Traffic Noise Study Report

Spessard Holland East-West Expressway (SR 408): Capacity Improvements from Kirkman Road to Church Street

Project Development and Environment (PD&E) Study
Orange County, Florida
CFX Project No: 408-174

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August 2023

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1.0 INTRODUCTION

CFX is conducting a Project Development and Environment (PD&E) Study for capacity improvements to SR 408 between Kirkman Road and Church Street.

More than 164,000 vehicles daily travel on SR 408 as it crosses downtown Orlando. Traffic has generally increased on the segment of SR 408 from SR 435 (Kirkman Road) to I-4 and is expected to continue to grow in the future. Currently, in the project study area, eastbound SR 408 is a three-lane facility from SR 435 (Kirkman Road) to I-4. At the same time, westbound SR 408 is a four-lane facility from I-4 to SR 423 (John Young Parkway), then transitions to a three-lane facility to SR 435 (Kirkman Road).

This PD&E Study will analyze and evaluate a proposed widening of a one-lane addition in the eastbound and westbound direction of SR 408 between SR 435 (Kirkman Road) and Church Street to provide greater capacity, reduce congestion and delay, and increase safety. The project study area is illustrated in **Figure 1.**

The general objective of the PD&E Study is to provide documented information necessary for CFX to decide on the type, design, and location of the proposed improvement within the project limits. The PD&E Study includes evaluating and documenting the physical, natural, social, and cultural environment within the corridor and the potential impacts associated with the various mobility alternatives. This analysis also addresses economic and engineering feasibility, mobility capacity and service levels, conceptual geometry, drainage, and structures.

The goals of the project include:

- Enhance the mobility of the area's growing population and economy by providing additional transportation infrastructure
- Reduce congestion and delay and increase safety
- Provide consistency with local plans and policies
- Promote regional connectivity

1.1 Build Alternative

The PD&E's preferred build alternative is illustrated in **Appendix A** and **Appendix D**. Additional engineering detail can be found in the project's associated engineering documentation.

1.2 No-Build Alternative

Consistent with FDOT guidelines, this analysis also considers an alternative that assesses what would happen to the environment in the future if this proposed project was not built. This Alternative, the No-Build Alternative, consists of the existing roadways within the study area, programmed improvements to existing facilities, and routine maintenance improvements. While the No-Build Alternative does not meet project needs, it provides a baseline condition to compare and measure the proposed project's effects.

1.3 Study Objective

This report summarizes the traffic noise analysis conducted for CFX Project #408-174. The analysis identifies the noise sensitive receptors within the study corridor, evaluates the noise levels predicted to occur due to the proposed project, and analyzes potential abatement options where noise impacts are predicted.

Sites and communities not specifically identified in **Appendix D** are 1) not within the project limits or 2) are located too far from the roadway to be considered noise sensitive.

Figure 1: Project Location Map

2.0 METHODOLOGY

The traffic noise study conducted for this project is consistent with *Code of Federal Regulations* (C.F.R.), Title 23, § 772; Chapter 335, Section 335.17, *Florida Statutes*; Part II, Chapter 18 of the Florida Department of Transportation's (FDOT) *Project Development and Environment Manual*; and Federal Highway Administration's (FHWA) traffic noise analysis guidelines contained in *FHWA-HEP-10-025*. The FHWA Traffic Noise Model (TNM) - version 2.5 was used to predict traffic noise levels for this project. The analysis evaluated noise levels for the existing condition and the 2045 No-Build and Build Alternatives.

Noise receptor coordinates used in the TNM are located in exterior areas where frequent human use may occur, usually at the edge of the residential structure closest to the project roadways, unless the analyst's professional judgment determines otherwise.

Project engineering design files were used to determine the design alternative's location for input into TNM. Roadway elevation data for the study was obtained from the project engineering team. Data for the noise receptors and cross streets were obtained from the United States Geological Survey digital elevation models[1].

2.1 NOISE METRICS

Sound levels for this analysis are expressed in decibels (dB) using an "A"-scale weighting, expressed as dB(A). This scale most closely approximates the response characteristics of the human ear to typical traffic sound levels. All reported sound levels are hourly equivalent noise levels [$L_{eq(h)}$]. The $L_{eq(h)}$ is defined as the equivalent steady-state sound level that, in a given hourly period, contains the same acoustic energy as the time-varying sound level for the same hourly period.

