels are shown below and were measured using the $L_{eq(h)}$ noise metric:

- Mainline Train: 68 to 71** dBA (Table 4, Transit Event 3N), **includes one Tri-Rail train event + horn
- Track Crossing Train: 69** dBA (Table 4, Transit Event 4N), **includes one Tri-Rail train event + horn

Jacksonville Amtrak Station existing condition noise levels are shown below and were measured using the $L_{eq(h)}$ noise metric:

- Mainline Train: 67 to 69 dBA (Table 4, Transit Event 8N), 73 dBA for 2 additional transit events (2 Freight Trains)
- Track Crossing Train: 79 to 81*** dBA (Table 4, Transit Event 7N), for 5 additional transit events (5 Freight Trains)

Indiantown Amtrak High Speed Rail existing condition noise levels are shown below and were measured using the $L_{eq(h)}$ noise metric:

- **Mainline / Track Crossing Train: 69 to 71 dBA (Table 4, Transit Event 10N, 11N), 70 dBA for 2 transit events**

Note: The Amtrak Passenger Trains in West Palm Beach, Florida did not blow the train horn during the transit noise measurement period. The City of West Palm Beach has signs posted that state no train horn. The Amtrak Passenger Trains in Indiantown and Jacksonville did blow the horn upon approach to the track crossing and the station.

The Summary of the Existing Noise Levels for the FEC Corridor Freight Trains is presented in **Table 5** and provides the basis for establishing the ambient noise conditions during the noisiest hour of transit-related activity during hours of noise sensitivity.

West Palm Beach FEC Freight Train Corridor existing condition noise levels are shown below and were measured using the $L_{eq(h)}$ noise metric:

- **Mainline Train: 71 to 72 dBA (Table 5, Transit Event 19N) , 75 dBA for 2 transit events**
- **Track Crossing Train: 71 to 74 dBA (Table 5, Transit Event 18N), 76 dBA for 2 transit events**

Jacksonville FEC Freight Train Corridor existing condition noise levels are shown below and were measured using the $L_{eq(h)}$ noise metric:

- **Mainline Train: 73** to 77 dBA (Table 5, Transit Event 15N) for 4 transit events**
****includes one Amtrak Passenger Train + horn**
- **Track Crossing Train: 76 to 81** dBA (Table 5, Transit Event 14N), for 6 transit events**includes three Amtrak Passenger Trains + horn**

Vero Beach High Speed Rail existing condition noise levels are shown below and were measured using the $L_{eq(h)}$ noise metric:

- **Mainline Train: 68 to 70 dBA (Table 5, Transit Event 21N)**

4.0 PREDICTIONS OF NOISE FROM THE PROJECT

The general methodology prescribed for the prediction of the existing and future noise levels from new or proposed railway projects was derived from the FRA Manual and is summarized below:

- For residential land uses, the noise measurements are to be recorded over a full 24 hour period for one or more weekday periods (generally between Monday morning and Friday afternoon) when nighttime noise impacts are to be considered. If only daytime noise impacts are to be considered, single hourly noise measurements can be substituted for the 24 hour measurements. The single hourly noise measurements have also been converted to the estimated 24 hour noise level as described in Section 3.1 of the report.

- The existing and future noise levels that are expected from the proposed improvements were documented with field measurements using the procedures described above and was verified to be consistent with the computer predicted noise levels that were generated for the existing and future project conditions. The computer predicted noise levels were generated using the Federal Transit Administration (FTA) Noise Model (Create Rail Noise Model) for the Amtrak Passenger Trains which travel at speeds of up to 79 mph under the existing conditions and at speeds of up to 90 mph under the proposed conditions.
- The Federal Transit Administration (FTA) Noise Model (Create Rail Noise Model) generates the predicted transit event noise levels based upon user input data. The input data includes the following: land use input (Category 1,2, or 3), reference train source derived from the source reference list, number of diesel locomotives and passenger trains per hour during the daytime and nighttime hours, train speeds, distance to the receiver point, train wheel conditions, track conditions, aerial structures present, barriers present, and intervening rows of buildings present.

Under the proposed conditions, the Amtrak Passenger Trains would share the FEC Corridor during the daytime and nighttime hours and the FEC Corridor freight trains would generally operate during the nighttime hours with the possibility of daytime freight train operations.

The Summary of the Predicted Noise Exposure Levels of the Amtrak Passenger Trains on the FEC Corridor is presented in **Table 6** and provides the basis for establishing the future predicted ambient noise conditions during the noisiest hour of transit-related activity during hours of noise sensitivity. The Existing Amtrak and FEC Railway Track Conditions are presented in **Appendix C**.

At the Jacksonville locations, both the Amtrak Passenger Trains and the FEC freight trains included train horn noise in all the measured transit events.

The future predicted condition noise levels for the West Palm Beach measurement location for the Amtrak Passenger Trains and the FEC Corridor freight trains are shown below and were calculated using the $L_{eq(h)}$ noise metric:

- Mainline Amtrak Passenger Train: 68 to 71** dBA, **includes one Tri-Rail train event + horn
 - Mainline FEC Corridor Freight Train: 71 to 72 dBA, for a single FEC Train event
Amtrak Passenger Train noise levels were lower than freight noise levels by 1 to 3 dBA
 - Track Crossing Amtrak Passenger Train: 69** dBA, includes one Tri-Rail train event + horn
 - Track Crossing FEC Corridor Freight Train: 73 to 74 dBA, for a single FEC Train event
Amtrak Passenger Train noise levels were lower than freight noise levels by 4 to 5 dBA
-

The future predicted condition noise levels for the Jacksonville measurement location for the Amtrak Passenger Trains and the FEC Corridor freight trains are shown below and were calculated using the $L_{eq(h)}$ noise metric:

- Mainline Amtrak Passenger Train: 69 dBA
- Mainline FEC Corridor Freight Train: 72 dBA, for a single FEC Train event (West Palm Beach Location)

Amtrak Passenger Train noise levels were lower than freight noise levels by 3 dBA

- Mainline Amtrak Auto & Passenger Train: 67 dBA
- Mainline FEC Corridor Freight Train: 72 dBA, for a single FEC Train event (West Palm Beach Location)

Amtrak Passenger Train noise levels were lower than freight noise levels by 5 dBA

The future predicted condition noise levels for the Indiantown High Speed Rail measurement location for the Amtrak Passenger Trains and the Vero Beach High Speed Rail measurement location for the FEC Corridor freight trains are shown below and were calculated using the $L_{eq(h)}$ noise metric:

- Mainline Amtrak Passenger Train: 71 dBA
- Mainline FEC Corridor Freight Train: 70 dBA, for a single FEC Train event

Amtrak Passenger Train noise levels were higher than freight noise levels by 1 dBA

- Mainline Amtrak Passenger Train: 69 dBA
- Mainline FEC Corridor Freight Train: 70 dBA, for a single FEC Train event

Amtrak Passenger Train noise levels were lower than freight noise levels by 1 dBA

- Mainline Amtrak Passenger Train: 70 dBA, 2 Amtrak Passenger Trains in one hour
- Mainline FEC Corridor Freight Train: 70 dBA, for a single FEC Train event

Amtrak Passenger Train noise levels were the same as freight noise levels

The assessment presented above is relative to the noise level difference between the Amtrak Passenger Trains and the FEC Corridor freight trains. The potential noise impacts from the proposed project will take into account that there will be four additional daily transit events from the Amtrak Passenger Trains on the study corridor. The addition of the four Amtrak Passenger Trains will result in an increase in transit noise on the proposed study corridor and will generate four additional moderate to severe noise impacts daily; however, the impacts are not expected to generate a significant increase in noise since there are already up to 24 freight trains

operating on the study corridor, mostly during the nighttime hours. There are occasions where the freight trains will operate during the daytime hours and would generally produce higher noise levels than the Amtrak Passenger Trains.

Overall, the Amtrak Passenger Trains generate up to 5 dBA less noise than the FEC Corridor freight trains with the exception of the higher speed Amtrak transit events which will produce up to 1 dBA more noise than the FEC Corridor freight trains. Currently, the Amtrak Passenger Trains operate at speeds of up to 79 mph.

The proposed high speed Amtrak Passenger Trains will operate at speeds of up to 90 mph and will not produce any additional noise impacts for single hourly events when compared to the similar FEC Corridor freight train events that were evaluated. However, for the case of two high speed Amtrak Passenger Trains traveling in the same hour, an additional noise impact of 2 dBA can be expected when compared to a single FEC Corridor freight train event and a 3 dBA decrease in the noise level can be expected when compared to two FEC Corridor freight train events in the same hour (WPB FEC Transit Event 19 N – 75 dBA).

The Federal Transit Administration (FTA) Noise Model (Create Rail Noise Model) was utilized to produce the predicted noise levels for the high speed Amtrak Passenger Trains, which are expected to operate at speeds of up to 90 mph. The Summary of the FTA Rail Noise Model Predicted Results is presented in **Table 7**.

Table 4
Summary of Existing Noise Levels for the Amtrak Passenger Trains

Transit Event Number	Transit Event Location	Transit Event ID / Sound File #	Measurement Period	Measured Noise Levels (dBA) Decibels A-Weighted Class 1 SLM – CESVA SC 310		Description of Acoustical Transit Event
				Leq(h) (Measured)	Ldn (Estimated)*	
1N	WPB Amtrak Station	Ambient - 001	1:00:12	68	66	Mainline Track - Local traffic from Tamarind Avenue
2N	WPB Amtrak Station	Ambient - 003	1:00:02	68	66	Track Crossing - Local traffic from Okeechobee Blvd.
3N	WPB Amtrak Station	ML Train # 98-000	1:00:02	68**	66**	Mainline Track (NB) – 2 Engines + 10 Cars, 19 mph - No Horn
		ML Train # 92-002	1:00:03	71**	69**	Mainline Track (NB) – 2 Engines + 9 Cars, 15 mph – No Horn
4N	WPB Amtrak Station	CR Train # 91-004	1:00:03	69**	67**	Track Crossing (SB) – 2 Engines + 10 Cars, 15 mph – No Horn
		CR Train # 97-005	1:00:02	69**	67**	Track Crossing (SB) – 2 Engines + 10 Cars, 21 mph – No Horn
5N	JAX Amtrak Station	Ambient - 005	00:55:49	61	69	Track Crossing - Local traffic from Soutel Drive + FEC Yard
6N	JAX Amtrak Station	Ambient- 007	1:00:02	44	52	Mainline Crossing - Local traffic from Soutel Drive +FEC Yard
7N	JAX Amtrak Station	CR Train # 98-000	1:00:02	79***	77***	Track Crossing (NB) – 2 Engines + 12 Cars, 16 mph + Horn
		CR Train # 92-004	1:00:02	79***	87***	Track Crossing (NB) – 2 Engines + 10 Cars, 20 mph + Horn
		CR Train # 52-002	1:00:03	81***	79***	Track Crossing (NB) – 2 Engines + 56 Cars, 16 mph + Horn
8N	JAX Amtrak Station	ML Train # 91-007	1:00:02	69	77	Mainline Track (SB) – 2 Engines + 14 Cars, 21 mph + Horn
		ML Train # 97-009	1:00:01	73***	71***	Mainline Track (SB) – 2 Engines + 14 Cars, 71 mph + Horn
		ML Train # 53-006	1:00:02	67	75	Mainline Track (SB) – 2 Engines + 52 Cars, 40 mph + Horn
9N	Amtrak HS-ML	Ambient - 002	1:00:03	61	59	Mainline Track - Local traffic from SR 710
10N	Amtrak HS-ML	ML Train # 98-000	1:00:03	71	69	Mainline Track (NB) – 2 Engines + 11 Cars, 71 mph + Horn
		ML Train # 92-001	1:03:49	69	67	Mainline Track (NB) – 2 Engines + 9 Cars, 71 mph + Horn
11N	Amtrak HS-ML	ML Train # 91-003	1:00:06	70	68	Mainline Track (SB) – 3 Engines + 9 Cars, 72 mph + Horn
		ML Train # 97-003				Mainline Track (SB) – 2 Engines + 10 Cars, 72 mph + Horn

** Hourly ambient sound level includes Tri-Rail Transit Events, *** Hourly ambient sound level includes FEC Transit Events

Table 5 Summary of Existing Noise Levels for the FEC Corridor Freight Trains						
Transit Event Number	Transit Event Location	Transit Event ID / Sound File #	Measurement Period	Measured Noise Levels (dBA) Decibels A-Weighted Class 1 SLM – CESVA SC 310		Description of Acoustical Transit Event
				Leq(h) (Measured)	Ldn (Estimated)*	
12N	JAX FEC -TC	Ambient – 005	00:55:49	61	69	Local traffic from Soutel Drive + FEC Train Yard
13N	JAX FEC -ML	Ambient – 007	1:00:02	44	52	Local traffic from Soutel Drive + FEC Train Yard
14N	JAX FEC - TC	CR Train -000	1:00:02	79**	77**	Track Crossing (SB) – 4 Engines + 154 Cars, 15 mph + Horn
		CR Train -002				Track Crossing (NB) – 2 Engines + 26 Cars, 20 mph + Horn
		CR Train -002	1:00:03	81**	79**	Track Crossing (NB) – 2 Engines + 37 Cars, 35 mph + Horn
		CR Train -002				Track Crossing (SB) – 5 Engines, 36 mph + Horn
		CR Train -003				Track Crossing (NB) – 2 Engines + 130 Cars, 24 mph + Horn
		CR Train -003	1:00:05	76	79	Track Crossing (NB) – 2 Engines + 71 Cars, 22 mph + Horn
		CR Train -004	1:00:02	79**	87**	Track Crossing (NB) – 1 Engine + 78 Cars, 05 mph + Horn
15N	JAX FEC ML	ML Train-008				Mainline Track (NB) -2 Engines, 37 mph + Horn
		ML Train-008	1:01:16	77	75	Mainline Track (SB) – 4 Engines + 115 Cars, 22 mph + Horn
		ML Train-009				Mainline Track (NB) – 1 Engine + 101 Cars, 25 mph + Horn
		ML Train-009	1:00:01	73**	71**	Mainline Track (NB) – 1 Engine + 98 Cars, 26 mph + Horn
16N	WPB FEC - TC	Ambient-002	1:00:02	52	55	Local traffic from Dixie Highway
17N	WPB FEC - ML	Ambient-003	1:00:03	48	56	Local traffic from Dixie Highway
18N	WPB FEC - TC	CR Train –000	1:00:01	74	77	Track Crossing (SB) – 2 Engines + 133 Cars, 43 mph + Horn
		CR Train –001	1:00:04	73	76	Track Crossing (NB) – 3 Engines + 154 Cars, 42 mph + Horn
		CR Train –003	1:01:38	71	79	Track Crossing (SB) – 2 Engines + 79 Cars, 39 mph + Horn
		CR Train –004	1:01:01	76	84	Track Crossing (NB) – 2 Engines + 121 Cars, 30mph + Horn
						Track Crossing (SB) – 2 Engines + 106 Cars, 40mph + Horn
19N	WPB FEC - ML	ML Train –000	1:00:03	71	74	Mainline Track (NB) – 3 Engines + 182 Cars, 37 mph + Horn
		ML Train –002	1:00:06	72	80	Mainline Track (SB) – 2 Engines + 149 Cars, 39 mph + Horn
		ML Train –004	1:00:03	75	83	Mainline Track (NB) – 2 Engines + 136 Cars, 30 mph + Horn
						Mainline Track (SB) – 2 Engines + 186 Cars, 38mph + Horn
20N	FEC HS-ML	Ambient - 001	1:00:08	60	63	Local traffic from Indian River Drive
		Ambient - 002	1:00:03	55	58	Local traffic from Indian River Drive
21N	FEC HS-ML	ML Train - 000	1:00:01	68	66	Mainline Track (SB) – 2 Engines + 120 Cars, 40 mph + Horn
		ML Train - 003	1:00:03	70	78	Mainline Track (SB) – 2 Engines + 189 Cars, 49 mph + Horn

** Hourly ambient sound level includes Amtrak Transit Events

Table 6
Summary of the Predicted Noise Exposure Levels of the Amtrak Passenger Trains on the FEC Corridor
Predicted Future Conditions

Transit Event Location	Type of Transit Event ML=Mainline Train CR= Track Crossing Train HS=Higher Speed	Amtrak Passenger Cars Measured Noise Levels (dBA)		FEC Freight Trains Measured Noise Levels (dBA)		Noise Level Difference Amtrak vs. FEC Freight Trains (dBA) Impact Y/N	
		Leq(h) (Measured)	Ldn (Estimated)*	Leq(h) (Measured)	Ldn (Estimated)*	Leq(h) (Measured)	Ldn (Estimated)*
WPB Amtrak Station	ML Train # 98-000	68**	66**	71	74	3/N	8/N
	ML Train # 92-002	71**	69**	72	80	1/N	11/N
WPB Amtrak Station	CR Train # 91-004	69**	67**	74	77	5/N	10/N
	CR Train # 97-005	69**	67**	73	76	4/N	9/N
JAX Amtrak Station	CR Train # 98-000	79***	77***				
	CR Train # 92-004	79***	87***				
	CR Train # 52-002	81***	79***				
JAX Amtrak Station	ML Train # 91-007	69	77	72	80	3/N	3/N
	ML Train # 97-009	73***	71***				
	ML Train # 53-006	67	75	72	80	5/N	5/N
Amtrak HS-ML	ML Train # 98-000	71	69	70	78	1/Y	9/N
	ML Train # 92-001	69	67	70	78	1/N	11/N
2 Amtrak Trains	ML Train # 91-003	70	68	70	78	0/N	10/N
	ML Train # 97-003						
WPB FEC - TC	CR 1-Train -000			74	77		
	CR 1-Train -001			73	76		
WPB FEC - ML	ML 1-Train -000			71	74		
	ML 1-Train -002			72	80		
JAX FEC - TC	CR 1-Train -000			79****	77****		
	CR 3-Trains -002			81****	79****		
	CR 1-Train -004			79****	87****		
JAX FEC - ML	ML 2-Trains-009			73****	71****		
FEC HS-ML	ML Train - 003			70	78		

Notes: **Amtrak noise levels include Tri-Rail Trains for WPB Station

*** Amtrak noise levels include FEC Trains for Jacksonville Station **** FEC noise levels include Amtrak Trains for Jacksonville Station

Table 7
Summary of High Speed Noise Levels for the Amtrak Passenger Trains
FTA Rail Noise Model Predicted Results

Transit Event Number	Transit Event Location	Transit Event ID / Sound File #	Measurement Period	Computer Predicted Noise Levels (dBA) Decibels A-Weighted Category 2 Land Use FTA Rail Noise Model		Description of Acoustical Transit Event
				Leq(h) (Predicted)	Ldn (Predicted)	
3N	WPB Amtrak Station	ML Train # 92-002 ML Train # 92-002	1:00:03	71* / 69 68	78* / 76 75	Mainline Track (NB) – 2 Engines + 9 Cars, 15 mph – No Horn Mainline Track (NB) – 2 Engines + 9 Cars, 90 mph
4N	WPB Amtrak Station	CR Train # 97-005 CR Train # 97-005	1:00:02	69* / 69 69	76* / 76 75	Track Crossing (SB) – 2 Engines + 10 Cars, 21 mph – No Horn Track Crossing (SB) – 2 Engines + 10 Cars, 90 mph
8N	JAX Amtrak Station	ML Train # 91-007 ML Train # 91-007	1:00:02	69* / 69 70	76* / 76 76	Mainline Track (SB) – 2 Engines + 14 Cars, 21 mph + Horn Mainline Track (SB) – 2 Engines + 14 Cars, 90 mph
		ML Train # 97-009 ML Train # 97-009	1:00:01	73* / 68 70	80* / 75 76	Mainline Track (SB) – 2 Engines + 14 Cars, 71 mph + Horn Mainline Track (SB) – 2 Engines + 14 Cars, 90 mph
10N	Amtrak HS-ML	ML Train # 98-000 ML Train # 98-000	1:00:03	71* / 68 69	77* / 74 75	Mainline Track (NB) – 2 Engines + 11 Cars, 71 mph + Horn Mainline Track (NB) – 2 Engines + 11 Cars, 90 mph
11N	Amtrak HS-ML	ML Train # 91-003 ML Train # 97-003 ML Train # 91-003 ML Train # 97-003	1:00:06	70* / 71 72	76* / 77 78	Mainline Track (SB) – 3 Engines + 9 Cars, 72 mph + Horn Mainline Track (SB) – 2 Engines + 10 Cars, 72 mph + Horn Mainline Track (SB) – 3 Engines + 9 Cars, 90 mph Mainline Track (SB) – 2 Engines + 10 Cars, 90 mph

* Hourly Field Measured Noise Level and Estimated 24 Hour Noise Level

4.1 Noise Contours for the Existing Amtrak Passenger Trains

The Noise Contours for the Existing Amtrak Passenger Trains are presented in **Figures 10-14**. The noise contours for this assessment were produced at a distance of 70 feet from the centerline of the closest railway track. At this distance, the noise levels for each noise contour are as follows:

- West Palm Beach Amtrak Station - Mainline - 68-71 dBA.
- West Palm Beach Amtrak Station - Track Crossing - 69 dBA.
- Jacksonville Amtrak Station - Mainline - 67-69 dBA.
- Jacksonville Amtrak Station - Track Crossing - 79-81 dBA.
- Indiantown - High Speed Mainline - 69-71 dBA.