2.2 TRAFFIC DATA

Traffic noise is heavily dependent on traffic volume and speed, with the amount of noise generated by traffic increasing as the vehicle speed and number of vehicles increase. Characteristics contributing to the 2045 Design Year's highest traffic noise levels were used to predict project noise levels. Worst-case noise conditions occur with the maximum traffic traveling at the posted speed and represent a Level of Service (LOS) C operating condition. However, if the traffic analysis indicates the roadway will operate below LOS C, the project's Demand peak-hour directional traffic volumes are used per Chapter 18 of the FDOT PD&E Manual. Traffic volumes and speeds used in the analysis are included in **Appendix B**.

[1] USGS, https://apps.nationalmap.gov/lidar-explorer/#/

2.3 NOISE ABATEMENT CRITERIA

Land use plays an important role in traffic noise analyses. To determine which land uses are "noise sensitive," this noise impact analysis used the FHWA Noise Abatement Criteria (NAC). **Table 1** shows these criteria are divided into individual land use activity categories. The FDOT has established noise levels at which noise abatement must be considered for each category, referred to in this report as the FDOT NAC. Another criterion for determining project impacts warrant abatement consideration occurs when project noise levels are below the NAC but show a substantial increase (15.0 dB(A) or more) over existing levels.

Table 1: Noise Abatement Criteria

Hourly A-Weighted Sound Level-decibels (dB(A))				Description of Activity Category
Activity Category	Activity Leq(h) [1]		Evaluation Location	
	FHWA	FDOT		
A	57.0	56.0	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67.0	66.0	Exterior	Residential.
C[2]	67.0	66.0	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, daycare centers, hospitals, libraries, medical facilities, parks, picnic areas, golf courses, places of worship, playgrounds, public meeting rooms, public/nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52.0	51.0	Interior	Auditoriums, daycare centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public/nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[2]	72.0	71.0	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties, or activities not included in A-D or F.
F	-	-	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	-	-	-	Undeveloped lands that are not permitted.

(Based on Table 1 of 23 CFR Part 772)

[1] The Leq(h) Activity Criteria values are for impact determination only and are not design standards for noise abatement measures.

[2] Includes undeveloped lands permitted for this activity category.

An illustration of typical exterior and interior noises and their corresponding sound level is presented in **Table 2**. This table gives the reader a better understanding of the noise levels discussed herein. In Florida, noise levels that reach 66.0 dB(A) at Activity Category B and C land use require noise abatement consideration. A 71.0 dB(A) noise level is required for an Activity Category E land use to be impacted by traffic noise.

Table 2: Comparative Sound Levels

Common Outdoor Activity	dB(A)	Inside Activity
Jet Flyover at 1,000 ft. Gas Lawn Mower at 3 ft.	--110-- --100--	Rock Band
Diesel Truck at 50 ft. (at50 mph) Busy Urban Area Daytime	--90-- --80--	Food Blender at 3 ft. Garbage Disposal at 3 ft.
Gas Mower at 100 ft. Commercial Area Heavy Traffic at 300 ft.	--70-- --60--	Vacuum Cleaner at 10 ft. Normal Speech at 3 ft. Large Business Office
Quiet Urban Daytime Quiet Urban Nighttime Quiet Suburban Nighttime	--50-- --40--	Dishwasher Next Room Theater, Large Conference Room (Background)
Quiet Rural Nighttime	--30-- --20--	Library Bedroom at Night
Lowest Threshold of Human Hearing	--10-- --0--	Lowest Threshold of Human Hearing
Source: *California Dept. of Transportation Technical Noise Supplement, Oct. 1998, Pg. 18*		

2.4 Noise Abatement Measures

When traffic noise impacts are identified, noise abatement must be considered. The potential abatement alternatives include traffic management techniques, alternative roadway alignments, buffer zones, and noise barriers. The most common type of noise abatement measure is the

construction of a noise barrier that reduces traffic noise by blocking the sound path between the roadway and the adjacent noise receptor.