Figure 10 – West Palm Beach Amtrak Station – Mainline 68-71 dBA



Figure 11 – West Palm Beach Amtrak Station – Track Crossing 69 dBA

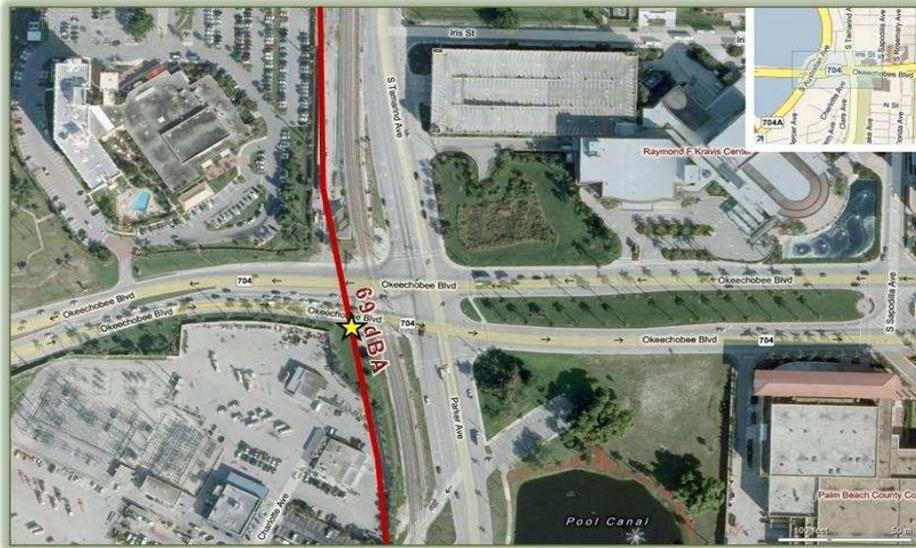


Figure 12 – Jacksonville Amtrak Station – Mainline 67-69 dBA



4.2 Noise Contours for the Existing FEC Train Corridor

The Noise Contours for the Existing FEC Train Corridor are presented in **Figures 15-19**. The noise contours for this assessment were produced at a distance of 70 feet from the centerline of the closest railway track. At this distance, the noise levels for each noise contour are as follows:

- West Palm Beach FEC Train Corridor– Track Crossing - 71-76 dBA.
- West Palm Beach FEC Train Corridor – Mainline - 71- 75 dBA.
- Jacksonville FEC Train Corridor – Track Crossing - 76 dBA.
- Jacksonville FEC Train Corridor – Mainline - 77 dBA.
- Vero Beach FEC Train Corridor -- High Speed Mainline - 68-70 dBA.

Figure 15 – West Palm Beach FEC Train Corridor – Track Crossing 71-76 dBA

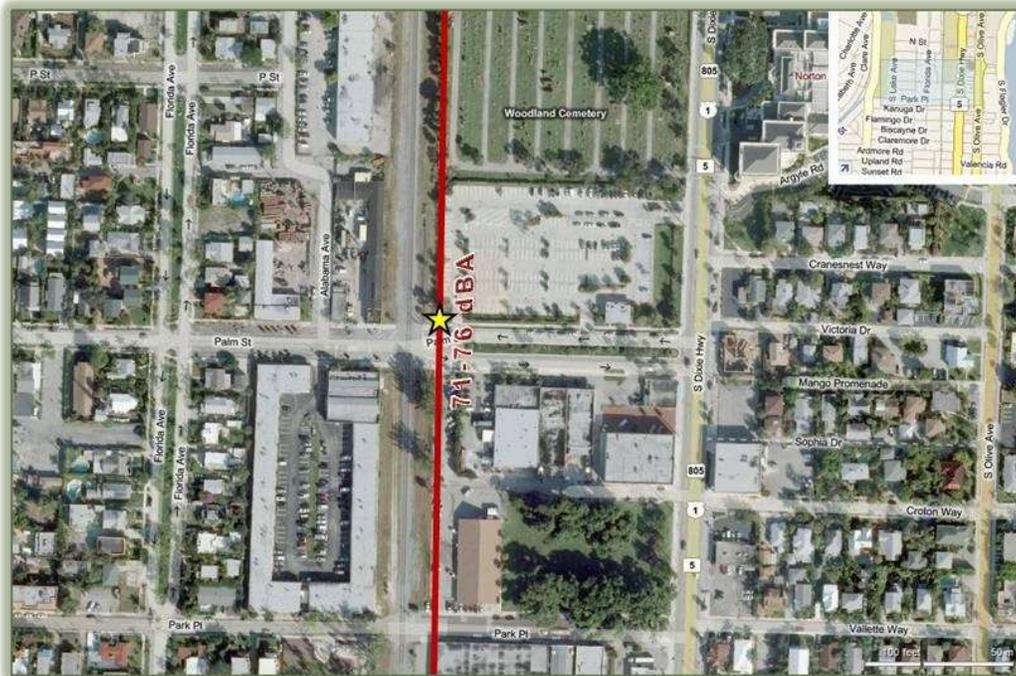


Figure 16 – West Palm Beach FEC Train Corridor – Mainline 71-75 dBA

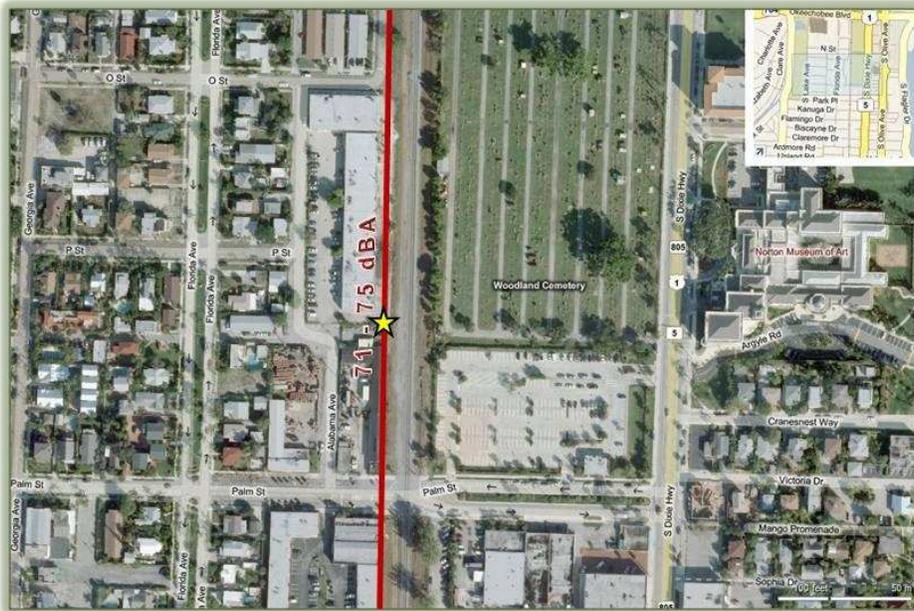


Figure 17 – Jacksonville FEC Train Corridor – Track Crossing 76 dBA



Figure 18 – Jacksonville FEC Train Corridor – Mainline 77 dBA

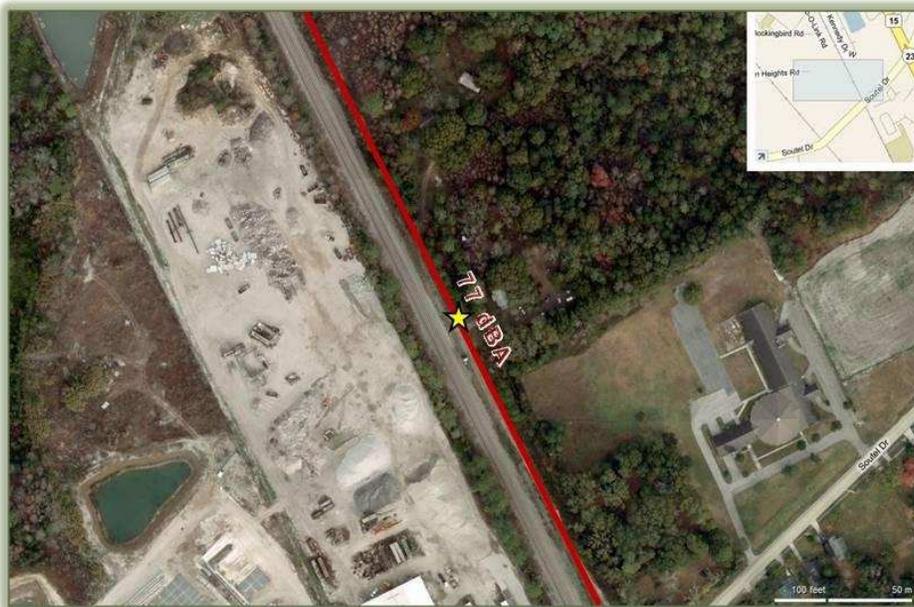
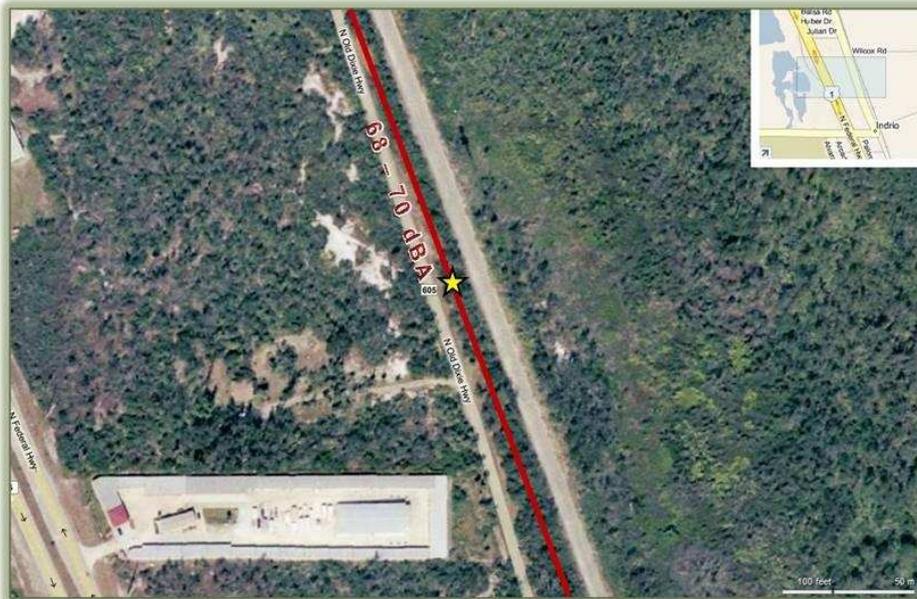


Figure 19 – Vero Beach FEC Train Corridor – High Speed Mainline 68-70 dBA



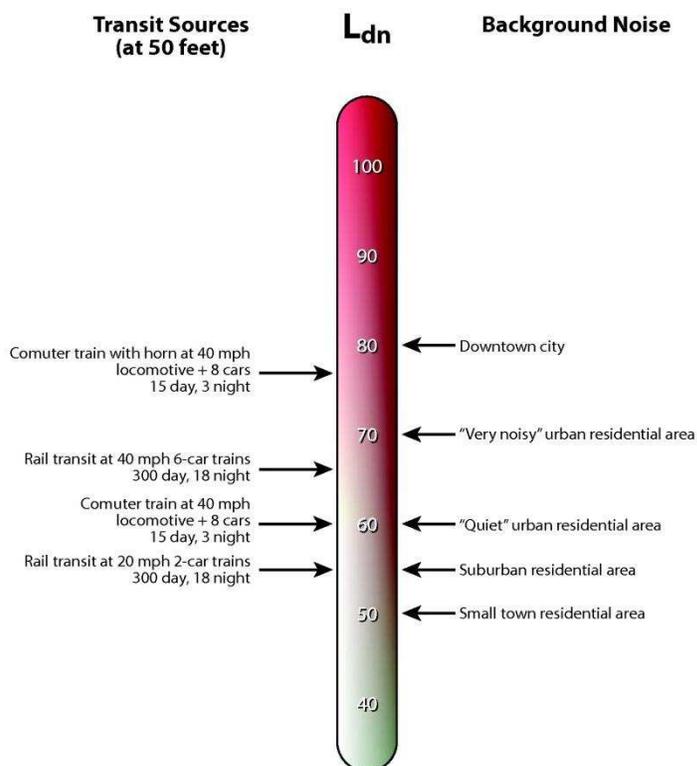
5.0 NOISE CRITERIA

5.1 Typical Transit and Background L_{dn} Sound Levels

The preferred noise metric for the assessment of sound over a 24 hour period is commonly called the Day-Night Sound Level (L_{dn}), which evaluates the sound level over a 24 hour period with a 10 decibel reduction for the noise level's that occurs during the nighttime hours (10pm to 7am). This reduction is designed to account for noise levels which occur during a period when nighttime sensitivity to noise is important. Many surveys have shown that the L_{dn} noise metric is well correlated with human annoyance; therefore this descriptor is widely used for noise impact assessments. The L_{dn} noise metric is also the chosen noise metric of the Housing and Urban Development (HUD) Noise Guide Book because it takes into account the 10 decibel reduction for nighttime noise level exposure on locations where nighttime sensitivity is important such as residential locations.

Typical background L_{dn} sound levels can range from 50 dBA for small town residential areas which are well removed from major transportation and transit corridors to 80 dBA for highly urbanized areas which are commonly in close proximity to major transportation and transit corridors. Typical background L_{dn} sound levels normally range from 55 dBA to 75 dBA. In the highly urbanized areas of the study corridor, typical background L_{dn} sound levels could range from 70 dBA to 82 dBA. The Typical Transit and Background L_{dn} Sound Levels are represented in **Figure 20 (Exhibit 3.8)**.

Exhibit 3.8 – Typical Transit and Background L_{dn} Sound Levels



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

5.2 Land Use Categories and Metrics for Transit Noise Impact Criteria

The Land Use Categories and Metrics for Transit Noise Impact Criteria are presented in **Figure 21 (Exhibit 3.9)**. Residential locations are described in Category 2 which includes homes, hospitals, and hotels where nighttime sensitivity to noise is assumed to be of utmost importance. The noise metric employed for Category 2 land uses is the L_{dn} noise metric.

The noise metric and criteria for Categories 1 and 3 land uses is the $L_{eq(h)}$ noise metric which evaluates the A-weighted sound level over a one hour time period. Category 1 lands include areas where quiet is an essential element in their intended purpose. Land uses in this category can include outdoor theaters and concert pavilions. Category 3 lands include institutional facilities which are used primarily during the daytime and evening hours. This category includes schools, libraries, and churches where it is important to avoid interference with the intended activities.

Exhibit 3.9 – Land Use Categories and Metrics for Transit Noise Impact Criteria

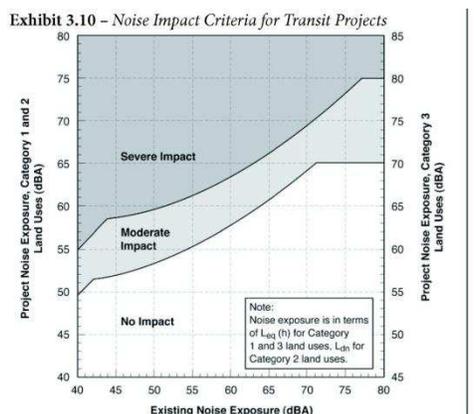
Land Use Category	Noise Metric(dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)^*$	Land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet and such land uses as outdoor theater and concert pavilions.
2	Outdoor L_{dn}	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 $L_{eq}(h)^*$	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. Active parks. Buildings with interior spaces where quiet is important, such as medical offices and conference rooms, recording studios and concert halls, fall into this category. Places of worship, meditation or study associated with cemeteries, monuments, museums and certain historical sites are also included.

*Note: L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

5.3 Noise Impact Criteria for Transit Projects

The Noise Impact Criteria for Transit Projects define the severity of the impacts for various noise exposure levels and is presented in **Figure 22 (Exhibit 3.10)**. The criteria are based on a comparison of existing and future project related outdoor noise levels. They incorporate the absolute criteria (noise from the proposed project) and the relative criteria (annoyance as a result of the project induced changes in noise levels). The potential impacts are assessed based on a combination of the existing ambient noise exposure and the additional noise exposure from the project, which have been determined to be noise levels exceeding 65 dBA and an increase of 3 dBA above the existing sound levels.



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

5.4 Noise Levels Defining Impact for Transit Projects

The FTA has established impact criteria for both Category 1 or 2 Sites and Category 3 Sites for the purposes of establishing the levels of noise impacts as a result of a proposed transit project. There are three categories which define the level of impact from a transit project. The categories are No Impact, Moderate Impact, and Severe Impact. The Noise Levels Defining Impact for Transit Projects is presented in **Figure 23 (Exhibit 3.11)**.

Exhibit 3.11 – Noise Levels Defining Impact for Transit Projects

Existing Noise Exposure* $L_{eq}(h)$ or L_{dn} (dBA)	Project Noise Impact Exposure, * Leq(h) or Ldn (dBA)					
	Category 1 or 2 Sites			Category 3 Sites		
	No Impact	Moderate Impact	Severe Impact	No Impact	Moderate Impact	Severe Impact
<43	< Ambient+10	Ambient + 10 to 15	>Ambient+15	<Ambient+15	Ambient + 15 to 20	>Ambient+20
43	<52	52-58	>58	<57	57-63	>63
44	<52	52-58	>58	<57	57-63	>63
45	<52	52-58	>58	<57	57-63	>63
46	<53	53-59	>59	<58	58-64	>64
47	<53	53-59	>59	<58	58-64	>64
48	<53	53-59	>59	<58	58-64	>64
49	<54	54-59	>59	<59	59-64	>64
50	<54	54-59	>59	<59	59-64	>64
51	<54	54-60	>60	<59	59-65	>65
52	<55	55-60	>60	<60	60-65	>65
53	<55	55-60	>60	<60	60-65	>65
54	<55	55-61	>61	<60	60-66	>66
55	<56	56-61	>61	<61	61-66	>66
56	<56	56-62	>62	<61	61-67	>67
57	<57	57-62	>62	<62	62-67	>67
58	<57	57-62	>62	<62	62-67	>67
59	<58	58-63	>63	<63	63-68	>68
60	<58	58-63	>63	<63	63-68	>68
61	<59	59-64	>64	<64	64-69	>69
62	<59	59-64	>64	<64	64-69	>69
63	<60	60-65	>65	<65	65-70	>70
64	<61	61-65	>65	<66	66-70	>70
65	<61	61-66	>66	<66	66-71	>71
66	<62	62-67	>67	<67	67-72	>72
67	<63	63-67	>67	<68	68-72	>72
68	<63	63-68	>68	<68	68-73	>73
69	<64	64-69	>69	<69	69-74	>74
70	<65	65-69	>69	<70	70-74	>74
71	<66	66-70	>70	<71	71-75	>75
72	<66	66-71	>71	<71	71-76	>76
73	<66	66-71	>71	<71	71-76	>76
74	<66	66-72	>72	<71	71-77	>77
75	<66	66-73	>73	<71	71-78	>78
76	<66	66-74	>74	<71	71-79	>79
77	<66	66-74	>74	<71	71-79	>79
>77	<66	66-75	>75	<71	71-80	>80

The Noise Levels Defining an Impact for Transit Projects have been predicted based upon the criteria presented in **Figure 23 (Exhibit 3.11)**. The Summary of the FTA Noise Level Impact Criteria for Amtrak Passenger Trains is presented in **Table 8**. The Summary of the FTA Noise Level Impact Criteria for the FEC Corridor Freight Trains is presented in **Table 9**. Based upon a comparison of the criteria presented, and the ambient noise levels established for the proposed project corridor, moderate to severe noise impacts already exist for the transit events under evaluation and it is expected that these impacts will continue to exist with or without the proposed project improvements.

The addition of the four Amtrak Passenger Trains will generate four additional moderate to severe noise impacts daily under the proposed study corridor conditions. However, the impacts are not expected to generate a significant increase in noise since there are already up to 24 freight trains operating daily on the study corridor, mostly during the nighttime hours. It is expected that the four daily Amtrak Passenger Trains will generate these types of impacts at all locations within close proximity to the study corridor and within the vicinity of the new Amtrak Stations which are being proposed between West Palm Beach and Jacksonville, Florida. Further detailed modeling can identify the noise contour locations associated with the change in the moderate to severe noise impacts as distances change across the screening distances from 750 to 1,600 feet from the proposed study corridor for Category 1, 2, and 3 Sites.

5.5 City of West Palm Beach Noise Ordinance

The City of West Palm Beach Noise Ordinance is Titled Article II Noise Control Regulations and is presented in **Appendix D**.

Section 34-35 – Noises; Unnecessary and Excessive Prohibited (4) Whistles States

- The blowing of any locomotive whistle or whistle attached to any stationary boiler except to give notice of the time to begin or stop work or as a warning of fire or danger or upon request of the proper municipal or county authorities.

Section 34-40 – Exemptions (6) States

- Locomotives and other railroad equipment and aircraft, to the extent that city regulation is preempted by federal law.

The City of West Palm Beach has signs posted in close proximity to and on the existing railway corridor that serves the Amtrak Passenger Trains and the Tri-Rail Commuter Trains that states “No Train Horn”. During the measurement of the existing sound levels at the West Palm Beach Amtrak Station, it was observed that the Amtrak Passenger Trains observed the signs while the Tri-Rail Commuter Trains did not observe the signs. The FEC Corridor freight trains frequently use the train horn on the approach to the track crossing locations during the nighttime hours.

5.6 Jacksonville Noise Ordinance

The Jacksonville Noise Ordinance is Titled Chapter 368 Noise Control and contains three parts and is presented in **Appendix E**.

Section 368.105 – Exemptions (d) States

- Commercial water-borne traffic, mass transportation vehicles, air transportation and rail transportation (except railroad switching yards).

The City of Jacksonville does not have signs posted which prohibit the use of train horns, and as such, the Amtrak Passenger Trains and the FEC Corridor freight trains blow the horn on the approach to track crossings.

Table 8
Summary of the FTA Noise Level Impact Criteria for Amtrak Passenger Trains
Existing Conditions for the West Palm Beach and Jacksonville Amtrak Stations

Transit Event Number	Transit Event Location	Type of Transit Event	Measurement Period	Measured Noise Levels (dBA) Decibels A-Weighted Class 1 SLM – CESVA SC 310		Project Noise Impact Exposure Category 1 or 2 Sites Leq(h)	Project Noise Impact Exposure Category 3 Sites Leq(h)
				Leq(h) (Measured)	Ldn (Estimated)*		
1N	WPB Amtrak Station	Ambient - 001	1:00:12	68	66		
2N	WPB Amtrak Station	Ambient - 003	1:00:02	68	66		
3N	WPB Amtrak Station	ML Train # 98-000	1:00:02	68**	66**	Moderate Impact	Moderate Impact
		ML Train # 92-002	1:00:03	71**	69**	Severe Impact	Moderate Impact
		ML Train # 92-002		68	75	Moderate Impact	Severe Impact
4N	WPB Amtrak Station	CR Train # 91-004	1:00:03	69**	67**	Severe Impact	Moderate Impact
		CR Train # 97-005	1:00:02	69**	67**	Severe Impact	Moderate Impact
		CR Train # 97-005		69	75	Severe Impact	Severe Impact
5N	JAX Amtrak Station	Ambient - 005	00:55:49	61	69		
6N	JAX Amtrak Station	Ambient- 007	1:00:02	44	52		
7N	JAX Amtrak Station	CR Train # 98-000	1:00:02	79***	77***	Severe Impact	Severe Impact
		CR Train # 92-004	1:00:02	79***	87***	Severe Impact	Severe Impact
		CR Train # 52-002	1:00:03	81***	79***	Severe Impact	Severe Impact
8N	JAX Amtrak Station	ML Train # 91-007	1:00:02	69	77	Severe Impact	Severe Impact
		ML Train # 91-007		70	76	Severe Impact	Severe Impact
		ML Train # 97-009	1:00:01	73***	71***	Severe Impact	Severe Impact
		ML Train # 97-009		70	76	Severe Impact	Severe Impact
		ML Train # 53-006	1:00:02	67	75	Severe Impact	Severe Impact
9N	Amtrak HS-ML	Ambient - 002	1:00:03	61	59		
10N	Amtrak HS-ML	ML Train # 98-000	1:00:03	71	69	Severe Impact	Moderate Impact
		ML Train # 98-000		69	75	Severe Impact	Severe Impact
		ML Train # 92-001	1:03:49	69	67	Severe Impact	Moderate Impact
11N	Amtrak HS-ML	CR Train # 91-003	1:00:06	70	68	Severe Impact	Moderate Impact
		CR Train # 97-003					
		ML Train # 91-003		72	78	Severe Impact	Severe Impact
		ML Train # 97-003					

** Hourly ambient sound level includes Tri-Rail Transit Events, *** Hourly ambient sound level includes FEC Transit Events

Table 9
Summary of the FTA Noise Level Impact Criteria for FEC Corridor Freight Trains
Existing Conditions for the West Palm Beach and Jacksonville FEC Train Corridor

Transit Event Number	Transit Event Location	Type of Transit Event	Measurement Period	Measured Noise Levels (dBA) Decibels A-Weighted Class 1 SLM – CESVA SC 310		Project Noise impact Exposure Category 1 or 2 Sites Leq(h)	Project Noise impact Exposure Category 3 Sites Leq(h)
				Leq(h) (Measured)	Ldn (Estimated)*		
12N	JAX FEC -TC	Ambient – 005	00:55:49	61	69		
13N	JAX FEC -ML	Ambient – 007	1:00:02	44	52		
14N	JAX FEC - TC	CR Train -000	1:00:02	79**	77**	Severe Impact	Severe Impact
		CR Train -002	1:00:03	81**	79**	Severe Impact	Severe Impact
		CR Train -002					
		CR Train -002					
		CR Train -003	1:00:05	76	79	Severe Impact	Severe Impact
		CR Train -003					
		CR Train -004	1:00:02	79**	87**	Severe Impact	Severe Impact
15N	JAX FEC ML	ML Train-008	1:01:16	77	75	Severe Impact	Severe Impact
		ML Train-008					
		ML Train-009					
		ML Train-009	1:00:01	73**	71**	Severe Impact	Severe Impact
16N	WPB FEC - TC	Ambient-002	1:00:02	52	55		
17N	WPB FEC - ML	Ambient-003	1:00:03	48	56		
18N	WPB FEC - TC	CR Train –000	1:00:01	74	77	Severe Impact	Severe Impact
		CR Train –001	1:00:04	73	76	Severe Impact	Severe Impact
		CR Train –003	1:01:38	71	79	Severe Impact	Severe Impact
		CR Train –004	1:01:01	76	84	Severe Impact	Severe Impact
19N	WPB FEC - ML	ML Train –000	1:00:03	71	74	Severe Impact	Severe Impact
		ML Train –002	1:00:06	72	80	Severe Impact	Severe Impact
		ML Train –004	1:00:03	75	83	Severe Impact	Severe Impact
20N	FEC HS-ML	Ambient - 001	1:00:08	60	63		
		Ambient - 002	1:00:03	55	58		
21N	FEC HS-ML	ML Train - 000	1:00:01	68	66	Severe Impact	Moderate Impact
		ML Train - 003	1:00:03	70	78	Severe Impact	Severe Impact

** Hourly ambient sound level includes Amtrak Transit Events

6.0 NOISE IMPACT SUMMARY

Based upon the FTA criteria and the measurements conducted in this assessment, moderate to severe noise impacts already exist for the transit events evaluated and it is expected that these impacts will continue to exist with or without the proposed project improvements. The existing FEC Corridor freight train operations evaluated generate greater noise impacts (up to 5 dBA) when compared to the existing and proposed Amtrak Passenger Trains and these impacts will continue to exist with or without the project.

The four proposed Amtrak Passenger Trains on the existing FEC Corridor will generate less noise (up to 5 dBA) as compared to the existing FEC Corridor freight trains at speeds below 79 mph. The Amtrak Passenger Trains which travel at speeds of up to 79 mph will produce more noise (up to 1 dBA) when compared to the existing FEC Corridor freight trains.

The Federal Transit Administration (FTA) Noise Model (Create Rail Noise Model) was utilized to produce the predicted noise levels for the high speed Amtrak Passenger Trains, which are expected to operate at speeds of up to 90 mph. Under the proposed conditions, the high speed Amtrak Passenger Trains will operate at speeds of up to 90 mph. Additional noise impacts will not be produced for single hourly events when compared to the similar FEC Corridor freight train events that were evaluated. However, for the case of two high speed Amtrak Passenger Trains traveling in the same hour, an additional noise impact of 2 dBA can be expected when compared to a single FEC Corridor freight train event and a 3 dBA decrease in the noise level can be expect when compared to two FEC Corridor freight train events in the same hour. These impacts are only relative when a direct comparison is made between each of the types of transit events evaluated for the existing and proposed project conditions, when measured at a distance of 70 feet from the existing study corridor.

The proposed project conditions will add four daily Amtrak Passenger Trains (2 northbound and 2 southbound) to the existing FEC Corridor. The FEC Corridor is currently experiencing up to 24 freight train operations on a daily basis, mostly during the nighttime hours. The existing FEC Corridor freight trains generate moderate to severe noise impacts based on the current FTA criteria contained in this assessment, for transit event noise levels evaluated. The addition of the four Amtrak Passenger Trains will generate four additional moderate to severe noise impacts daily under the proposed study corridor conditions. While it is expected that the four Amtrak Passenger Trains will contribute additional noise to the proposed study conditions, it is not expected to be a significant impact since there are already up to 24 freight trains operating on the study corridor, mostly during the nighttime hours. It is expected that the four daily Amtrak Passenger Trains will generate these types of impacts at all locations within close proximity to the study corridor and within the vicinity of the new Amtrak Stations which are being proposed between West Palm Beach and Jacksonville, Florida. Evaluations can be conducted when warranted to determine whether moderate to severe noise impacts can be expected within the screening range of 750 to 1,600 feet from the proposed study corridor for Category 1, 2, and 3 Sites.

Below follows a brief summary of the noise assessment results for the four proposed Amtrak Passenger Trains (the dBA value is above or below existing freight train noise levels):

- West Palm Beach Amtrak Passenger Train (Mainline Track): Noise level 1 to 3 dBA below
- West Palm Beach Amtrak Passenger Train (Track Crossing): Noise level 4 to 5 dBA below
- *Amtrak Passenger Train at 90 mph (Mainline Track): Noise level 1 to 3 dBA below*
- *Amtrak Passenger Train at 90 mph (Track Crossing): Noise level 4 to 5 dBA below*

- *Jacksonville Amtrak Passenger Train (Mainline Track): Noise level 3 dBA below*
 - *Jacksonville Amtrak Passenger Train (Mainline Track): Noise level 5 dBA below*
 - *Amtrak Passenger Train at 90 mph (Mainline Track): Noise level 2 dBA below*

 - *Indiantown High Speed Amtrak Passenger Train (Mainline Track): Noise level 1 dBA above*
 - *Indiantown High Speed Amtrak Passenger Train (Mainline Track): Noise level 1 dBA below*
 - *Indiantown High Speed Amtrak Passenger Train (Mainline Track): No change in Noise Level*
 - *Amtrak Passenger Train at 90 mph (Mainline Track): Noise level 1 dBA below*
 - *Amtrak Passenger Trains at 90 mph (Mainline Track): Noise level 2 dBA above*
- Comparison between 2 Amtrak Passenger Trains and 1 FEC Corridor freight train**
- *Amtrak Passenger Trains at 90 mph (Mainline Track): Noise level 3 dBA below*
- Comparison between 2 Amtrak Passenger Trains and 2 FEC Corridor freight trains**

The Amtrak Passenger Trains currently travel at speeds of up to 79 mph while the FEC Corridor freight trains travel at lower speeds of up to 49 mph. The differences in transit event speed accounts for the difference in the noise levels established in this assessment. Under the proposed project conditions, the Amtrak Passenger Trains will travel at speeds of up to 90 mph. The actual speed could be less for locations in close proximity to the Amtrak Stations and at locations where there are numerous close proximity track crossing locations due to safety considerations.

The City of West Palm Beach has signs posted which prohibit the use of train horns on the existing Amtrak corridor and the FEC corridor. During this assessment, the Amtrak Passenger Trains did not blow the train horn but the Tri-Rail commuter train did blow the horn. The FEC Corridor freight trains blow the horn on the approach to the track crossing, primarily during the nighttime hours; however one daily daytime event was observed where the train horn was used.

The City of Jacksonville does not have signs posted which prohibit the use of train horns on the existing Amtrak and FEC double track corridor. During this assessment, the Amtrak Passenger Trains, the Amtrak Auto trains and the FEC Corridor freight trains blow the horn on the approach to the track crossing, primarily during the daytime and nighttime hours.

7.0 MEASUREMENT OF EXISTING VIBRATION CONDITIONS

7.1 Methodology

The Federal Railroad Administration (FRA) has established specific guidelines for the assessment of transit vibration projects which is contained in the guidance document titled “High Speed Ground Transportation Noise and Vibration Impact Assessment”, dated October 2005. The purpose of this vibration assessment is to supplement the findings contained in the Programmatic Environmental Assessment dated October 1, 2009. The primary goal of this assessment is to determine if there will be additional vibration impacts from the addition of four Amtrak Passenger Trains on the existing FEC Corridor. The FEC Corridor is currently operating up to 24 freight trains daily on the study corridor, mostly during the nighttime hours. The Amtrak Passenger Trains would travel during the daytime and nighttime hours, making a total of four daily trips between Miami and Jacksonville, Florida.

The FRA guidelines suggest the following methodology components for new projects:

- Survey Existing Vibration Conditions
- Predict Future Vibration and Vibration Impact
- Develop Mitigation Procedures

For the purposes of the vibration assessment, it has been determined that daytime and nighttime vibration impacts could occur for the proposed Amtrak Passenger Train service on the FEC Corridor. Ground-Borne vibration measurements were recorded during the daytime and nighttime hours for the Amtrak Passenger Trains and the FEC Corridor freight trains which primarily travel during the nighttime hours. The existing condition vibration measurements were recorded over a short period of time which represented the transit-related activity during hours of noise and vibration related sensitivity. The background ambient screening measurements were generally recorded over a one hour time period and were recorded concurrently with the noise measurements.

The measurement sites selected for the Amtrak Passenger Trains represented locations adjacent to the railway centerline of the West Palm Beach and Jacksonville, Florida Amtrak Stations and the Indiantown, Florida high speed mainline location. The measurement sites selected for the FEC Corridor freight trains represented locations adjacent to the railway centerline of the West Palm Beach and Jacksonville, Florida FEC Corridor and the Vero Beach, Florida high speed mainline location.

The FRA recommends using a screening procedure to determine the likelihood of a vibration impact. The area defined by the screening distance is limited to a distance of 200 feet from the railway track for the evaluation of Category 2 receiver locations. This means, in the absence of measurements or in-situ testing, the vibration levels beyond 200 feet from the track would not cause an impact to the residences.

Based upon the data presented in the Programmatic Environmental Assessment, dated October 1, 2009, the potential areas of impact for vibration related transit events exist within the 200 feet screening distance. For the purposes of the vibration assessment, a distance of 70 feet from the nearest railway centerline was selected in order to determine the vibration level differences and impacts from the Amtrak Passenger Trains and the FEC Corridor freight trains. At this distance, there was better probability of establishing a noise related vibration impact, from the transit sources, without the influence of other sources of interference from the surrounding areas. The Measurement Locations for the Existing Noise and Vibration Conditions are presented in **Table 1**.

7.2 Equipment Specifications

The vibration measurement procedures utilized in the vibration assessment are presented below and represent the general procedures used for the purposes of the recorded measurement of the ground-borne vibration:

- The instrumentation was calibrated before and after each series of measurements with the manufacturer's specified calibrator.
- The instrumentation and the manufacturer's specified calibrator received an annual calibration by the manufacturer's authorized representative.
- The instruments velocity transducer was properly fitted on the instruments microphone.
- The instrumentation was properly fitted on the instrument tri-pod and was positioned approximately five feet above the ground surface and away from obstructions.
- The instruments batteries were changed daily or as necessary.

- Vibration measurements were recorded during the onset and pass by of the vibration related transit event utilizing the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric. All vibration measurements were reported in whole numbers, decibels, Z-weighted, so as not to imply a level of accuracy that is not attainable. Each vibration measurement was recorded during the hour of maximum transit noise and vibration exposure and is used for land uses involving only daytime activities. The Noise and Vibration Measurement Instrumentation is presented in **Table 2**. The Noise and Vibration Monitoring Equipment is presented in **Appendix B**.

7.3 Meteorological Conditions

The meteorological conditions were recorded for each series of measurements or measurement periods. A summary of the meteorological conditions recorded during the noise and vibration assessment is presented in **Table 3**.

7.4 Field Measurement Data

The Summary of the Existing Vibration Levels for the Amtrak Passenger Trains is presented in **Table 10**. The Summary of the Existing Vibration Levels for the FEC Corridor Freight Trains is presented in **Table 11**. The measured ground-borne vibration levels in this assessment were established at a distance of 70 feet from the existing study corridor. The data presented for the vibration assessment has evaluated the existing transit vibration levels from the Amtrak Passenger Trains under the following conditions:

- Mainline approach and departure from the Amtrak Station
- Track crossing approach and departure from the Amtrak Station
- High speed mainline approach and departure from the Amtrak Station

The data presented for the vibration assessment has evaluated the existing transit vibration levels from the FEC Corridor Freight Trains under the following conditions:

- Mainline track approaching the track crossing
- Track crossing locations
- High speed mainline locations

7.5 Interpretation of Measurement Data

The Summary of the Existing Vibration Levels for the Amtrak Passenger Trains is presented in **Table 10** and provides the basis for establishing the ambient vibration conditions during the noisiest hour of transit-related activity during hours of vibration sensitivity.

The existing condition vibration levels for the West Palm Beach Amtrak Station are shown below and were measured using the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric:

- **Mainline Train: 76 VdB (Table 7, Transit Event 3V)**
- **Track Crossing Train: 72 to 76 VdB (Table 7, Transit Event 4V)**

The existing condition noise levels for the Jacksonville Amtrak Station are shown below and were measured using the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric:

- **Mainline Train: 66 to 75 VdB (Table 7, Transit Event 8V), 84 VdB for speed of 71 mph**
- **Track Crossing Train: 69 to 73 VdB (Table 7, Transit Event 7V)**

Indiantown High Speed Rail existing condition vibration levels are shown below and were measured using the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric:

- **Mainline / Track Crossing Train: 80 to 83 VdB (Table 7, Transit Event 10V, 11V)**

The Summary of the Existing Vibration Levels for the FEC Corridor Freight Trains is presented in **Table 11** and provides the basis for establishing the ambient vibration conditions during the noisiest hour of transit-related activity during hours of vibration sensitivity.

West Palm Beach FEC Corridor freight trains existing condition vibration levels are shown below and were measured using the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric:

- **Mainline Train: 83 to 86 VdB (Table 8, Transit Event 19V)**
- **Track Crossing Train: 79 to 81 VdB (Table 8, Transit Event 18V)**

Jacksonville FEC Corridor freight trains existing condition vibration levels are shown below and were measured using the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric:

- **Mainline Train: 70 to 82 VdB (Table 8, Transit Event 15V)**
- **Track Crossing Train: 65 to 76 VdB (Table 8, Transit Event 14V)**

Vero Beach High Speed Rail existing condition vibration levels are shown below and were measured using the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric:

- **Mainline Train: 79 VdB (Table 8, Transit Event 21V)**

8.0 PREDICTIONS OF VIBRATION FROM THE PROJECT

The general methodology prescribed for the prediction of the existing and future vibration levels from new or proposed railway projects was derived from the FRA Manual and is summarized below:

- For residential land uses, the vibration measurements were recorded over a one hour period for the purposes of establishing the ambient background ground-borne vibration levels. During the periods of peak hour transit events, the ground-borne vibration levels were measured during the transit event which was being evaluated and was essentially a short duration measurement. This method eliminated the need to estimate the vibration levels based upon generic assumptions which can be found in the FRA Manual. This method was used to evaluate the existing Amtrak Passenger Trains which travel at speeds of up to 79 mph and the FEC Corridor freight trains which travel at speeds of up to 49 mph.
- The future predicted vibration levels for the Amtrak Passenger Trains which will travel at speeds of up to 90 mph was determined according to the FTA guidelines, which has determined that a speed correction to 90 mph would produce an additional 5 VdB increase in the baseline vibration levels when compared to an Amtrak Passenger Train traveling at a speed of 50 mph.

Under the proposed conditions, the Amtrak Passenger Trains would share the FEC Corridor during the daytime and nighttime hours and the FEC Corridor freight trains would generally operate during the nighttime hours and with the possibility of daytime freight train operations.

The Summary of the Predicted Vibration Levels for the Amtrak Passenger Trains on the FEC Corridor is presented in **Table 12** and provides the basis for establishing the future predicted ambient vibration conditions during the noisiest hour of transit-related activity during hours of vibration sensitivity. The Existing Amtrak and FEC Railway Track Conditions are presented in **Appendix C**.

The future predicted condition vibration levels for the West Palm Beach measurement location for the Amtrak Passenger Trains and the FEC Corridor freight trains are shown below and were calculated using the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric:

- Mainline Amtrak Passenger Train: 76 VdB
- Mainline FEC Corridor Freight Train: 83 to 86 VdB

Amtrak Passenger Train vibration levels were lower than freight vibration levels by 7 to 10 VdB

- Track Crossing Amtrak Passenger Train: 72 to 76 VdB
- Track Crossing FEC Corridor Freight Train: 79 to 80 VdB

Amtrak Passenger Train vibration levels were lower than freight vibration levels by 3 to 8 VdB

The future predicted condition vibration levels for the Jacksonville measurement location for the Amtrak Passenger Trains and the FEC Corridor freight trains are shown below and were calculated using the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric:

- Mainline Amtrak Passenger Train: 75 VdB, 84 VdB at a speed of 71 mph
- Mainline FEC Corridor Freight Train: 78 to 79 VdB

Amtrak Passenger Train vibration levels were lower than freight vibration levels by 3 VdB, and 5 VdB above for a speed of 71 mph

- Mainline Amtrak Auto & Passenger Train: 66 VdB
- Mainline FEC Corridor Freight Train: 82 VdB

Amtrak Passenger Train vibration levels were lower than freight vibration levels by 16 VdB

- Track Crossing Amtrak Passenger Train: 69 to 73 VdB
- Track Crossing FEC Corridor Freight Train: 73 to 75 VdB

Amtrak Passenger Train vibration levels were lower than freight vibration levels by 2 to 4 VdB

- Track Crossing Amtrak Auto & Passenger Train: 72 VdB, includes one FEC Transit Event

- **Track Crossing FEC Corridor Freight Train: 75 VdB**

Amtrak Passenger Train vibration levels were lower than freight vibration levels by 3 VdB

The future predicted condition vibration levels for the Indiantown High Speed Rail measurement location for the Amtrak Passenger Trains and the Vero Beach High Speed Rail measurement location for the FEC Corridor freight trains are shown below and were calculated using the **VdB** (Velocity re 10^{-6} in. / sec.) vibration metric:

- **Mainline Amtrak Passenger Train: 80 to 83 VdB**
- **Mainline FEC Corridor Freight Train: 79 VdB**

Amtrak Passenger Train vibration levels were higher than freight vibration levels by 1-4 VdB, due to the speed difference. Amtrak's high speed is greater than FEC's High Speed

The assessment presented above is only relative to the vibration level difference between the Amtrak Passenger Trains and the FEC Corridor freight trains. The potential vibration impacts from the proposed project will take into account that there will be four additional daily transit events from the Amtrak Passenger Trains on the study corridor. The addition of the four Amtrak Passenger Trains will result in an increase in transit vibration on the proposed study corridor; however, it is not expected to be a significant increase in ground-born vibration since there are already up to 24 freight trains operating on the study corridor, mostly during the nighttime hours. There are occasions where the freight trains will operate during the daytime hours and would generally produce higher vibration levels than the Amtrak Passenger Trains. Overall, the Amtrak Passenger Trains generate less vibration impacts than the FEC Corridor freight trains with the exception of the higher speed Amtrak Passenger Trains which will produce additional vibration impacts of up to 5 VdB for speeds of up to 79 mph. The proposed high speed Amtrak Passenger Trains will operate at speeds of up to 90 mph under the proposed study corridor conditions. According to the FTA guidelines, a speed correction to 90 mph for the proposed Amtrak Passenger Trains would produce an additional 5 VdB increase in the baseline vibration levels when compared to an Amtrak Passenger Train traveling at a speed of 50 mph. Based upon the results presented in this assessment, such a correction factor appears to be reasonable when compared to the Amtrak Passenger Trains traveling at speeds of up to 79 mph.