Consistent with the FDOT PD&E Manual – Chapter 18, the following factors must be evaluated to determine if a noise barrier is considered feasible and reasonable:

- The barrier must reduce traffic-related noise levels by at least 5.0 dB(A) for at least two impacted receptors to be considered acoustically feasible. Receptors that receive the 5.0 dB(A) reduction, or higher, are defined as "benefited" by FDOT. Consequently, noise barriers are not evaluated for isolated and single receptors.
- To be considered acoustically reasonable, the noise barrier must achieve the FDOT noise reduction design goal of 7.0 dB(A) for at least one benefited receptor.
- The cost per benefited receptor (CBPR) is calculated by multiplying the barrier's total square footage by $30. Per Chapter 18, $30 per/ft^2 is the statewide average used to determine cost reasonableness regardless of barrier type (shoulder/traffic railing mounted, right-of-way post/panel, etc.) To be considered cost reasonable, a barrier that meets all acoustical criteria should not exceed $42,000 per benefited receptor.

In some locations, noise barriers may provide a benefit to non-impacted residences. Due to design considerations or aesthetics, CFX may propose noise barriers exceeding cost reasonableness limits. An example would be extending a noise barrier to maintain community continuity (i.e., avoiding terminating a noise barrier in the middle of a community).

Consistent with the FDOT Design Manual, Section 264[2], noise barrier heights are limited as follows:

- Noise barriers on bridge and retaining wall structures are limited to a maximum height of 8 feet; unless otherwise specified;
- Shoulder-mounted noise barriers at the edge of shoulder pavement are limited to a maximum height of 14 feet; and
- Non-shoulder mounted noise barriers (i.e., post and panel) outside the clear recovery zone are limited to a maximum height of 22 feet. If a non-shoulder barrier is placed within the clear recovery zone, it must be shielded.

Other factors must also be considered when evaluating a barrier's feasibility, including accessibility, sight distance, and aesthetics. Accessibility refers to the ingress and egress to properties that would be affected by constructing a noise barrier. Sight distance is a safety issue

[2] FDOT, *FDOT Design Manual*

related to drivers' ability to see far enough in each direction to enter the roadway safely. Aesthetics refers to the noise barrier's physical appearance from the highway and affected property.

3.0 TRAFFIC NOISE ANALYSIS

3.1 Identification of Noise Sensitive Sites

Using **Table 1** as a guide, the noise sensitive land uses analyzed within the study corridor fall under Activity Category B [residential.

No land uses in the study corridor warrant an Activity Category A, C, D, or E analysis. A search of building permits for potentially noise sensitive Category G (undeveloped) and non-noise-sensitive Category F lands within the study area did not identify any active permits for future buildings that would be considered noise sensitive. Another search will be conducted during the final design process. Any noise sensitive land permitted between the time of this report and the approval of the Project Environmental Impact Report will be analyzed for project noise impacts if warranted.

3.2 Model Validation

Existing noise levels are measured in the project corridor to confirm if traffic is the primary noise source. These field measurements are also required to verify the accuracy of the TNM before it can be used to predict noise levels. A series of three 10-minute measurements were taken on January 6, 2022, using an Extech Instruments Model 407780 Type 2 Integrating Sound Level Meter. The sound level meter, calibrated at 114.0 dB(A) with an Extech Instruments Model 407766 calibrator, was adjusted to the A-weighted frequency scale, which approximates the frequency sensitivity of the human ear. Traffic data, including vehicle volumes, speeds by type, and meteorological conditions, were recorded during each measurement session. The data collection effort also recorded the travel speed for each type of vehicle using a Bushnell Speedster handheld radar gun.

One location within the study corridor was selected to undergo a series of three 10-minute measurements. The validation site, illustrated in **Appendix D – Page D-4**, was selected for measurement because it presented a clear view of free-flow traffic conditions on SR 408. No unusual noise events occurred during this location's three 10-minute monitoring sessions. The weather during the monitoring session was 63°, with 80% humidity, under clear skies with no wind.

Validation of TNM occurs when the model-predicted noise levels are within three decibels of the field-measured levels. Since all noise levels in this analysis are based on one hour, each of the 10-minute sessions' field-recorded traffic volumes was adjusted upward by a factor of six to reflect

hourly traffic flow. Once adjusted, these volumes were input into the noise prediction model. As shown in **Table 3**, TNM predicted within the 3.0-decibel acceptance range for each 10-minute session. Consequently, the model is acceptable for predicting noise levels for this project.