Table 10
Summary of Existing Vibration Levels for the Amtrak Passenger Trains

Transit Event Number	Transit Event Location	Transit Event ID / Vibration File #	Measurement Period	Measured Vibration Levels (VdB) Velocity re 10 ⁻⁶ in. / sec. Class 1 SLM – CESVA SC 310 With Velocity Transducer	Description of Vibration Transit Event
				VdB (Measured)	
1V	WPB Amtrak Station	Ambient - 001	1:00:06	57	Mainline Track - Local traffic from Tamarind Avenue
2V	WPB Amtrak Station	Ambient - 004	1:00:03	61	Track Crossing - Local traffic from Okeechobee Blvd.
3V	WPB Amtrak Station	ML Train # 98-000	01:07	76	Mainline Track (NB) – 2 Engines + 10 Cars, 19 mph – No Horn
		ML Train # 92-003	00:51	76	Mainline Track (NB) – 2 Engines + 9 Cars, 15 mph – No Horn
4V	WPB Amtrak Station	CR Train # 91-006	00:37	76	Track Crossing (SB) – 2 Engines + 10 Cars, 15 mph – No Horn
		CR Train # 97-007	01:03	72	Track Crossing (SB) – 2 Engines + 10 Cars, 21 mph – No Horn
5V	JAX Amtrak Station	Ambient -010	55:40	49	Track Crossing - Local traffic from Soutel Drive + FEC Yard
6V	JAX Amtrak Station	Ambient -011	27:44	40	Mainline Crossing - Local traffic from Soutel Drive + FEC Yard
7V	JAX Amtrak Station	CR Train # 98-001	00:43	73	Track Crossing (NB) – 2 Engines + 12 Cars, 16 mph + Horn
		CR Train # 92-008	01:01	69	Track Crossing (NB) – 2 Engines + 10 Cars, 20 mph + Horn
		CR Train # 52-002	02:50	72*	Track Crossing (NB) – 2 Engines + 56 Cars, 16 mph + Horn
8V	JAX Amtrak Station	ML Train # 91-012	00:45	75	Mainline Track (SB) – 2 Engines + 14 Cars, 21 mph + Horn
		ML Train # 97-017	00:15	84	Mainline Track (SB) – 2 Engines + 14 Cars, 71 mph + Horn
		ML Train # 53-011	27:44	66	Mainline Track (SB) – 2 Engines + 52 Cars, 40 mph + Horn
9V	Amtrak HS-ML	Ambient-003	1:00:05	49	Mainline Track – Local traffic from SR 710
10V	Amtrak HS-ML	ML Train # 98-000	00:23	81	Mainline Track (NB) – 2 Engines + 11 Cars, 71 mph +Horn
		ML Train # 92-002	00:18	83	Mainline Track (NB) – 2 Engines + 9 Cars, 71 mph +Horn
11V	Amtrak HS-ML	ML Train # 91-004	00:25	80	Mainline Track (SB) – 3 Engines + 9 Cars, 72 mph +Horn
		ML Train # 97-005	00:18	81	Mainline Track (SB) – 2 Engines + 10 Cars, 72 mph +Horn

* Velocity vibration level includes one FEC Transit Event

Table 11
Summary of Existing Vibration Levels for the FEC Corridor Freight Trains

Transit Event Number	Transit Event Location	Transit Event ID / Vibration File #	Measurement Period	Measured Vibration Levels (VdB) Velocity re 10 ⁻⁶ in. / sec. Class 1 SLM – CESVA SC 310 With Velocity Transducer	Description of Vibration Transit Event
				VdB (Measured)	
12V	JAX FEC -TC	Ambient – 010	55:40	49	Local traffic from Soutel Drive + FEC Train Yard
13V	JAX FEC -ML	Ambient – 012	00:45	47	Local traffic from Soutel Drive + FEC Train Yard
14V	JAX FEC - TC	CR Train -000	04:32	75	Track Crossing (SB) – 4 Engines + 154 Cars, 15 mph + Horn
		CR Train- 002	02:50	72*	Track Crossing (NB) – 2 Engines + 26 Cars, 20 mph + Horn
		CR Train- 003	00:56	73	Track Crossing (NB) – 2 Engines + 37 Cars, 35 mph + Horn
		CR Train-004	00:24	76	Track Crossing (SB) – 5 Engines, 36 mph + Horn
		CR Train-005	04:45	73	Track Crossing (NB) – 2 Engines + 130 Cars, 24 mph + Horn
		CR Train-006	02:06	71	Track Crossing (NB) – 2 Engines + 71 Cars, 22 mph + Horn
		CR Train-009	06:06	65	Track Crossing (NB) – 1 Engine + 78 Cars, 05 mph + Horn
15V	JAX FEC ML	ML Train-013	00:35	70	Mainline Track (NB) -2 Engines, 37 mph + Horn
		ML Train-014	03:32	78	Mainline Track (SB) – 4 Engines + 115 Cars, 22 mph + Horn
		ML Train-015	02:13	79	Mainline Track (NB) – 1 Engine + 101 Cars, 25 mph + Horn
		ML Train-016	01:39	82	Mainline Track (NB) – 1 Engine + 98 Cars, 26 mph + Horn
16V	WPB FEC - TC	Ambient-003	1:00:01	43	Local traffic from Dixie Highway
17V	WPB FEC - ML	Ambient-003	18:15	42	Local traffic from Dixie Highway
18V	WPB FEC - TC	CR Train –000	02:44	79	Track Crossing (SB) – 2 Engines + 133 Cars, 43 mph + Horn
		CR Train –002	03:33	80	Track Crossing (NB) – 3 Engines + 154 Cars, 42 mph + Horn
		CR Train –005	01:46	80	Track Crossing (SB) – 2 Engines + 79 Cars, 39 mph + Horn
		CR Train –006	02:57	81	Track Crossing (NB) – 2 Engines + 121 Cars, 30mph + Horn
		CR Train –007	02:07	79	Track Crossing (SB) – 2 Engines + 106 Cars, 40mph + Horn
19V	WPB FEC - ML	ML Train –000	02:41	86	Mainline Track (NB) – 3 Engines + 182 Cars, 37 mph + Horn
		ML Train –002	02:55	84	Mainline Track (SB) – 2 Engines + 149 Cars, 39 mph + Horn
		ML Train –004	03:39	83	Mainline Track (NB) – 2 Engines + 136 Cars, 30 mph + Horn
		ML Train –005	02:58	84	Mainline Track (SB) – 2 Engines + 186 Cars, 38mph + Horn
20V	FEC HS-ML	Ambient - 001	1:00:06	48	Local traffic from Indian River Drive
21V	FEC HS-ML	ML Train - 000	02:31	79	Mainline Track (SB) – 2 Engines + 120 Cars, 40 mph + Horn
		ML Train - 003	03:10	79	Mainline Track (SB) – 2 Engines + 189 Cars, 49 mph + Horn

* Velocity vibration level includes one Amtrak Transit Event

Table 12 Summary of the Predicted Vibration Levels of the Amtrak Passenger Trains on the FEC Corridor Proposed Future Conditions				
Transit Event Location	Type of Transit Event ML=Mainline Train CR= Track Crossing Train HS=Higher Speed	Amtrak Passenger Cars Measured Vibration Levels (VdB)	FEC Freight Trains Measured Vibration Levels (VdB)	Noise Level Difference Amtrak vs. FEC Freight Trains (VdB) Impact Y/N
		VdB (Measured)	VdB (Measured)	VdB (Measured)
WPB Amtrak Station	ML Train # 98-000	76	83	7/N
	ML Train # 92-003	76	84	8/N
WPB Amtrak Station	CR Train # 91-006	76	79	3/N
	CR Train # 97-007	72	80	8/N
JAX Amtrak Station	CR Train # 98-001	73	75	2/N
	CR Train # 92-008	69	73	4/N
	CR Train # 52-002	72*	75	3/N
JAX Amtrak Station	ML Train # 91-012	75	78	3/N
	ML Train # 97-017	84	79	5/Y (Amtrak Speed 71 mph)
	ML Train # 53-011	66	82	16/N
Amtrak HS-ML	ML Train # 98-000	81	79	2/Y (Amtrak Speed 71 mph)
	ML Train # 92-002	83	79	4/Y (Amtrak Speed 71 mph)
	ML Train # 91-004	80	79	1/Y (Amtrak Speed 72 mph)
	ML Train # 97-005	81	79	2/Y (Amtrak Speed 72 mph)
WPB FEC - TC	CR Train -000		79	
	CR Train -002		80	
WPB FEC - ML	ML Train -004		83	
	ML Train -005		84	
JAX FEC - TC	CR Train - 000		75	
	CR Train- 005		73	
JAX FEC ML	ML Train- 014		78	
	ML Train- 015		79	
	ML Train - 016		82	
FEC HS-ML	ML Train - 000		79	
	ML Train - 003		79	

* Velocity vibration level includes one FEC Transit Event

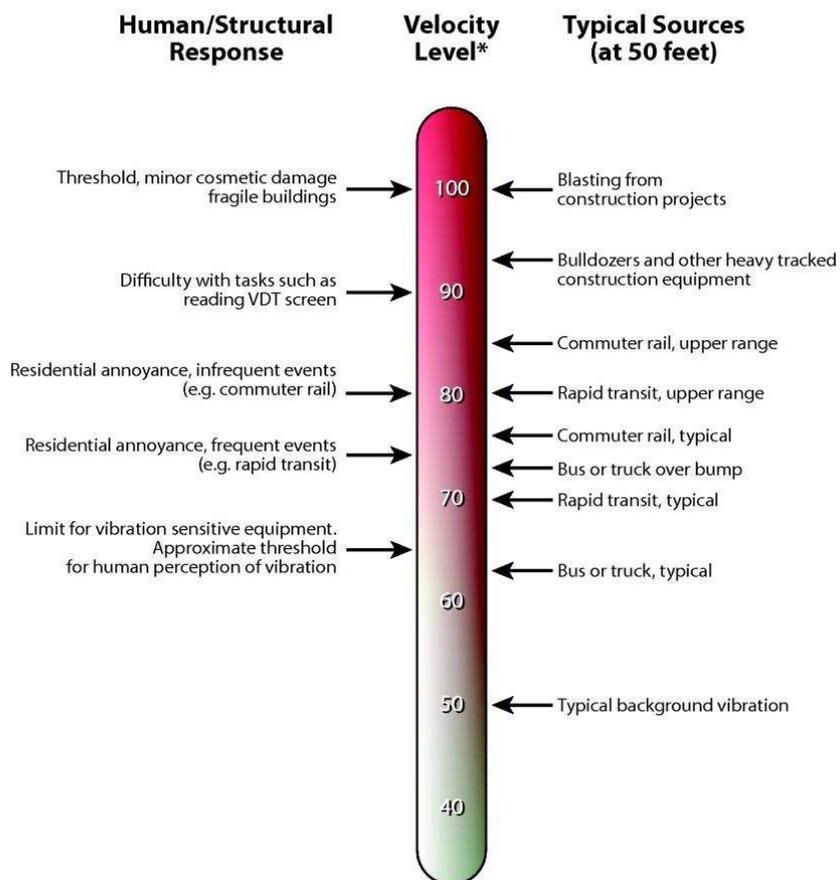
9.0 VIBRATION CRITERIA

9.1 Typical Ground-Borne Vibration Levels

The preferred vibration metric for the assessment of transit related ground-borne vibration is commonly called the vibration velocity level, in decibels (VdB), which is used to describe the “smoothed” vibration amplitude. Thus, ground-borne vibration levels are stated in units of vibration decibels (VdB). This unit is equivalent to a velocity of one micro-inch per second (10^{-6} inches per second). This is not a universally accepted notation; it is used to reduce the confusion with sound decibels.

Typical ground-borne vibration levels for common sources, as well as criteria for human and structural responses to ground-borne vibration, range from approximately 50 VdB to 100 VdB which is represented in **Figure 24 (Exhibit 3.14)**. Although the approximate threshold of human perception to vibration is 65 VdB, annoyance is usually not significant unless the vibration level exceeds 70 VdB.

Exhibit 3.14 – Typical Ground-Borne Vibration Levels



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

9.2 Ground-Borne Vibration and Noise Impact Criteria

The FRA Ground-Borne Vibration and Noise Impact Criteria are based on land use and train frequency. Vibration sensitive receptors are classified into three categories:

- Category 1 receptors are characteristic of buildings where vibration would interfere with interior operations. Examples include a Laser Eye Center.
- Category 2 receptors include residences and buildings where people normally sleep. Examples include Townhouses and Apartment Buildings.
- Category 3 receptors include Institutional land uses with primarily daytime use. Examples include Schools and Churches.

The land use categories and the corresponding ground-borne vibration and noise impact levels for each type of event and its expected frequency are presented in **Figure 25 (Exhibit 3.15)**.

Exhibit 3.15 – Ground-Borne Vibration and Noise Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/sec)		
	Frequent Events ¹	Occasional Events ²	Infrequent Events ³
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB ⁴	65 VdB ⁴	65 VdB ⁴
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78VdB	83 VdB

Notes:

1 "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.

2 "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.

3 "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail lines.

4 This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

5 Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

9.3 Ground-Borne Vibration and Noise Impact Criteria for Special Buildings

The ground-borne vibration and noise impact criteria for special buildings provide guidance for the assessment of building or rooms where there could be an additional sensitivity to ground-borne vibration impacts. The types of buildings, rooms, and impact criteria are presented in **Figure 26 (Exhibit 3.16)**. The FRA recommends an additional screening procedure for the assessment of such building where a potential vibration impact could occur.

Exhibit 3.16 – Ground-Borne Vibration and Noise Impact Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (Vdb Re 1 Micro-Inch/Sec)	
	Frequent Events ¹	Occasional or Infrequent Events ²
Concert Halls	65 VdB	65 VdB
TV Studios	65 VdB	65 VdB
Recording Studios	65 VdB	65 VdB
Auditoriums	72 VdB	80 VdB
Theaters	72 VdB	80 VdB

Notes:

- 1 "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.
- 2 "Occasional or Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.
- 3 If the building would rarely be occupied when the trains are operating, there is no need to consider impact. As an example consider locating a commuter rail line next to a concert hall. If no commuter trains would operate after 7 pm, it should be rare that the trains interfere with the use of the hall.

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

The Ground-Borne Vibration and Noise Impact Criteria have been evaluated based upon the criteria presented in **Figure 25 (Exhibit 3.15)**. The Summary of the FRA Vibration Impact Criteria for Amtrak Passenger Trains is presented in **Table 13**. The Summary of the FRA Vibration Impact Criteria for the FEC Corridor Freight Trains is presented in **Table 14**. Based upon a comparison of the criteria presented, and the ground-borne vibration levels established for the proposed project corridor, the Amtrak Passenger Trains traveling at speeds of up to 79 mph will generate vibration impacts of up to 4 VdB over the Category 2 land uses. Additional vibration impacts of up to 1 VdB are expected for the proposed Amtrak Passenger Trains which will travel at speeds of up to 90 mph under the proposed project conditions. The existing FEC Corridor freight train operations currently generate ground-borne vibration impacts of up to 6 VdB over the criteria for Category 2 land uses and it is expected that these impacts will continue to exist with or without the proposed project improvements. The addition of the four Amtrak Passenger Trains will generate four additional ground-borne vibration impacts daily under the proposed study corridor conditions. However, the impacts are not expected to generate a significant increase in ground-borne vibration since there are already up to 24 freight trains operating daily on the study corridor, mostly during the nighttime hours. It is expected that the four daily Amtrak Passenger Trains will generate these types of impacts at all locations within close proximity to the study corridor and within the vicinity of the new Amtrak Stations which are being proposed between West Palm Beach and Jacksonville, Florida. Additionally, the vibration impacts can be expected within 200 feet from the proposed study corridor for Category 2 Land Uses.

Table 13
Summary of the FRA Vibration Impact Criteria for the Amtrak Passenger Trains
Existing Condition Vibration Levels for the West Palm Beach and Jacksonville Amtrak Stations

Transit Event Number	Transit Event Location	Type of Transit Event	Measurement Period	Measured Vibration Levels (VdB) Velocity re 10-6 in. / sec. Class 1 SLM – CESVA SC 310 With Velocity Transducer	Ground-Borne Vibration Impact Levels for Infrequent Events VdB re 10-6 in. / sec		
				VdB (Measured)	Category 1	Category 2	Category 3
1V	WPB Amtrak Station	Ambient - 001	1:00:06	57	65	80	83
2V	WPB Amtrak Station	Ambient - 004	1:00:03	61	65	80	83
3V	WPB Amtrak Station	ML Train # 98-000	01:07	76	65	80	83
		ML Train # 92-003	00:51	76	65	80	83
4V	WPB Amtrak Station	CR Train # 91-006	00:37	76	65	80	83
		CR Train # 97-007	01:03	72	65	80	83
5V	JAX Amtrak Station	Ambient -010	55:40	49	65	80	83
6V	JAX Amtrak Station	Ambient -011	27:44	40	65	80	83
7V	JAX Amtrak Station	CR Train # 98-001	00:43	73	65	80	83
		CR Train # 92-008	01:01	69	65	80	83
		CR Train # 52-002	02:50	72*	65	80	83
8V	JAX Amtrak Station	ML Train # 91-012	00:45	75	65	80	83
		ML Train # 97-017	00:15	84	65	80	83
		ML Train # 53-011	27:44	66	65	80	83
9V	Amtrak HS-ML	Ambient-003	1:00:05	49	65	80	83
10V	Amtrak HS-ML	ML Train # 98-000	00:23	81	65	80	83
		ML Train # 92-002	00:18	83	65	80	83
11V	Amtrak HS-ML	CR Train # 91-004	00:25	80	65	80	83
		CR Train # 97-005	00:18	81	65	80	83

* Velocity vibration level includes one FEC Transit Event

Table 14
Summary of the FRA Vibration Impact Criteria for the FEC Corridor Freight Trains
Existing Condition Vibration Levels for the West Palm Beach and Jacksonville FEC Train Corridor

Transit Event Number	Transit Event Location	Type of Transit Event	Measurement Period	Measured Vibration Levels (VdB) Velocity re 10-6 in. / sec. Class 1 SLM – CESVA SC 310 With Velocity Transducer	Ground-Borne Vibration Impact Levels for Infrequent Events VdB re 10-6 in. / sec		
				VdB (Measured)	Category 1	Category 2	Category 3
12V	JAX FEC -TC	Ambient – 010	55:40	49	65	80	83
13V	JAX FEC -ML	Ambient – 012	00:45	47	65	80	83
14V	JAX FEC - TC	CR Train -000	04:32	75	65	80	83
		CR Train- 002	02:50	72*	65	80	83
		CR Train- 003	00:56	73	65	80	83
		CR Train-004	00:24	76	65	80	83
		CR Train-005	04:45	73	65	80	83
		CR Train-006	02:06	71	65	80	83
		CR Train-009	06:06	65	65	80	83
15V	JAX FEC ML	ML Train-013	00:35	70	65	80	83
		ML Train-014	03:32	78	65	80	83
		ML Train-015	02:13	79	65	80	83
		ML Train-016	01:39	82	65	80	83
16V	WPB FEC - TC	Ambient-003	1:00:01	43	65	80	83
17V	WPB FEC - ML	Ambient-003	18:15	42	65	80	83
18V	WPB FEC - TC	CR Train –000	02:44	79	65	80	83
		CR Train –002	03:33	80	65	80	83
		CR Train –005	01:46	80	65	80	83
		CR Train –006	02:57	81	65	80	83
		CR Train –007	02:07	79	65	80	83
19V	WPB FEC - ML	ML Train –000	02:41	86	65	80	83
		ML Train –002	02:55	84	65	80	83
		ML Train –004	03:39	83	65	80	83
		ML Train –005	02:58	84	65	80	83
20V	FEC HS-ML	Ambient - 001	1:00:06	48	65	80	83
21V	FEC HS-ML	ML Train - 000	02:31	79	65	80	83
		ML Train - 003	03:10	79	65	80	83

* Velocity vibration level includes one Amtrak Transit Event

10.0 VIBRATION IMPACT SUMMARY

Based upon the FRA criteria, measurements and analysis contained in this assessment, the expected ground-borne vibration impacts, from the four proposed Amtrak Passenger Trains, on the existing FEC Corridor, will exceed Category 2 Land Uses by up to 4 VdB under the existing project conditions and these impacts will continue to exist with or without the project. The proposed project conditions will add an additional four Amtrak Passenger Trains on the FEC Corridor. The vibration impacts will occur for the Amtrak Passenger Trains traveling at speeds of up to 79 mph. Under the proposed project conditions, the Amtrak Passenger Trains will travel at speeds of up to 90 mph and additional vibration impacts of up to 1 VdB are expected for the higher speed Amtrak Passenger Trains. The existing FEC Corridor freight train operations currently generate ground-borne vibration impacts of up to 6 VdB over the criteria for Category 2 Land Uses and Special Buildings and these impacts will continue to exist with or without the project. These impacts are only relative when a direct comparison is made between each of the types of transit events evaluated for the existing and proposed project conditions and are predicted for the distance of 70 feet from the track centerline.

The proposed project conditions will add four daily Amtrak Passenger Trains (2 northbound and 2 southbound) to the existing FEC Corridor. The FEC Corridor is currently experiencing up to 24 freight train operations on a daily basis, mostly during the nighttime hours. The existing FEC Corridor freight trains generate ground-borne vibration impacts in excess of the established criteria for Category 2 Land Uses based on the current FRA criteria contained in this assessment, for transit event vibration levels evaluated. The addition of the four Amtrak Passenger Trains will generate four additional vibration impacts daily under the proposed study corridor conditions. While it is expected that the four Amtrak Passenger Trains will contribute additional vibration impacts to the proposed study conditions, it is not expected to be a significant impact. It is expected that the four daily Amtrak Passenger Trains will generate these types of impacts at all locations within close proximity to the study corridor and within the vicinity of the new Amtrak Stations which are being proposed between West Palm Beach and Jacksonville, Florida. Additionally, the vibration impacts can be expected within 200 feet from the proposed study corridor for Category 2 Land Uses and Special Buildings. Special Building locations such as churches and historical buildings / locations may require additional consideration.

Below follows a brief summary of the vibration assessment results for the four proposed Amtrak Passenger Trains (the VdB value is above or below existing freight noise levels):

- West Palm Beach Amtrak Passenger Train (Mainline Track): Vibration level 7 to 10 VdB below
- West Palm Beach Amtrak Passenger Train (Track Crossing): Vibration level 3 to 8 VdB below

- Jacksonville Amtrak Passenger Train (Track Crossing): Vibration level 2 to 4 VdB below
- Jacksonville Amtrak Passenger Train (Mainline Track): Vibration level 3 to 16 VdB below
- Jacksonville Amtrak Passenger Train (Mainline Track): Vibration level 5 VdB above, High Speed Amtrak Passenger Train Traveling at up to 79 mph

- Indiantown High Speed Amtrak Passenger Train (Mainline Track): Vibration level 1 to 4 VdB above, Due to speed difference between the Amtrak Passenger Trains and the FEC Corridor Freight Trains.

The Amtrak Passenger Trains currently travel at speeds of up to 79 mph while the FEC Corridor freight trains travel at lower speeds of up to 49 mph. The differences in transit event speed accounts for the difference in the vibration levels established in this assessment. Under the proposed project conditions, the Amtrak Passenger Trains will travel at speeds of up to 90 mph. The actual speed could be less for locations in close proximity to the Amtrak Stations and at locations where there are numerous close proximity track crossing locations due to safety considerations.

The City of West Palm Beach and the City of Jacksonville do not have any criteria related to ground-borne vibration or its effects as it relates to transit railway events.

APPENDIX – A

**PROGRAMMATIC ENVIRONMENTAL ASSESSMENT FOR NOISE AND VIBRATION,
OCTOBER 2009**

14 species of snappers (family *Lutjanidae*), nine species of porgies (family *Sparidae*), 11 species of grunts (family *Haemulidae*), eight species of jacks (family *Carangidae*), three species of tilefishes (family *Malacanthidae*), three species of triggerfishes (family *Balistidae*), two species of wrasses (family *Labridae*), and the Atlantic spadefish (*Chaetodipterus faber*).

- Shrimp – includes White shrimp (*Litopenaeus setiferus*), Pink shrimp (*Farfantepenaeus duorarum*), Brown shrimp (*Farfantepenaeus aztecus*), Rock shrimp (*Sicyonia brevirostris*), and Royal red shrimp (*Pleoticus robustus*).
- Spiny lobster (*Panulirus argus*)

The proposed stations and the adjoining areas in St. Augustine, Daytona Beach, Titusville, Cocoa, Melbourne, Vero Beach, Fort Pierce, and Stuart do not contain EFH.

The No-build Alternative would not impact EFH. Ongoing coordination efforts with NMFS would continue to Avoid or minimize potential impacts to EFH during project-level NEPA.

3.3 Atmospheric Environment

3.3.1 Air Quality

Transportation sources that use fossil fuels for power produce pollutants. The primary mode of transportation in the study area is the personal automobile and the FEC freight trains. A project that affects overall VMT or changes the distribution of trips by mode would affect fuel use and the amount of pollutants emitted.

The EPA has established National Ambient Air Quality Standards (NAAQS) for six criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO₂), ozone (O₃), lead (Pb), particulate matter (PM), and sulfur dioxide (SO₂) (exhibit 3.7). Primary standards set emission limits to protect public health, and secondary standards to protect public welfare. Transportation sources, particularly motor vehicles, are the primary source of CO, oxides of nitrogen (NO_x), and hydrocarbons (also referred to as volatile organic compounds or VOC). In the presence of heat and sunlight, NO_x and VOC chemically react to form O₃. Particulate matter and SO₂ are primarily emitted from stationary sources that burn fossil fuels (e.g., power plants).

3 • Florida East Coast Amtrak Service

Exhibit 3.7 – National Ambient Air Quality Standards

Pollutant	Primary Standards		Secondary Standards	
	Level	Averaging Time	Level	Averaging Time
CO	9 ppm (10 mg/m ³)	8-hour	None	
	35 ppm (40 mg/m ³)	1-hour		
Lead (Pb)	0.15 µg/m ³	Rolling 3-Month Average	Same as Primary	
	1.5 µg/m ³	Quarterly Average	Same as Primary	
NO ₂	0.053 ppm (100 µg/m ³)	Annual (Arithmetic Mean)	Same as Primary	
Particulate Matter (PM ₁₀)	150 µg/m ³	24-hour	Same as Primary	
Particulate Matter (PM _{2.5})	15.0 µg/m ³	Annual (Arithmetic Mean)	Same as Primary	
	35 µg/m ³	24-hour	Same as Primary	
O ₃	0.075 ppm (2008 std)	8-hour	Same as Primary	
	0.08 ppm (1997 std)	8-hour	Same as Primary	
	0.12 ppm	1-hour	Same as Primary	
SO ₂	0.03 ppm	Annual (Arithmetic Mean)	0.5ppm (1300 µg/m ³)	3-hour
	0.14 ppm	24-hour		

Source: <http://www.epa.gov/air/criteria.html>.

All areas of the U.S. have been assigned a designation to comply with the NAAQS. Based on air quality monitoring data, an area that has not shown a violation of the NAAQS is designated as “in attainment.” An area that has shown a violation of the NAAQS may be designated as “non-attainment.” Areas that were designated non-attainment subsequent to the Clean Air Act Amendments of 1990 (CAAA), but have since been re-designated as in attainment by the EPA, are referred to as “maintenance areas”. All counties within the study area are designated as in attainment of the NAAQS (EPA, 2009).

The No-build Alternative would not impact air quality.

The Build Alternatives, with an increased number of train trips per day, would result in a negligible increase in air emissions. The Build Alternatives are not anticipated to have a significant adverse impact to current or future air quality standards along the east coast of Florida.

3.3.2 Noise

Noise is typically defined as unwanted or undesirable sound, where sound is characterized by small air pressure fluctuations above or below the atmospheric pressure. The basic parameters of noise that affect human subjective response are: (1) intensity or level; (2) frequency content; and (3) variation with time. Intensity or level of noise is determined by how great the sound pressure fluctuates above or below the atmospheric pressure, and is expressed on a compressed scale in units of decibels. By using this scale, the

range of normally encountered sound can be expressed by values between 0 and 120 decibels. On a relative basis, a 3-decibel change in sound level generally represents change which is barely perceptible to the human ear, whereas a 10-decibel change in sound level would typically be perceived as a doubling (or halving) in the loudness of a sound.

The frequency content of noise is related to the tone or pitch of the sound, and is expressed based on the rate of the air pressure fluctuation in terms of cycles per second, called Hertz (Hz). The human ear can detect a wide range of frequencies from about 20 Hz to 17,000 Hz. However, because the sensitivity of human hearing varies with frequency, the A-weighting system is commonly used when measuring environmental noise to provide a single number descriptor that correlates with human subjective response. Sound levels measured using this weighting system are called “A-weighted” sound levels (dBA). The A-weighted sound level is widely accepted by acousticians as a proper unit for describing environmental noise.

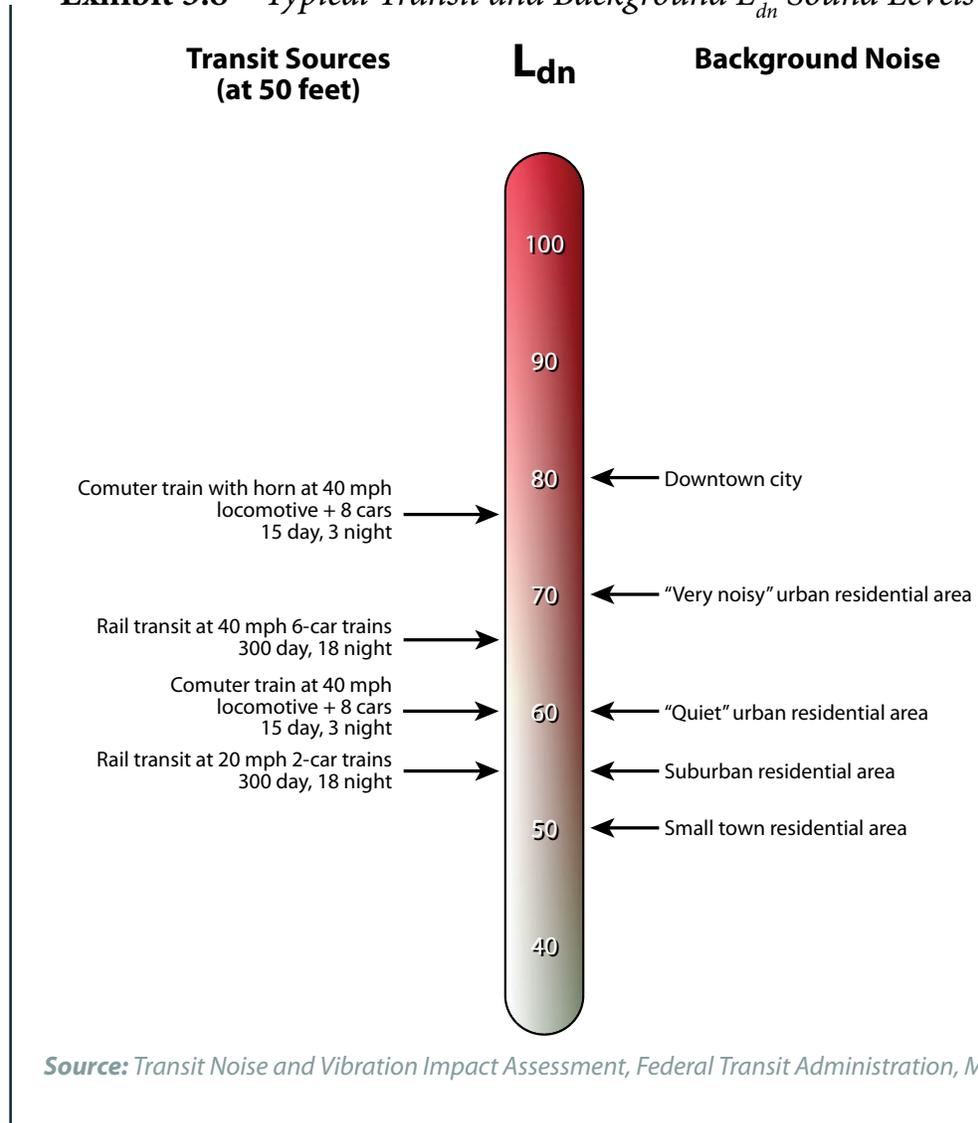
Because noise fluctuates over time, it is common practice to condense this information into a single number called the “equivalent” sound level (L_{eq}). L_{eq} can be thought of as the steady sound level that represents the same sound energy as the varying sound levels experienced over a specified time period (typically 1 hour or 24 hours). Often the L_{eq} values over a 24-hour period are used to calculate cumulative noise exposure in terms of the Day-Night Sound Level (L_{dn}). L_{dn} is the A-weighted L_{eq} for a 24-hour period with an added 10-decibel penalty imposed on noise that occurs during the nighttime hours (between 10 PM and 7 AM). Many surveys have shown that L_{dn} is well correlated with human annoyance and this descriptor is widely used for noise impact assessment (exhibit 3.8). While the extremes of L_{dn} range from 50 dBA in a small residential environment to 80 dBA in noisy urban environments, L_{dn} is generally found to range between 55 dBA and 75 dBA in most communities.

The noise criteria and descriptors used to determine impact assessment depend on land use (exhibit 3.9). Residences are in Land Use Category 2. Category 2 includes buildings where people normally sleep (e.g., residences, hospitals); nighttime sensitivity to noise is of utmost importance.

The noise metric used for Category 2 land use is the L_{dn} , the day-night sound level. The L_{dn} descriptor is commonly used to determine the cumulative noise impact for residential land uses. L_{dn} is defined as the cumulative

3 · Florida East Coast Amtrak Service

Exhibit 3.8 – Typical Transit and Background L_{dn} Sound Levels



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

Exhibit 3.9 – Land Use Categories and Metrics for Transit Noise Impact Criteria

Land Use Category	Noise Metric(dBA)	Description of Land Use Category
1	Outdoor $L_{eq}(h)^*$	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 theater and concert pavilions.
2	Outdoor L_{dn}	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 $L_{eq}(h)^*$	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. Active parks. Buildings with interior spaces where quiet is important, such as medical offices and conference rooms, recording studios and concert halls, fall into this category. Places of worship, meditation or study associated with cemeteries, monuments, museums and certain historical sites are also included.

*Note: L_{eq} for the noisiest hour of transit-related activity during hours of noise sensitivity.

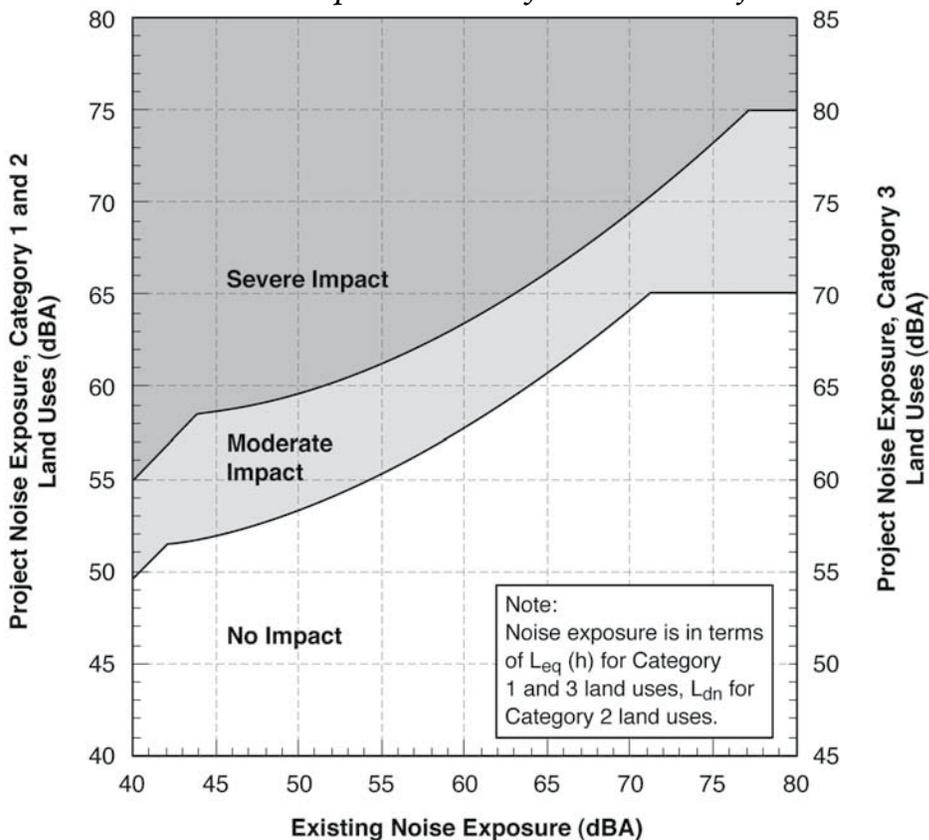
Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

24-hour noise exposure that accounts for the moment to moment fluctuations in A-weighted levels from all sound sources during a 24-hour period.

The L_{dn} is the descriptor of choice because it correlates well with surveys measuring the public attitude towards noise impacts, increases with the duration of transit events, and considers the number of transit events over a full day. The L_{dn} accounts for increased sensitivity to noise at night by increasing nighttime noise (between 10:00 PM and 7:00 AM) by 10 decibels before totaling.

The FTA Noise Impact Criteria define the severity of impact for various noise exposure levels for Category 2 land uses (exhibit 3.10 and 3.11). The criteria are based on a comparison of existing and future project-related outdoor noise levels. They incorporate both absolute criteria (noise from the proposed project), and relative criteria (annoyance as a result of project induced changes in noise levels). Impacts are assessed based on a combination of the existing ambient noise exposure and the additional noise exposure from the project, which have been determined to be noise levels exceeding 65 dBA and an increase of 3 dBA above existing sound levels.

Exhibit 3.10 – Noise Impact Criteria for Transit Projects



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

3 • Florida East Coast Amtrak Service

Exhibit 3.11 – Noise Levels Defining Impact for Transit Projects

Existing Noise Exposure* $L_{eq}(h)$ or L_{dn} (dBA)	Project Noise Impact Exposure,* Leq(h) or Ldn (dBA)					
	Category 1 or 2 Sites			Category 3 Sites		
	No Impact	Moderate Impact	Severe Impact	No Impact	Moderate Impact	Severe Impact
<43	< Ambient+10	Ambient + 10 to 15	>Ambient+15	<Ambient+15	Ambient + 15 to 20	>Ambient+20
43	<52	52-58	>58	<57	57-63	>63
44	<52	52-58	>58	<57	57-63	>63
45	<52	52-58	>58	<57	57-63	>63
46	<53	53-59	>59	<58	58-64	>64
47	<53	53-59	>59	<58	58-64	>64
48	<53	53-59	>59	<58	58-64	>64
49	<54	54-59	>59	<59	59-64	>64
50	<54	54-59	>59	<59	59-64	>64
51	<54	54-60	>60	<59	59-65	>65
52	<55	55-60	>60	<60	60-65	>65
53	<55	55-60	>60	<60	60-65	>65
54	<55	55-61	>61	<60	60-66	>66
55	<56	56-61	>61	<61	61-66	>66
56	<56	56-62	>62	<61	61-67	>67
57	<57	57-62	>62	<62	62-67	>67
58	<57	57-62	>62	<62	62-67	>67
59	<58	58-63	>63	<63	63-68	>68
60	<58	58-63	>63	<63	63-68	>68
61	<59	59-64	>64	<64	64-69	>69
62	<59	59-64	>64	<64	64-69	>69
63	<60	60-65	>65	<65	65-70	>70
64	<61	61-65	>65	<66	66-70	>70
65	<61	61-66	>66	<66	66-71	>71
66	<62	62-67	>67	<67	67-72	>72
67	<63	63-67	>67	<68	68-72	>72
68	<63	63-68	>68	<68	68-73	>73
69	<64	64-69	>69	<69	69-74	>74
70	<65	65-69	>69	<70	70-74	>74
71	<66	66-70	>70	<71	71-75	>75
72	<66	66-71	>71	<71	71-76	>76
73	<66	66-71	>71	<71	71-76	>76
74	<66	66-72	>72	<71	71-77	>77
75	<66	66-73	>73	<71	71-78	>78
76	<66	66-74	>74	<71	71-79	>79
77	<66	66-74	>74	<71	71-79	>79
>77	<66	66-75	>75	<71	71-80	>80

* L_{dn} is used for land use where nighttime sensitivity is a factor;

L_{eq} during the hour of maximum transit noise exposure is used for land use involving only daytime activities.

Affected Environment and Environmental Consequences • 3

The FRA recommends using a screening procedure to determine the likelihood of a noise impact. The areas defined by the screening distances are meant to be sufficiently large to encompass potentially impacted locations. The FTA screening distance is 750 feet for an area with unobstructed line of sight to the rail project and the screening distance is 1,600 feet for grade crossings where the train would blow the horn as a safety measure.

There are significant sources of existing noise along the mainline from FEC operations. The FEC Railway is primarily used for heavy freight transport and long train consists which make the existing conditions the dominant vibration source. The heavy freight operations typically consist of eighteen trains per day.

Nine 24-hour measurements conducted for the SFECCTA study were used as the baseline for this project. Nine additional measurements were taken (exhibit 3.12). Three 24-hour noise measurements were taken in Palm Beach, Broward, and Miami-Dade Counties on different land uses to provide an evaluation of the background baseline sound levels.

The No-build Alternative would not impact noise.

The future noise levels with the Build Alternatives were predicted based on the proposed gas turbine train technologies and the following assumptions:

- One power car and eight passenger cars
- Two additional roundtrips per day
- Operating period is between 7:00 AM and 10:00 PM
- Maximum train speed of 90 mph
- Train speed approaching the station is 10 mph
- Train would sound its horn at all grade crossings and no quiet zones exist

The future noise impacts distances were calculated for the Build Alternatives with and without the horn at grade crossings and at stations (exhibit 3.13).

The distances for moderate and severe noise impacts are within the existing FEC Railway ROW; the Build Alternatives would result in no moderate or severe noise impacts when the trains are operating on the mainline or near

Exhibit 3.12 – Summary of Existing Sound Levels within the FEC Railway

County	Location	L_{dn} (dBA)
Palm Beach	Intersection of Lakeview Ave and Alabama Ave	81
Palm Beach	502 Park Place	75
Palm Beach	591 Valley Forge Rd	80
Broward	Hardy Park	79
Broward	130 W. Broward Blvd.	75
Broward	210 SW 11th Ct	79
Miami-Dade	19392 W. Dixie Hwy	78
Miami-Dade	NE 101 St and Park Drive	77
Miami-Dade	9076 NE 4th Ave	75

3 • Florida East Coast Amtrak Service

Exhibit 3.13 – Summary of Noise Impact Distances (feet)

Land Use	Service without Horn (Speed 90 mph)		Service with Horn (Speed 90 mph)		At stations (Speed 10 mph)	
	Severe	moderate	Severe	moderate	Severe	moderate
Quiet Outdoors	3	12	20	91	4	16
Residential	2	9	14	66	3	12
Institutional	1	6	9	42	2	8

stations. When the trains approach grade crossings and blow the horn, there is a potential for moderate impacts to land uses with nighttime sensitivity (e.g., houses, hotels, hospitals) and land uses where quiet is important (e.g., meditation places). The potential area of moderate impacts, measured from the FEC Railway centerline, is 66 feet for land uses with nighttime sensitivity and 91 feet for land uses where quiet is important. As a part of the ETDM process and project-level NEPA, additional analysis and coordination will occur as needed.

3.3.3 Vibration

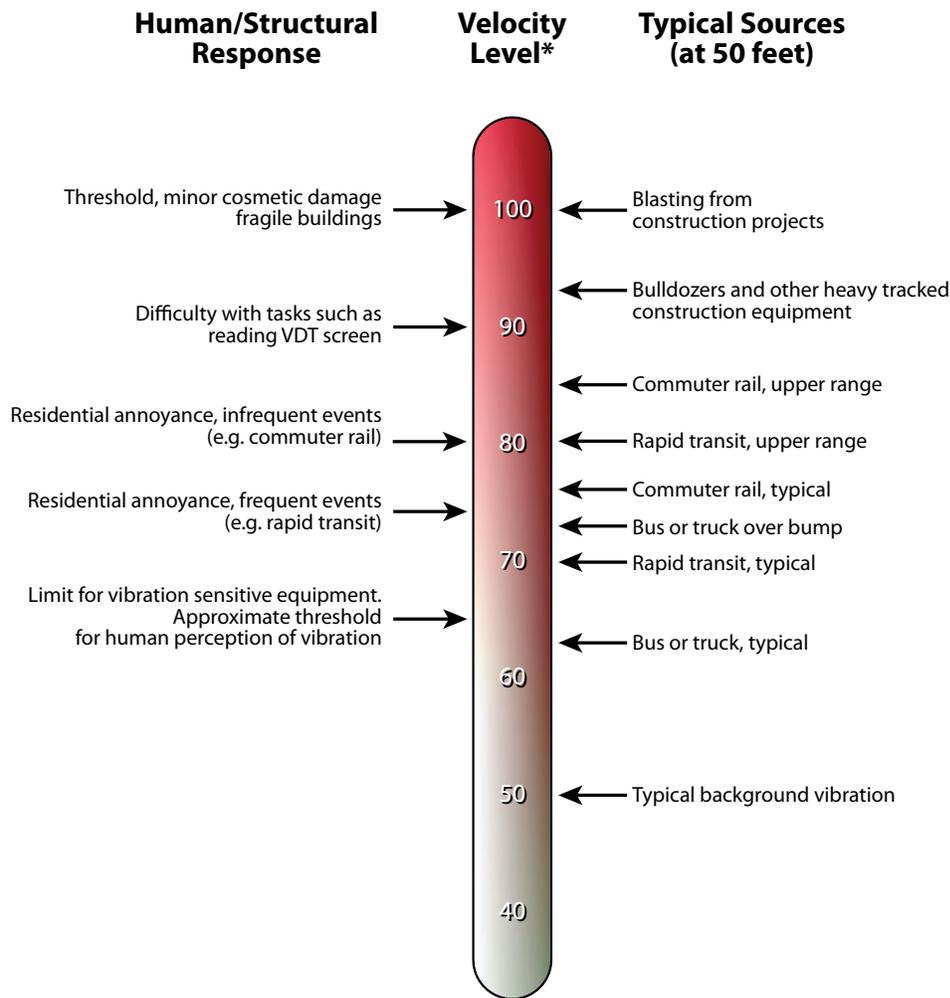
Ground-borne vibration is the oscillatory motion of the ground surrounding some equilibrium position described in terms of displacement, velocity, or acceleration. Because sensitivity to vibration typically corresponds to the amplitude of vibration velocity within the low-frequency range of most concern for environmental vibration (roughly 5-100 Hz), velocity is the preferred measure for evaluating ground-borne vibration from rail projects.

Vibration consists of rapidly fluctuating motions with an average motion of zero. Several descriptors can be used to quantify vibration amplitude. The most common measure used to quantify vibration amplitude is the peak particle velocity (PPV), defined as the maximum instantaneous peak of the vibratory motion. PPV is typically used in monitoring blasting and other types of construction-generated vibration, since it is related to the stresses experienced by buildings. Although PPV is appropriate for evaluating building damage, it is less suitable for evaluating human response, which is better related to the average vibration amplitude. In a sense, the human body responds to average vibration amplitude. Because the net average of a vibration signal is zero, the root mean square (rms) vibration velocity level, in decibels (VdB), is used to describe the “smoothed” vibration amplitude. Thus, ground-borne vibration levels are stated in units of vibration decibels (VdB). This unit is equivalent to a velocity of one micro-inch per second

(10⁻⁶ in/sec.). This is not a universally accepted notation; it is used to reduce the confusion with sound decibels.

Typical ground-borne vibration levels for common sources, as well as criteria for human and structural response to ground-borne vibration, range from approximately 50 to 100 VdB (exhibit 3.14). Although the approximate threshold of human perception to vibration is 65 VdB, annoyance is usually not significant unless the vibration exceeds 70 VdB.

Exhibit 3.14 – Typical Ground-Borne Vibration Levels



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

The FRA ground-borne vibration impact criteria are based on land use and train frequency (exhibit 3.15). Vibration sensitive receptors are classified in three categories:

3 • Florida East Coast Amtrak Service

Exhibit 3.15 – Ground-Borne Vibration and Noise Impact Criteria

Land Use Category	Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/sec)		
	Frequent Events ¹	Occasional Events ²	Infrequent Events ³
Category 1: Buildings where vibration would interfere with interior operations.	65 VdB ⁴	65 VdB ⁴	65 VdB ⁴
Category 2: Residences and buildings where people normally sleep.	72 VdB	75 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	78VdB	83 VdB

Notes:

1 "Frequent Events" is defined as more than 70 vibration events of the same source per day. Most rapid transit projects fall into this category.

2 "Occasional Events" is defined as between 30 and 70 vibration events of the same source per day. Most commuter trunk lines have this many operations.

3 "Infrequent Events" is defined as fewer than 30 vibration events of the same kind per day. This category includes most commuter rail lines.

4 This criterion limit is based on levels that are acceptable for most moderately sensitive equipment such as optical microscopes. Vibration sensitive manufacturing or research will require detailed evaluation to define the acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC systems and stiffened floors.

5 Vibration-sensitive equipment is not sensitive to ground-borne noise.

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

- Category 1 receptors are those buildings where low ambient vibrations are essential for the operations conducted within the building. An example of Category 1 receptor is a building in which research using electron microscopes is conducted.
- Category 2 receptors consist of single family residences, apartments, and townhouses.
- Category 3 receptors consist of churches, schools and other commercial buildings that do not house vibration sensitive equipment.

There are some buildings, such as concert halls, recording studios, and theaters, which can be very sensitive to vibration, but do not fit into the three categories (exhibit 3.16). Due to the sensitivity of these buildings, they usually warrant special attention during the assessment of a rail project.

The FRA recommends the following screening procedure to determine if there is a likelihood of vibration impact from a project (exhibit 3.17).

The FRA guidelines require a screening distance of 200 feet for evaluation of Category 2 receivers. This means, in the absence of measurements or in-

Affected Environment and Environmental Consequences • 3

Exhibit 3.16 – Ground-Borne Vibration and Noise Impact Criteria for Special Buildings

Type of Building or Room	Ground-Borne Vibration Impact Levels (Vdb Re 1 Micro-Inch/Sec)	
	Frequent Events ¹	Occasional or Infrequent Events ²
Concert Halls	65 VdB	65 VdB
TV Studios	65 VdB	65 VdB
Recording Studios	65 VdB	65 VdB
Auditoriums	72 VdB	80 VdB
Theaters	72 VdB	80 VdB

Notes:

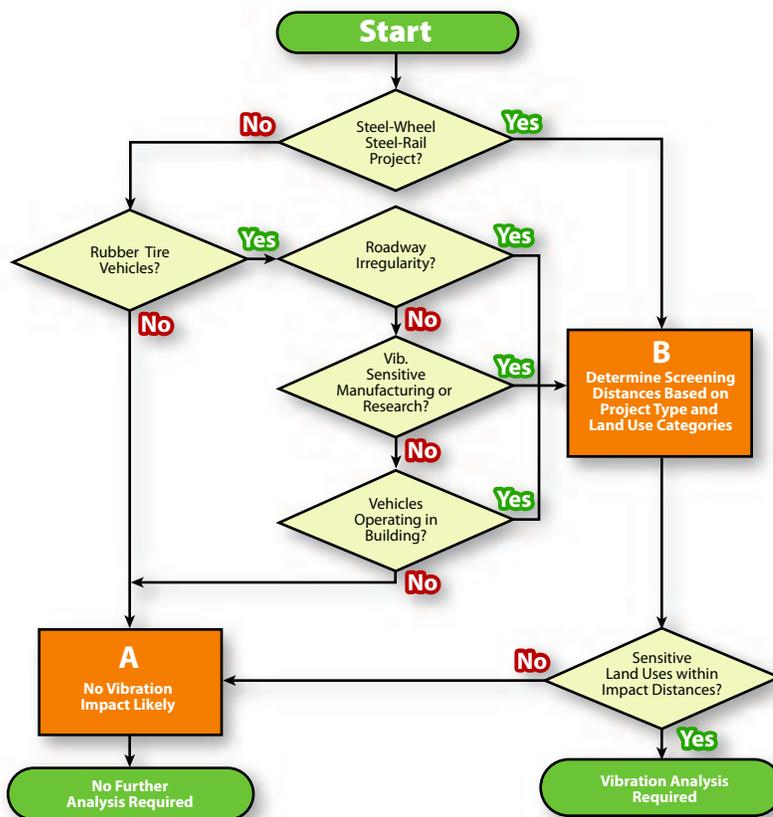
1 "Frequent Events" is defined as more than 70 vibration events per day. Most rapid transit projects fall into this category.

2 "Occasional or Infrequent Events" is defined as fewer than 70 vibration events per day. This category includes most commuter rail systems.

3 If the building would rarely be occupied when the trains are operating, there is no need to consider impact. As an example consider locating a commuter rail line next to a concert hall. If no commuter trains would operate after 7 pm, it should be rare that the trains interfere with the use of the hall.

Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

Exhibit 3.17 – Flow Chart of Vibration Screening Process



Source: Transit Noise and Vibration Impact Assessment, Federal Transit Administration, May 2006

3 • Florida East Coast Amtrak Service

situ testing, that vibration levels beyond 200 feet from the track would not cause an impact to residences. For the Florida East Coast Amtrak Service Project, residences exist within 200 feet and may be susceptible to vibration impacts. Sources of existing ground-borne vibration in the study area are the FEC Railway and Amtrak trains. In-situ testing of both train operations on the FEC has been conducted to assess vibration levels caused by commuter and freight trains. Existing vibration levels were measured and used as a baseline to predict future vibration levels.

The FEC Railway is primarily used for heavy freight transport and long train consists which make the existing conditions of the heavy freight the dominant vibration source on this line. The heavy freight operations typically include eighteen trains per day (exhibit 3.18). The FEC Railway heavy freight operations were measured and found to produce vibration levels of approximately 95 VdB at 130 feet from the track.

The No-build Alternative would not impact vibration.

The Build Alternatives are not anticipated to impact vibration. The median vibration level (VdB) at each distance measured decreases as distance increases (exhibit 3.19).

No significant noise and vibration impacts are anticipated as a result of the project; however, as part of the ETDM process and project-level NEPA, additional analysis and coordination would occur as appropriate.

The FTA vibration level for infrequent operations and residential receivers is 80 VdB. Measurements indicate that Amtrak service results in vibration levels of 80 VdB within approximately 130 feet of the track. Beyond this distance, the vibration levels are lower than 80 VdB and do not cause

Exhibit 3.18 – Heavy Freight Vibration Levels within the FEC corridor

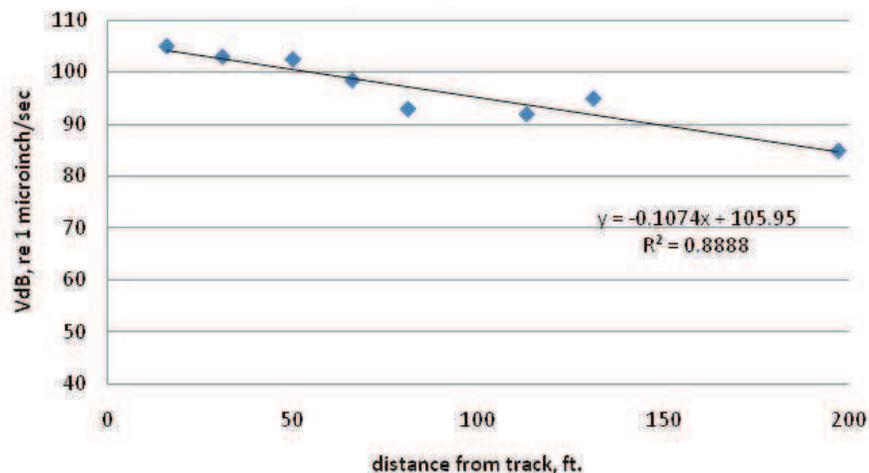
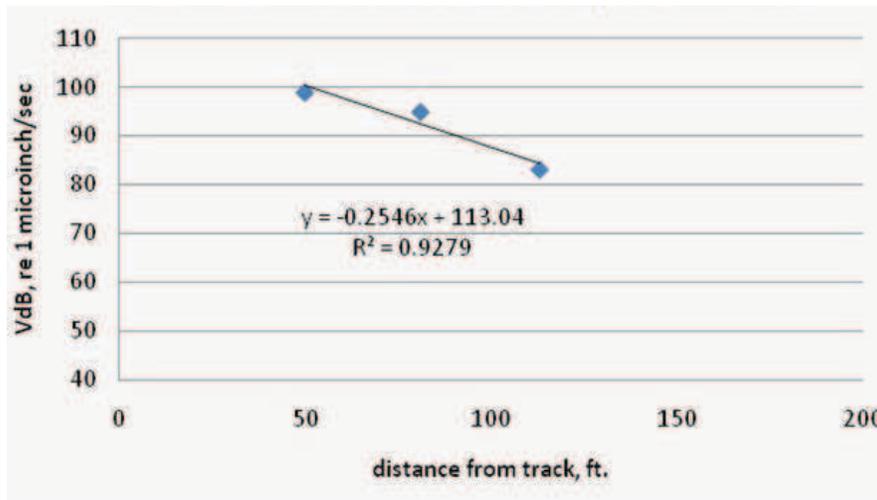


Exhibit 3.19 – Amtrak Rail Operations Vibration Levels



a residential impact. According to the FTA guidelines, the criteria is based on a speed of 50 mph and a speed correction to 90 mph results in a 5 VdB increase in the baseline vibration level to 85 VdB at 130 feet.

The additional passenger service was compared to the existing conditions on the FEC Railway. The proposed passenger service is short duration and less impact than freight operations. Heavy freight operations produce vibration levels of approximately 95 VdB at 130 feet from the track. The FTA guidelines state, if new passenger service is predicted to be 5 VdB below existing levels, there is no impact from the new service. As the freight rail operations generate vibration levels 10 VdB higher than the proposed service, the build alternatives would not result in vibration impacts. As a part of the ETDM process and project-level NEPA, additional analysis and coordination will occur as needed.

3.4 Social Environment

3.4.1 Land Use, Zoning and Property Acquisition

3.4.1.1 Existing Land Use

The most common land use in the study area is retail/office (exhibit 3.20). Retail/office land use comprises about 16 percent of the total land in the study area. Palm Beach, Broward, and Miami-Dade Counties contain the largest percentages of retail/office land in the study area with about 31 percent, 22 percent, and 16 percent, respectively.

Approximately 2,079 acres (15 percent) of the study area along the FEC Railway are classified as residential. Palm Beach County counts for approximately 30 percent of the residential in the study area, followed by Brevard County with 15 percent.

APPENDIX – B

NOISE AND VIBRATION MONITORING EQUIPMENT



West Palm Beach Amtrak Station - Mainline



West Palm Beach Amtrak Station – Track Crossing



West Palm Beach FEC Train Corridor – Mainline



West Palm Beach FEC Train Corridor – Track Crossing



Indiantown Amtrak High Speed – Mainline / Track Crossing



Vero Beach FEC Train Corridor High Speed – Mainline



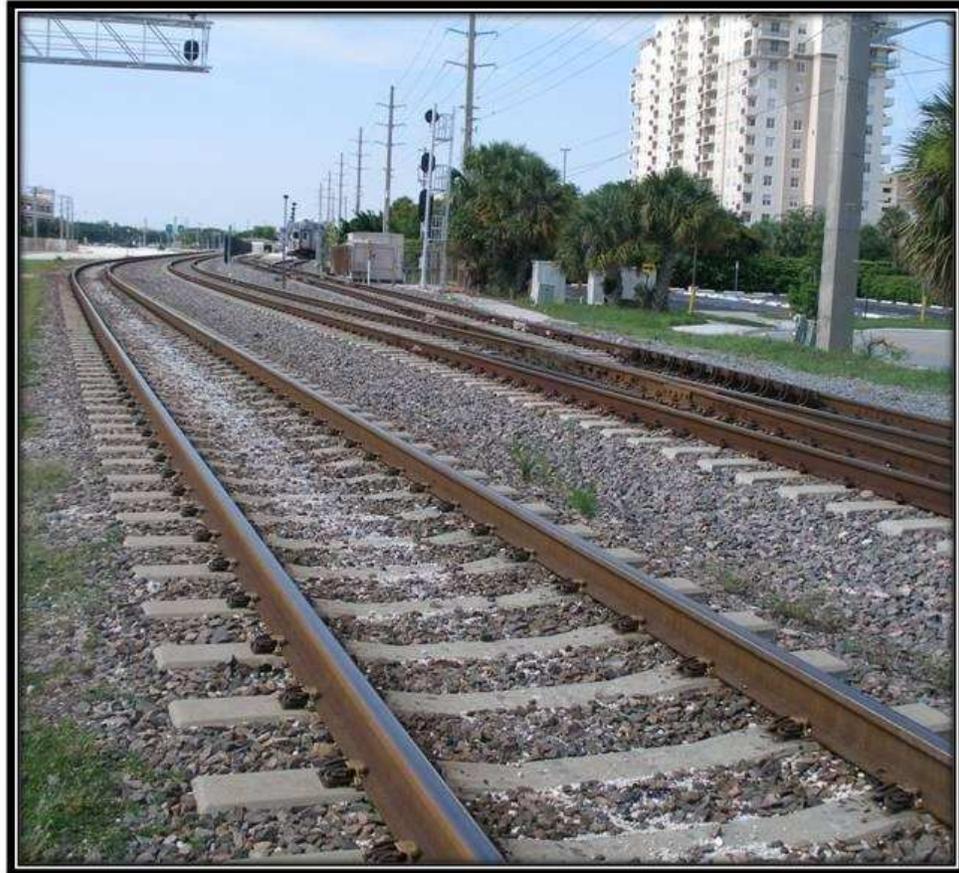
Jacksonville Amtrak and FEC Train Corridor High Speed – Mainline



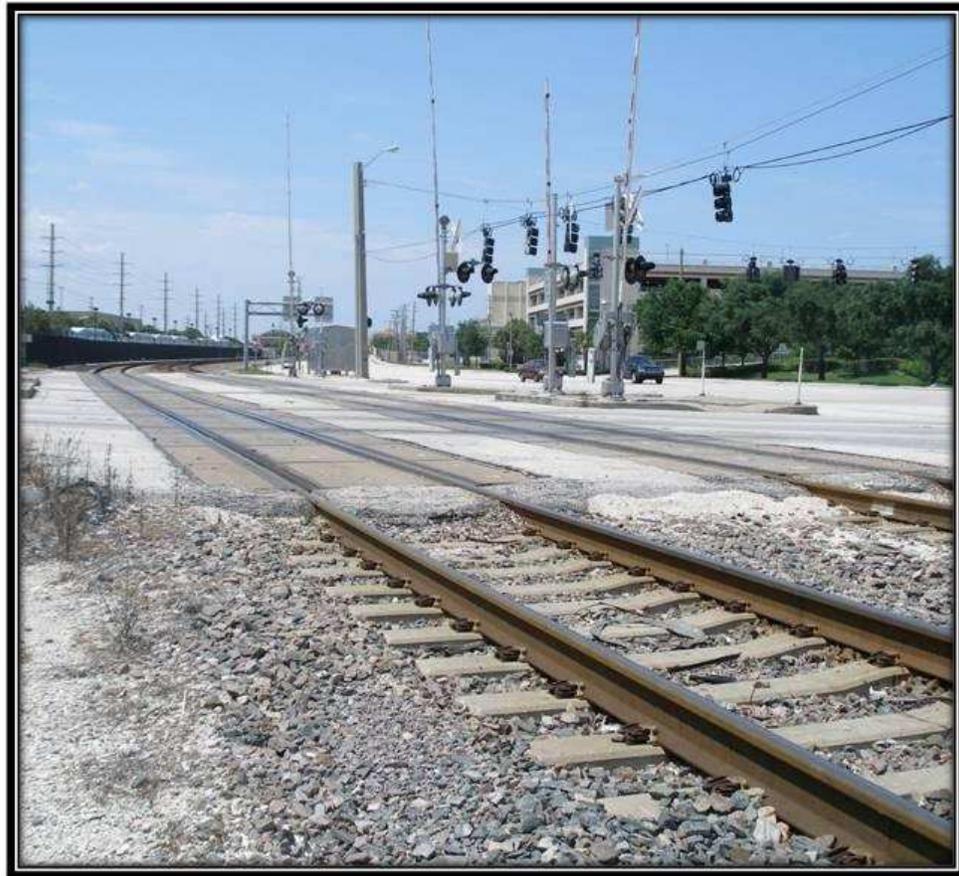
Jacksonville Amtrak and FEC Train Corridor High Speed – Track Crossing

APPENDIX – C

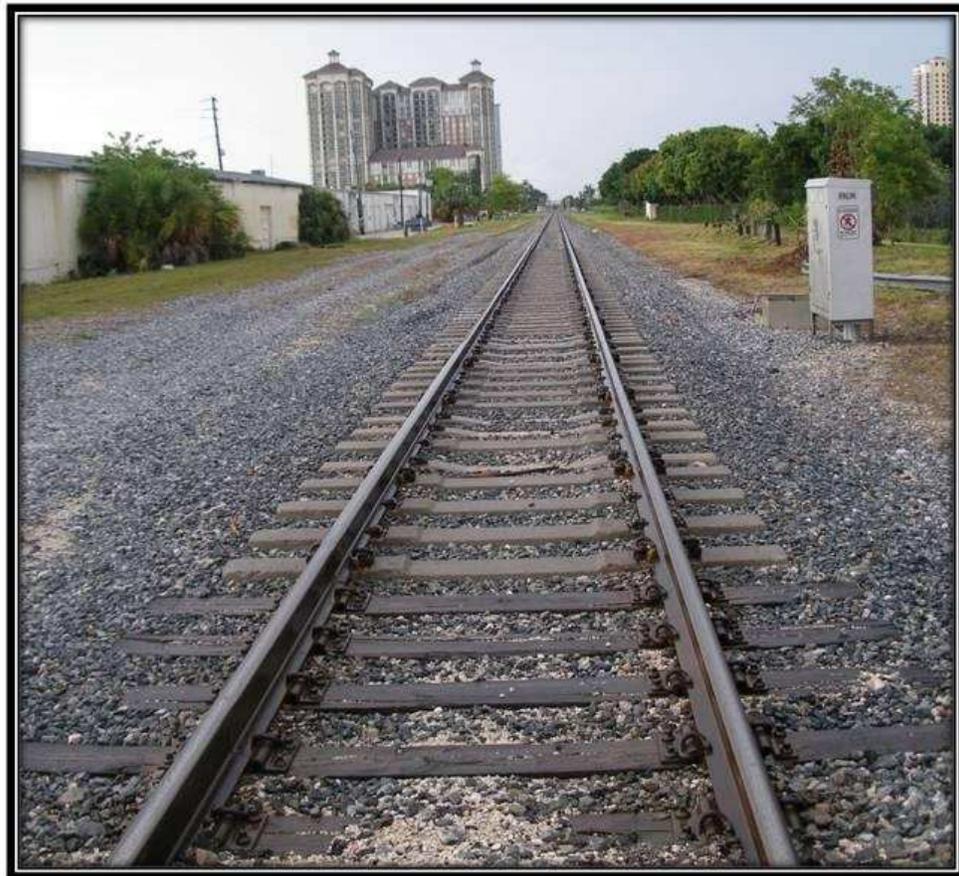
EXISTING AMTRAK AND FEC RAILWAY TRACK CONDITIONS



West Palm Beach Amtrak Station – Mainline Track Conditions



West Palm Beach Amtrak Station – Track Crossing Conditions



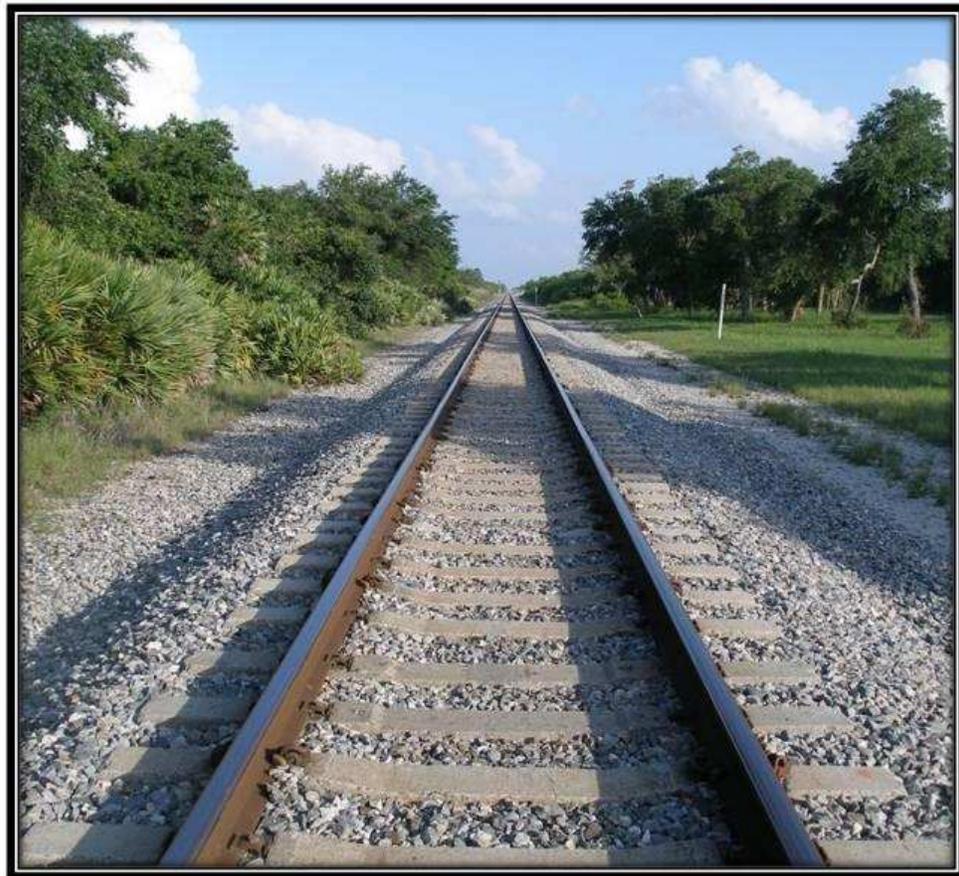
West Palm Beach FEC Train Corridor – Mainline Track Conditions



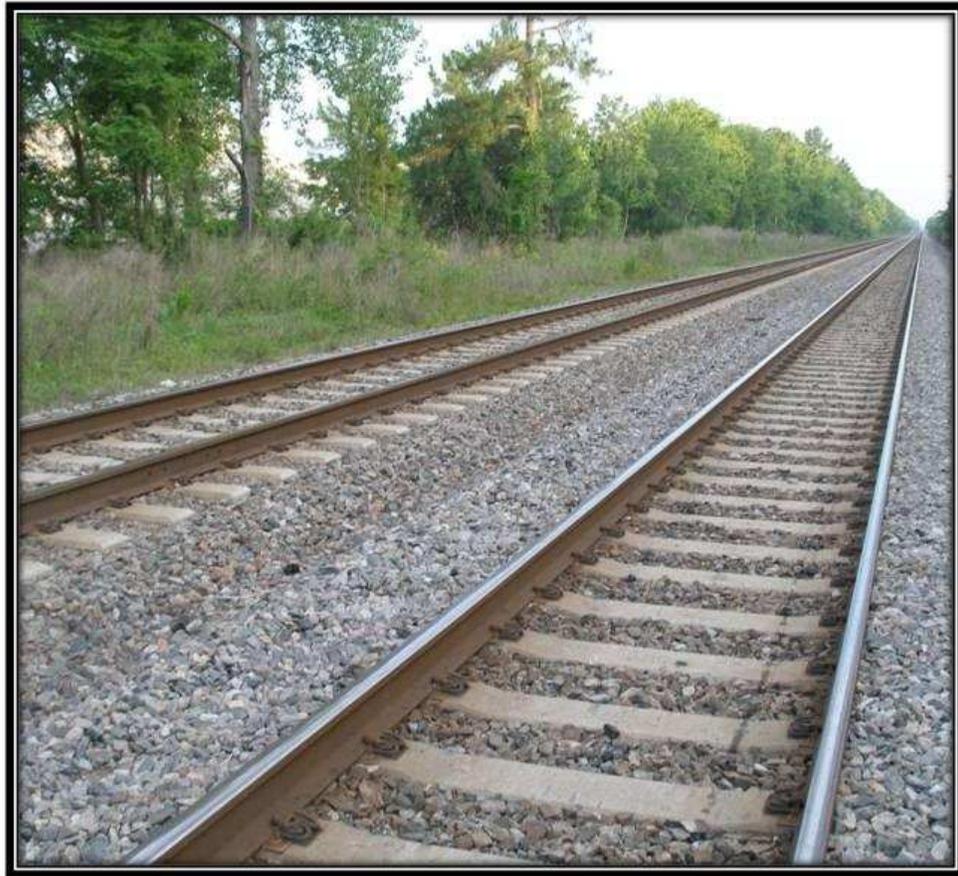
West Palm Beach FEC Train Corridor – Track Crossing Conditions



Indiantown Amtrak High Speed Mainline – Track Conditions



Vero Beach FEC Train Corridor High Speed Mainline – Track Conditions



Jacksonville Amtrak and FEC Train Corridor High Speed Mainline
Double Track - Track Conditions



Jacksonville Amtrak and FEC Train Corridor High Speed
Double Track Crossing - Track Conditions

APPENDIX – D

CITY OF WEST PALM BEACH NOISE ORDINANCE

ARTICLE II. - NOISE CONTROL REGULATIONS*

Editor's note—

Ord. No. 4136-08, § 1, adopted April 21, 2008, amended Art. II in its entirety to read as herein set out. Former Art. II, §§ 34-31—34-44, pertained to similar subject matter and derived from Ord. No. 4105-08, § 1, adopted Mar. 10, 2008.

[Sec. 34-31. - Purpose.](#)

[Sec. 34-32. - Findings.](#)

[Sec. 34-33. - Scope.](#)

[Sec. 34-34. - Definitions.](#)

[Sec. 34-35. - Noises; unnecessary and excessive prohibited.](#)

[Sec. 34-36. - Responsibility for compliance.](#)

[Sec. 34-37. - Noise level in specific area.](#)

[Sec. 34-38. - Sound limitations for health care facilities.](#)

[Sec. 34-39. - Temporary permits.](#)

[Sec. 34-40. - Exemptions.](#)

[Sec. 34-41. - Enforcement by code enforcement officers; notice of violation.](#)

[Sec. 34-42. - Fines and penalties for violation; appeals; alternate means of enforcement.](#)

[Sec. 34-43. - Motor vehicle alarms.](#)

[Sec. 34-44. - Nuisance.](#)

[Secs. 34-45—34-70. - Reserved.](#)

Sec. 34-31. - Purpose.

This article is enacted to protect, preserve, and promote the health, safety, welfare, peace and quiet of the inhabitants and visitors of the City of West Palm Beach through the reduction, control, and prevention of loud and raucous noise, or any noise which unreasonably disturbs, injures, or endangers the comfort, repose, health, peace, or safety of the city's inhabitants and visitors.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-32. - Findings.

(a)

Loud and raucous noise degrades the environment of the city to a degree that:

(1)

Is harmful to the health, welfare, and safety of its inhabitants and visitors;

(2)

Interferes with the comfortable enjoyment of life and property;

(3)

Interferes with the well being, tranquility, and privacy of the home; and

(4)

Both causes and aggravates health problems.

(b)

Both the effective control and the elimination of loud and raucous noise are essential to the health and welfare of the city's inhabitants and visitors, and to the conduct of the normal pursuits of life, including recreation, work, and communication.

(c)

The city has a substantial interest in protecting citizens from unwelcome noise.

(d)

The use of sound amplification equipment creates loud and raucous noise that may, in a particular manner and at a particular time and place, substantially and unreasonably invade the privacy, peace, and freedom of inhabitants of, and visitors to, the city.

(e)

The city has a substantial interest in protecting its merchants from unwelcome noise that has the effect of preventing the transaction of business due to excessive noise.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-33. - Scope.

This article applies to the control of all sound originating within the jurisdictional limits of the city.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-34. - Definitions.

The following words, terms and phrases, when used in this article, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Amplified sound means a sound augmented by any electronic or other means that increases the sound level or volume.

Code enforcement officer means an authorized employee or agent of the city whose duty it is to ensure code compliance, including but not limited to inspectors or the city's code enforcement department and police officers.

Emergency work means any work performed for the purpose of remedying conditions that create an imminent peril to life, health or property.

Plainly audible means the sound can be clearly heard by a person of normal sensibilities using only unaided auditory senses.

Property line means an imaginary line along the ground surface, and its vertical extension, which separates the real property owned by a person from that owned by another person, but not including intrabuilding real property divisions.

Receiving property means any residence or place of business or other property into which sound, not originating therefrom, is traveling.

Residence means any occupied room or rooms connected together containing sleeping facilities, including single- and multiple-family homes, townhomes, apartments, condominium units, and hotel and motel rooms.

Sound source means the place from which sound emanates, including without limitation a speaker, loudspeaker, or other sound-producing instrument, motor vehicle, person, animal or bird.

Special master means a hearing officer appointed pursuant to chapter 26 of this Code.

Uninvited noise means noise not originating on the receiving property.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-35. - Noises; unnecessary and excessive prohibited.

It shall be unlawful for any person to make, continue, or cause to be made or continued any unreasonably loud, excessive, unnecessary or unusual noise. The following acts, among others, are declared to be unreasonably loud, excessive, unnecessary or unusual noises in violation of this section, but this enumeration shall not be deemed to be exclusive, namely:

(1)

Horns, signaling devices, etc. The sounding of any horn or signaling device on any automobile, motorcycle, bus or other vehicle on any street or public place of the city, except as a danger warning; the creation by means of any such signaling device of any unreasonably loud or harsh sound; and the sounding of any such device for any unnecessary and unreasonable period of time.

(2)

Radios, televisions, phonographs, etc. The using, operating, or permitting to be played, used or operated any radio receiving set, television set, musical instrument, phonograph, or other machine or device for the producing or reproducing of sound in such manner as to disturb the peace, quiet and comfort of the neighboring inhabitants, or at any time with louder volume than is necessary for convenient hearing for the person or persons who are in the room, vehicle or chamber in which such machine or device is operated and who are voluntary listeners thereto. The operation of any such set, instrument, phonograph, machine or device between the hours of 11:00 p.m. and 7:00 a.m. in such manner as to be plainly audible at a distance of 100 feet from the building, structure or vehicle in which it is located shall be prima facie evidence of a violation of this section.

(3)

Animals, birds, etc. The owning, harboring, possessing or keeping of any dog, animal or bird which causes frequent, habitual or long continued noise which is plainly audible inside of a receiving property across a property line or in such manner as to disturb the peace, quiet and comfort of the neighboring inhabitants.

(4)

Whistles. The blowing of any locomotive whistle or whistle attached to any stationary boiler except to give notice of the

time to begin or stop work or as a warning of fire or danger or upon request of the proper municipal or county authorities.

(5)

Exhausts. The discharge into the open air of the exhaust of any steam engine, stationary internal combustion engine, or motor vehicle except through a muffler or other device which will effectively prevent unreasonably loud or explosive noises therefrom.

(6)

Defect in vehicle or load. The use of any automobile, motorcycle, jet ski, water bike, recreational vehicle, dirt bike or motor vehicle so out of repair, so loaded or in such manner as to create unreasonably loud or unnecessary grating, grinding, rattling or other noise within a residential area.

(7)

Schools, courts, houses of worship. The creation of any excessive or unreasonably loud noise on any street adjacent to any school, institution of learning, house of worship or court while the same are in use, which unreasonably interferes with the workings of such institutions, or which disturbs or unduly annoys the inhabitants of such facilities, provided conspicuous signs are displayed in such streets indicating that it is a school, house of worship or court street.

(8)

Hawkers, peddlers. The shouting and crying of peddlers, hawkers, and vendors which disturbs the peace and quiet of the neighborhood.

(9)

Noises to attract attention. The use of any drum, loudspeaker or other instrument or device for the purpose of attracting attention by creation of any unreasonably loud or unnecessary noise to any performance, show, sale, display or advertisement of merchandise.

(10)

Loudspeakers, etc. The use or operation on or upon the public streets, alleys and thoroughfares anywhere in this city for any purpose of any device known as a sound truck, loud speaker or sound amplifier or radio or any other instrument of any kind or character which emits therefrom loud and raucous noises and is attached to and upon any vehicle operated or standing upon such streets or public places aforementioned.

(11)

Power tools and landscaping equipment. The operation of noise-producing lawn mowers, lawn edgers, weed trimmers, blowers, chippers, chain saws, power tools and other noise-producing tools which are used to maintain or at a residence out-of-doors between 8:00 p.m. and 7:00 a.m.

(12)

Shouting. Any unreasonably loud, boisterous or raucous shouting in any residential area.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-36. - Responsibility for compliance.

For purposes of this article, any person owning or having responsibility for management of a premises, however temporarily, any performer or disc jockey producing sound upon any premises, any person playing music, any person having control or volume knobs or levels, and the business as named on the occupational license, if applicable, shall be jointly and severally liable for compliance with this article and shall be responsible for any violations of this article.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-37. - Noise level in specific area.

(a)

Purpose. The purpose of these regulations is to allow for areas of the city where the ambience contributes to the enjoyment by residents and visitors of uses that feature the serving of food and beverages accompanied by outdoor live and pre-recorded musical entertainment.

(b)

Boundaries. The area for which this section applies shall be located as follows: the southern right of way line of Banyan Boulevard from Tamarind Avenue to North Flagler Drive shall be the northern boundary line; the northern right of way line of Okeechobee Boulevard from Tamarind Avenue to North Flagler Drive shall be the southern boundary line; the eastern right of way line of North Flagler Drive shall be the eastern boundary line; and the western building line of Tamarind Avenue shall be the western boundary line. This area shall be referred to as the downtown area.

(c)

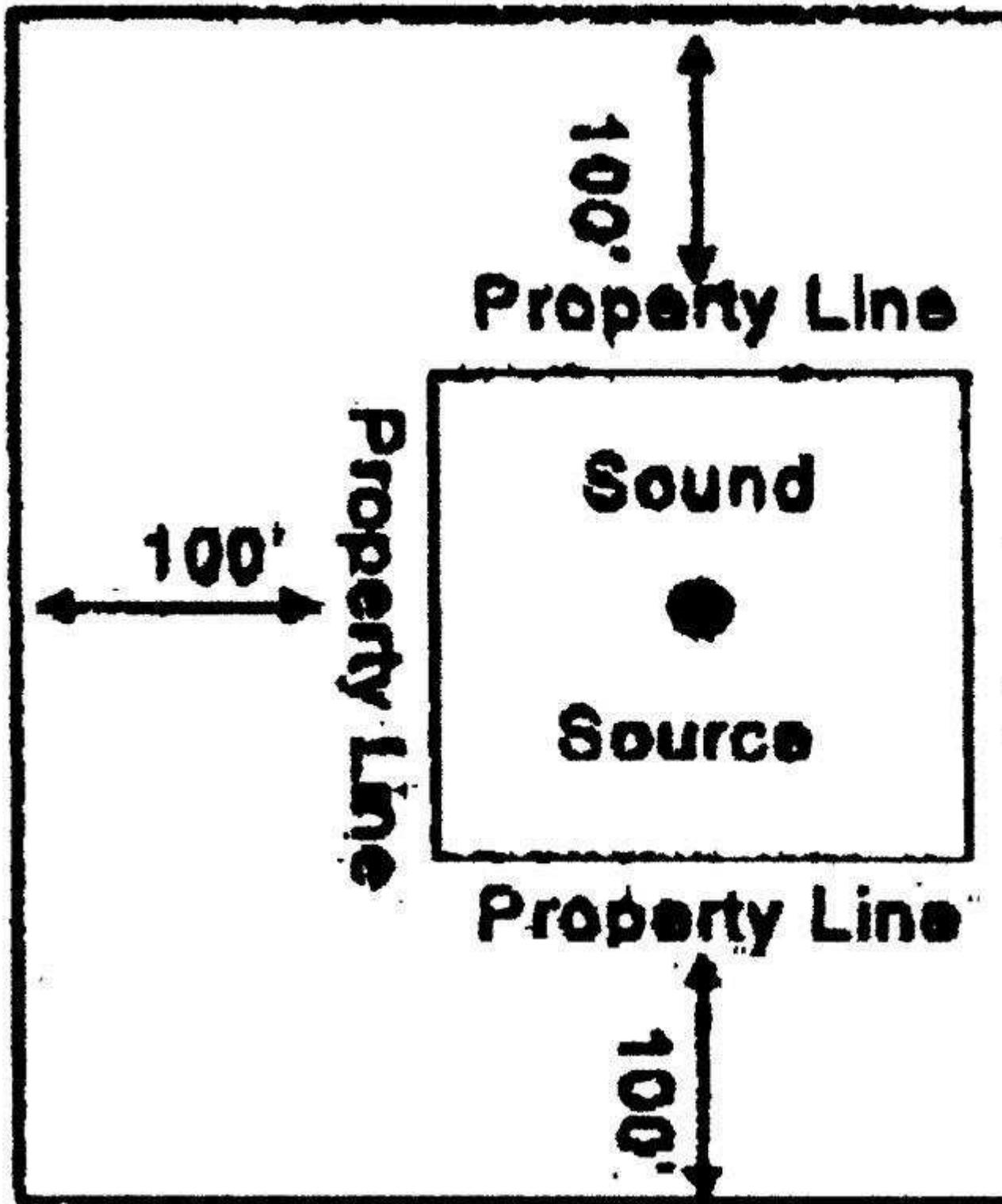
Limitation on noise volume.

(1)

For purposes of enforcement of this article, the following definition of "unreasonably loud" shall apply for all noises originating within the area as described in subsection (b) of this section:

Uninvited noise shall be deemed unreasonably loud if it is plainly audible at a distance greater than 100 feet away

from the property line of the sound source. The 100 feet distance from a sound source shall be measured in a straight line from any point on the property line of the sound source as shown in the accompanying illustration.



Boundaries for Unreasonably Loud Uninvited Noise

(2)

All procedures for enforcement of violations of the noise limitations in subsection (c)(1) of this section and for appeals of notices of violations issued by code enforcement officers shall be as set forth in this article.

(d)

No variances granted. No variances shall be granted from the permissible volume limitations set forth in subsection (c) of this

section.

(e)

Applicability of zoning provisions. The regulations set forth in this section shall be supplementary to all other provisions, and the zoning regulations set forth in chapter 94 shall continue to apply within the area.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-38. - Sound limitations for health care facilities.

(a)

No person shall produce, cause to be produced, or allow to be produced, by any means, any amplified sound, operate or play any radio, phonograph, stereo set, tape or CD player, television, sound amplifier, or other electronic audio device that produces or reproduces amplified sound on any public street or sidewalk or from private property within 100 feet of any portion of a building housing a health care facility or any other institution reserved for the sick or infirmed, provided that the public streets or sidewalks adjacent to such facilities shall be clearly marked by conspicuous signs identifying those areas. "Health care facility" as used in this subsection, includes, but is not limited to, hospitals, physicians' offices, walk-in medical centers, medical diagnostic centers, surgical centers, and facilities which are licensed, certified or otherwise authorized to perform medical procedures in this state and to provide health services. "Health care facility" shall not include residential homes, convalescent homes or other facilities that provide long term residency. Any health care facility that identifies the facility as being located in a quiet zone in accordance with subsection (b) below shall be subject to the same limitations on amplified sound described in this section within 100 feet of any portion of the building housing such health care facility.

(b)

It shall be the duty of each health care facility or owner of such establishment to erect and maintain lampposts or signs in some conspicuous place on every street, avenue or alley in the vicinity of every health care facility, public or private, indicating that the same is a "Quiet Zone." The signs which must meet and conform with the city's sign code shall be placed on such streets, avenues or alleys upon which a health care facility is situated and shall read in a manner similar to, but not restricted to, the following: "Hospital — Quiet Zone."

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-39. - Temporary permits.

(a)

The mayor is authorized to issue a temporary permit to allow noise when produced by a temporary use or activity as provided in this section. The mayor may prescribe any reasonable conditions necessary to minimize any adverse effect upon the community. A permit granted under this article shall contain all conditions upon which the permit has been granted, including the period of time for which the permit has been granted. Such relief may be granted in the following situations:

(1)

Code compliance in progress. When an applicant is utilizing best efforts to comply with the noise restrictions in this article, but additional time is required for the applicant to modify his activity to comply and no reasonable alternative is available to the applicant. Such permits may be granted for a period of time not to exceed ten days.

(2)

Construction. When construction activities pursuant to a valid building permit cannot be carried out in a manner which would comply with sections 34-35 and 34-38; provided that all equipment shall be operated in accordance with manufacturers specifications, shall be in good repair and shall utilize all noise baffling methods as specified by the manufacturer, and further provided that such activities shall occur only as follows:

a.

Between the hours of 7:00 a.m. and 7:00 p.m., Monday through Friday; between the hours of 8:00 a.m. and 8:00 p.m., Saturday and Sunday.

b.

Notwithstanding the provisions set forth in subsection (a)(2)a. of this section, the building official may authorize any construction activity at a particular site earlier than 7:00 a.m. and/or later than 8:00 p.m. The work authorized by the building official pursuant to this subsection (a)(2)b. may be conditioned upon notice to surrounding property owners and tenants.

(3)

Special events. When the applicant seeks to hold an activity or special event for which a permit is required by chapter 78, article VI, of this Code relating to special events and has met all of the city's requirements for obtaining such permit, and the activity or special event cannot be performed or held in a manner that would comply with sections 34-35 and 34-38. This section shall also apply to private entities holding leases for use of city owned property within the city.

(b)

Failure to comply with any condition of a temporary permit issued pursuant to this section shall constitute a violation and shall result in enforcement procedures and penalties as set forth in sections 34-41 and 34-42.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-40. - Exemptions.

The following uses and activities shall be exempt from the requirements of sections 34-35 and 34-38 and from the enforcement procedures in this article:

- (1) Cries for emergency assistance and warning calls, including any animal or bird giving a sound of danger or warning under particular circumstances reasonably requiring the need for warning.
- (2) Radios, sirens, horns and bells and other sounds created by police, fire and other emergency response vehicles.
- (3) Parades, fireworks displays, special events and other activities for which a permit has been obtained from the city, pursuant to section 34-39, within such hours and in accordance with such restrictions as may be imposed as conditions for the issuance of the permit.
- (4) Activities on or in municipal and school athletic facilities and on or in publicly owned property and facilities, including public plazas within community development districts ("CDD plazas"), when such activities have been authorized by the public authority owning the properties or facilities or their agents; except where such publicly owned properties other than CDD plazas are under private operation pursuant to a lease or concession agreement.
- (5) Fire alarms and burglar alarms, bells and chimes of churches or other religious institutions; however false burglary alarms shall be subject to enforcement procedures and penalties as set forth in chapter 46, article II, of this Code.
- (6) Locomotives and other railroad equipment and aircraft, to the extent that city regulation is preempted by federal law.
- (7) Noises resulting from emergency work.
- (8) Any noise resulting from activities of a temporary duration permitted pursuant to section 34-39.
- (9) Noise generated by motor vehicles as defined in F.S. § 320.01 when operated and equipped in accordance with requirements set forth in the Florida Statutes.
- (10) Noise resulting from the operation of vessels when operated in compliance with the decibel limitations in F.S. § 327.65. However, noise exceeding the limitations set forth in F.S. § 327.65 shall be subject to enforcement and penalties as set forth in F.S. Ch. 327.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-41. - Enforcement by code enforcement officers; notice of violation.

- (a) If a code enforcement officer receives a complaint from a complainant regarding a violation of this article, he shall investigate the complaint and determine whether the violation exists. If the code enforcement officer observes a violation of this article, the inspector shall inform the violator that he must immediately cease the violation and will be subject to additional penalties if the violation continues and issue a notice of violation to the violator as provided in chapter 26 of this Code. The notice shall inform the violator of the:
 - (1) Name of the violator.
 - (2) Date and time of violation.
 - (3) Nature of the violation.
 - (4) Amount of fine for which the violator may be liable pursuant to section 34-42 of this Code or as otherwise provided by law.
 - (5) Instructions and due date for paying the fine.
 - (6) Notice that the violation may be appealed by requesting an administrative hearing within ten days after service of the notice of violation, that failure to do so shall constitute an admission of the violation and waiver of the right to a hearing, and that unpaid fines will result in the imposition of liens which may be foreclosed by the city.
- (b) The notice shall also inform the violator that repeat violations of this article will result in the imposition of larger fines and may also result in revocation of occupational license and/or certificate of use and/or injunctive proceedings as provided by law.

Sec. 34-42. - Fines and penalties for violation; appeals; alternate means of enforcement.

(a)

The following civil fines shall be imposed for violations of this chapter:

(1)

First offense, \$250.00 fine.

(2)

Second offense (within one year of the first offense) and each offense thereafter, \$1,000.00 fine.

For purposes of this section, "offense" shall mean a notice of violation that has not been contested timely or a finding of violation by a special master. A person may receive a separate notice of violation once every hour if a violation has occurred at any time within that period. Each notice of violation shall constitute a separate offense for which a separate fine may be imposed.

(b)

A violator who has been served with a notice of violation shall elect either to:

(1)

Pay the civil fine in the manner indicated on the notice; or

(2)

Request an administrative hearing before a special master to appeal the decision of the code inspector that has resulted in the issuance of the notice of violation.

(c)

The named violator shall request an administrative hearing before the special master by filing a written request for hearing with the special master's office within ten days of the date of the notice of violation. A courtesy notice shall be provided to the complainant of any hearing regarding the notice of violation, and the complainant may testify at such hearings. Failure to give such notice shall not be a cause for continuance or cancellation of any scheduled hearing of the matter.

(d)

If the named violator after notice fails to pay the civil fine or fails to timely request an administrative hearing before a special master, the special master shall be informed of such failure by report from the code enforcement officer. Failure of the named violator to appeal the notice of violation within the prescribed time period shall constitute a waiver of the violator's right to administrative hearing before the special master. A waiver of the right to an administrative hearing shall be treated as an admission of the violation and penalties may be assessed accordingly.

(e)

Any party aggrieved by the decision of a special master may appeal that decision to a court of competent jurisdiction as provided in F.S. § 162.11.

(f)

The city may institute proceedings in a court of competent jurisdiction to compel payment of civil fines. A certified copy of an order imposing a civil fine may be recorded in the public records and thereafter shall constitute a lien upon any other real or personal property owned by the violator and it may be enforced in the same manner as a court judgment by the sheriffs of this state, including levy against the personal property, but shall not be deemed to be a court judgment except for enforcement purposes. After three months from the filing of any such lien that remains unpaid, the city may foreclose or otherwise execute on the lien.

(g)

As an alternative or additional means of enforcement, the city may institute proceedings to revoke or suspend an occupational license and/or certificate of use or seek injunctive relief. In cases of recurring violations, the code enforcement officer may issue a citation for prosecution before the special master as provided in this chapter wherein, upon a finding of violation by the special master, a per diem fine may be imposed. A violation shall be considered recurring when a person or entity has received three notices of violation within a period of one month.

(h)

As a further alternative or additional means of enforcement, the city may employ the alternative code enforcement procedures for a civil infraction described in chapter 26, article III of this Code.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-43. - Motor vehicle alarms.

(a)

Definition. The following term shall have the following meaning for purpose of this section:

Alarm system means a motor vehicle siren or home alarm system contained in or appurtenant to a motor vehicle, designed to activate and sound in the event of a break-in or attempted break-in of the vehicle.

(b)

Violation generally. It shall be unlawful for any motor vehicle equipped with an alarm system to activate and emit a siren or home noise, audible at a distance of 100 feet intermittently or continuously within a period in excess of 30 minutes. Any

person who has custody of any such offending motor vehicle shall be deemed in violation of this section.

(c)

Violation deemed public nuisance. A violation of this section on the public streets or areas within the city is hereby declared public nuisance which may be abated by the removal of such vehicle upon authorization of a law enforcement officer. Prior to removing such vehicle, the law enforcement officer shall afford the owner or custodian of such vehicle the opportunity to disconnect or deactivate the alarm system at the scene. Otherwise, the vehicle shall be removed to an authorized facility. The law enforcement agency shall ascertain the name and address of the registered owner of such vehicle and provide written notice by certified mail, return receipt requested, within 24 hours of such removal, the reason(s) for the removal, and the place where such vehicle has been removed. The fees assessed for the removal of the vehicle may be appealed by filing a complaint in the county court and posting with the court a cash or surety bond or security equal to the amount for the removal and/or storage of the vehicle to ensure the payment of such in the event the owner or custodian of the vehicle does not prevail.

(d)

Penalty. A violation of this section on private property shall cause the person who owns or has custody of the offending vehicle to be fined \$50.00. Any duly designated law enforcement officer and/or code enforcement officer is authorized and empowered to enter without force upon private property in order to detect and issue a citation or notice of violation to and upon the owner or custodian of the offending motor vehicle. The citation or notice of violation may be appealed in accordance with the procedures set forth in chapter 26 of this Code.

(e)

Exception. It shall not be a violation of this section if it is determined by the law enforcement officer and/or code enforcement officer that the siren or horn noise has been triggered by the unauthorized opening of the hood, truck or door(s) of the vehicle, by the breaking or attempted breaking of a window or by lightning, thunderstorms, or severe weather conditions.

(Ord. No. 4136-08, § 1, 4-21-2008)

Sec. 34-44. - Nuisance.

Any violation of this article shall constitute a nuisance. The city attorney may bring suit on behalf of the city or any affected citizen may bring suit in his name, against the person or persons causing or maintaining the violation, and against the owner/agent of the building or property on which the violation exists. Relief may be granted according to the terms and conditions of F.S. Ch. 60, relating to abatement of nuisances, or pursuant to section 34-42. In any such action, the city or affected citizen, if the prevailing party, shall be awarded costs, including reasonable attorneys fees.

(Ord. No. 4136-08, § 1, 4-21-2008)

Cross reference—Abatement of nuisances, § 26-101 et seq.

Secs. 34-45—34-70. - Reserved.

APPENDIX – E

JACKSONVILLE NOISE ORDINANCE

PART 1. - GENERAL PROVISIONS

[Sec. 368.101. - Legislative findings and determinations.](#)

[Sec. 368.102. - Exercise of County powers; territorial application of Chapter.](#)

[Sec. 368.103. - Short title.](#)

[Sec. 368.104. - Definitions.](#)

[Sec. 368.105. - Exceptions.](#)

[Sec. 368.106. - Administration; rules and administrative orders.](#)

[Sec. 368.107. - Adoption of standards.](#)

[Sec. 368.108. - Chapter 360 applicable.](#)

Sec. 368.101. - Legislative findings and determinations.

The Council finds and determines as follows:

(a)

The making, creating and maintenance of excessive, unnecessary, unnatural or unusually loud noises which are prolonged, unusual and unnatural in their time, place and use affect and are a detriment to the public health, comfort, convenience, safety, welfare and prosperity of the residents of the City.

(b)

The necessity in the public interest for the provisions and prohibitions hereinafter contained and enacted is declared as a matter of legislative determination and public policy and the provisions and prohibitions hereinafter contained and enacted are in pursuance of and for the purpose of securing and promoting the public health, comfort, convenience, safety, welfare and prosperity of the City and its residents.

(Ord. 84-674-684, § 3)

Sec. 368.102. - Exercise of County powers; territorial application of Chapter.

This Chapter is an exercise of the City's powers as a County under Section 3.01 of the Charter of the City. This Chapter shall apply throughout the General Services District.

(Ord. 85-1295-690, § 3)

Sec. 368.103. - Short title.

This Chapter shall be known and may be cited as the *Jacksonville Noise Control Ordinance*.

(Ord. 84-674-684, § 3; Ord. 85-1295-690, § 3)

Sec. 368.104. - Definitions.

In this Chapter and the rules promulgated by the Board under this Chapter, unless the context otherwise requires:

(a)

A-weighted sound level means the sound pressure level, in decibels, as measured on a sound level meter using the A-weighting scale. This level is designated dB(A) or dBA.

(b)

Board means the Jacksonville Environmental Protection Board.

(c)

Chief means the Chief of the Environmental Quality Division.

(d)

Decibel or *dB* means a unit of level when the base of the logarithm is the tenth root of ten, and the quantities concerned are proportional to power, as defined in ANSI S1.1 - 1994, or subsequent revisions.

(e)

Emergency means an occurrence or set of circumstances involving actual or imminent physical or psychological trauma or property damage which demands immediate action.

- (f) *Emergency work* means work performed for the purpose of preventing or alleviating an emergency.
- (g) *Noise* means a sound which disturbs humans or which causes or tends to cause an adverse psychological or physiological effect on humans, or that exceeds standards established by the Board.
- (h) *Noise disturbance* means a sound which exceeds any standard established by the Board or violates a work practice standard established by the Board.
- (i) *Noise pollution* means the emission of sound that violates any standard established by the Board.
- (j) *Noise source* means any equipment or facility or combination thereof, which operates within any land classified as Class A, B, C or D by SLUCM Codes as defined and established by the Board, and which equipment or facility or combination thereof, emits sound beyond the property line of the land on which said equipment or facility is operated.
- (k) *Real property boundary* means an imaginary line along the ground surface, and its vertical extension, which separates the real property owned by one person from that owned by another person, but does not include intrabuilding divisions.
- (l) *Receiving land use* means the use or occupancy of the real property which receives the transmission of sound.
- (m) *Rupture Disc* means a pressure relieving device that vents the pressure in a pipe or vessel if the pressure exceeds a fixed amount.
- (n) *Safety relief valve* means a relief valve used and designed to prevent explosion by high pressure in the pipe or vessel to which it is connected.
- (o) *Sound* means an oscillation in pressure in air.
- (p) *Sound level* means in decibels, a weighted sound pressure level, determined by the use of metering characteristics and frequency weightings specified in ANSI S1.4-1983, or subsequent revisions, "Specifications for Sound Level Meters".
- (q) *Sound-level meter* means an instrument which includes a microphone, amplifier, RMS detector, integrator or time averager, output or display meter and the weighting networks used to measure sound pressure levels.
- (r) *Sound pressure level* means ten times the logarithm to the base ten of the ratio of the time-mean-square pressure of a sound, in a stated frequency band, to the square of the reference sound pressure in gases of 20 μ Pa, Unit, decibel (dB), as defined in ANSI S1.1 - 1994, or subsequent revisions.
- (s) *Person* has the meaning given to it in Section 1.102(II), Ordinance Code of the City of Jacksonville and in addition includes any officer, employee, agent, department or instrumentality of the Federal Government, any state, municipality, or political subdivision of the state, or of any foreign government.

(Ord. 84-674-684, § 3; Ord. 85-1295-690, § 3; Ord. 94-144-121, § 6; Ord. 94-1307-763, § 2; Ord. 2008-513-E, § 1; Ord. 2009-359-E, § 3)

Sec. 368.105. - Exceptions.

This Chapter shall not apply to:

- (a) The emission of sound for the purpose of alerting persons to the existence of an emergency or a potential danger.
- (b) The emission of sound in the performance of emergency work.
- (c) Agricultural activities of a farm as FARM is defined in the Florida Right to Farm Act, F.S. § 823.14.
- (d) Commercial water-borne traffic, mass transportation vehicles, air transportation and rail transportation (except railroad switching yards).
- (e) Unamplified carillons, bells or chimes.
- (f) The emission of sound in the discharge of weapons at sport shooting ranges as defined and exempted in F.S. §

823.16.

- (g) Fireworks and outdoor musical entertainment permitted pursuant to Chapter 191, Part 2, Ordinance Code.
- (h) The unamplified human voice.
- (i) Sound emitted from safety relief valves and rupture discs.

(Ord. 84-674-684, § 3; Ord. 85-1295-690, § 3; Ord. 2009-359-E, § 3)

Sec. 368.106. - Administration; rules and administrative orders.

The Board may make, adopt, amend and repeal rules and administrative orders to implement, administer and enforce this Chapter.

(Ord. 84-674-684, § 3; Ord. 85-1295-690, § 3)

Sec. 368.107. - Adoption of standards.

The American National Standards Institute, Inc. publication entitled Specifications for Sound-Level Meters, designated as ANSI S1.4-1983, or subsequent revisions, is hereby adopted as the standard specifications for sound-level meters. The American National Standards Institute, Inc. publication entitled Acoustical Terminology, designated as ANSI S1.1-1994, or subsequent revisions, is hereby adopted as the standard reference for technical definitions of acoustical terms not defined in this Chapter.

(Ord. 84-674-684, § 3; Ord. 85-1295-690, § 3; Ord. 2009-359-E, § 3)

Sec. 368.108. - Chapter 360 applicable.

The provisions of Chapter 360 shall be applicable to this Chapter, unless otherwise specifically provided in this Chapter.

(Ord. 84-674-684, § 3; Ord. 85-1295-690, § 3)

PART 2. - NOISE DISTURBANCES

[Sec. 368.201. - Unlawful noises prohibited.](#)

[Sec. 368.202. - Maximum permissible sound levels.](#)

[Sec. 368.203. - Measurement of sound.](#)

Sec. 368.201. - Unlawful noises prohibited.

No person shall make or continue or cause to be made or continued, except as permitted by this Chapter, a noise disturbance or a noise in excess of the standards for noise established in the rules of the Board.

(Ord. 84-674-684, § 3; Ord. 2009-359-E, § 3)

Sec. 368.202. - Maximum permissible sound levels.

With the exception of sound levels specifically authorized by the rules of the Board, the maximum permissible sound levels allowed at or within the real property boundary of a receiving land use shall not exceed the general levels fixed in the rules of the Board. An activity or use that produces a sound in excess of the permitted sound levels for a receiving land use shall be deemed a noise disturbance and in violation of this Chapter and the rules of the Board.

(Ord. 84-674-684, § 3; Ord. 2009-359-E, § 3)

Sec. 368.203. - Measurement of sound.

The measurement of sound shall be made with a sound-level meter meeting the standards prescribed in the rules of the Board. Recorded measurements shall be taken so as to provide a proper representation of the noise source. The measurement of sound levels shall be made at or within the real property boundary of the receiving land use.

(Ord. 84-674-684, § 3; Ord. 2009-359-E, § 3)

PART 3. - ENFORCEMENT

Editor's note—

Ord. 2009-359-E, § 3, amended the Code by repealing former Pt. 3, §§ 368.301—368.304, which pertained to enforcement, and derived from Ord. 84-674-684, Ord. 85-1295-690 and Ord. 94-1307-684, and renumbering former Pt. 4 as a new Pt. 3. Formerly, Pt. 4 was pertained to violations and penalties.

[Sec. 368.301. - Violations and criminal penalties.](#)

[Sec. 368.302. - Violations and civil penalties.](#)

[Sec. 368.303. - Assessment and recovery of civil penalty.](#)

[Sec. 368.304. - Variances.](#)

[Sec. 368.305. - Appeals.](#)

Sec. 368.301. - Violations and criminal penalties.

(a)

A person who knowingly and willfully or by culpable negligence commits a violation specified in Section 368.301(c)(1), (2) (3), and (4), Ordinance Code, may, upon conviction by a court of appropriate jurisdiction thereof, be punished by:

(1)

A fine of not more than \$500; or

(2)

Not more than 90 days in jail; or both.

(b)

Each day during any portion of which such violation, as described in subsection (c) of this Section occurs constitutes a separate offense.

(c)

The following persons shall be guilty of a class D offense:

(1)

Persons who, when taking a measurement of sound levels under this ordinance, falsify the record or tamper with the sound-level meter so as to produce false measurement, or procure or acquiesce in this falsification or tampering; or

(2)

Persons who violate a rule, regulation, order or compliance plan of the board with respect to noise pollution control; or

(3)

Persons making, causing to be made, or continuing to make a noise in excess of the standards for noise established under rules of the Board; or

(4)

Persons aiding or participating in a violation for which a criminal penalty may be assessed under this Chapter shall be considered a principle in the violation and may be assessed a criminal penalty up to the maximum amount prescribed for that violation.

(Ord. 84-674-684, § 3; Ord. 88-117-123, § 16; Ord. 94-1307-684, § 7; Ord. 2009-359-E, § 3)

Sec. 368.302. - Violations and civil penalties.

The following civil penalties may be assessed by administrative or judicial process.

(a)

A person who:

(1)

Makes or continues or causes to be made or continued a noise disturbance or a noise in excess of the standards for noise established under the rules of the Board;

(2)

Violates a condition of a variance granted by the Board under Section 368.304;

May be administratively or judicially assessed a civil penalty of up to \$1,000.00 for each violation.

(b)

An applicant for a variance under this Chapter and an officer, director, partner, agent or attorney of an applicant who knowingly makes a false statement or provides false information on a document or paper accompanying and forming a part of the application shall be administratively or judicially assessed a civil penalty of up to \$1,000.00 for each false statement or false item of information.

(c)

A person who aids or participates in a violation for which a civil penalty may be assessed under this Chapter shall be considered a principal in the violation and may be assessed a civil penalty of up to the maximum amount prescribed for that violation.

(d)

For violations that are of a continuing nature, each day that the violation continues shall be a separate offense subject to penalty.

(e)

Each day during any portion of which such violation as described in subsection 368.302(a) occurs constitutes a separate offense.

(Ord. 84-674-684, § 3; Ord. 88-117-123, § 17; Ord. 89-1235-597, § 1; Ord. 94-1307-763, § 8; Ord. 2009-359-E, § 3)

Sec. 368.303. - Assessment and recovery of civil penalty.

Civil penalties shall be assessed by the administrative process in Chapter 360 or, in the alternative, by judicial process in a civil action filed, in the name of the City, in a court of competent jurisdiction, giving due consideration to the appropriateness of the penalty with respect to the gravity of the violation, the good faith of the violator, the history of previous violations, and the financial ability of the violator to respond. A civil penalty assessed and owed under this Chapter shall be paid to the Tax Collector for deposit into the Environmental Protection Fund established by Section 360.601. An administratively assessed civil penalty under this Section may be recovered in a civil action in the name of the City. The City shall be entitled to reasonable attorney's fees and costs, including appellate fees and costs, in an action where the City is successful in obtaining affirmative relief.

(Ord. 84-674-684, § 3; Ord. 88-117-123, § 18; Ord. 2009-359-E, § 3)

Sec. 368.304. - Variances.

A variance to cause or create a noise which would otherwise be in violation of this Chapter may be requested as provided in Section 360.111.

(Ord. 2009-359-E, § 3)

Sec. 368.305. - Appeals.

Appeals shall be in accordance with Part 4, Chapter 360.

(Ord. 2009-359-E, § 3)