Table 3: Field Measurement Data and TNM Validation Results

FIELD TRAFFIC COUNT: 1/6/2022										
Session #1: 9:45 AM										
SR 408	**Cars**		**Medium Trucks**		**Heavy Trucks**		**Buses**		**Motorcycles**	
	Volume	**Avg. Speed**	**Volume**	**Avg. Speed**	**Volume**	**Avg. Speed**	**Volume**	**Avg. Speed**	**Volume**	**Avg. Speed**
EB	505	59	33	55	7	53	0	0	1	57
WB	338	59	27	54	19	52	2	53	1	58
Field Measurement (dB(A)):					72.5					
TNM Prediction (dB(A)):					74.6					
Variance:					2.1					
Session #2: 9:56 AM										
SR 408	**Cars**		**Medium Trucks**		**Heavy Trucks**		**Buses**		**Motorcycles**	
	Volume	**Avg. Speed**	**Volume**	**Avg. Speed**	**Volume**	**Avg. Speed**	**Volume**	**Avg. Speed**	**Volume**	**Avg. Speed**
EB	411	59	26	55	14	53	0	0	1	57
WB	286	59	12	54	13	52	0	0	0	0
Field Measurement (dB(A)):					71.8					
TNM Prediction (dB(A)):					73.7					
Variance:					1.9					
Session #3: 10:07 AM										
SR 408	**Cars**		**Medium Trucks**		**Heavy Trucks**		**Buses**		**Motorcycles**	
	Volume	**Avg. Speed**	**Volume**	**Avg. Speed**	**Volume**	**Avg. Speed**	**Volume**	**Avg. Speed**	**Volume**	**Avg. Speed**
EB	400	59	21	55	9	53	1	53	2	57
WB	309	59	25	54	13	52	0	0	0	0
Field Measurement (dB(A)):					72.1					
TNM Prediction (dB(A)):					73.8					
Variance:					1.7					

3.3 Predicted Noise Levels

Traffic on SR 408 is the dominant noise source within the project's evaluation area. For this project, 191 receptor sites, all Activity Category B, were analyzed for project-related impacts. The noise analysis divided the project corridor into eleven Noise Study Areas (NSA).

The 2022 existing condition and 2045 No-Build and Build Alternative noise analysis results discussed in this section are also presented in a noise impact comparison matrix in **Appendix C.** A summary of the results is provided in **Table 3**.

Eighteen receptors currently experience noise levels that meet or exceed the 66.0 dB(A) NAC. Predicted noise levels for the No-Build Alternative meet or exceed the NAC 19 sites. By comparison, the Build Alternative is predicted to meet or exceed the 66.0 dB(A) NAC at 95 sites, with an average 4.0 dB(A) increase in noise over the existing condition. The greatest increase over existing is 10.3 dB(A); thus, none of the noise increases are considered substantial (defined as 15 dB(A) or higher).

When discussing noise level increases, the general rule that applies to perception is:

- A 3 dB(A) increase is barely perceptible to most people.
- A 5 dB(A) increase is noticeable to most people.
- A 10 dB(A) increase is perceived as twice as loud and considered a doubling noise.

A discussion of each NSA and the corresponding impact and abatement analysis is provided in the following sections. A set of project aerials illustrating the NSA's and analyzed sites is included in **Appendix D**.

3.3.1 Noise Study Area 1

NSA 1 is south of SR 408 between Kirkman Road and Pine Hills Road. Within this NSA is an existing eight-foot-tall post and panel barrier offset from the eastbound shoulder edge of pavement (EOP). The existing wall must be removed to accommodate the Build Alternative footprint. Twenty-eight single-family residences were included in the analysis and are represented by receptors 1-1 through 1-28. This NSA, its associated receptors, and existing barriers are illustrated in **Appendix D: Pages D-1 and D-2**.

Currently, the average noise level for all NSA 1 receptors is 61.8 dB(A), with the highest noise level being 64.6 dB(A) at receptor 1-3. No residences are currently affected by traffic noise, nor are they predicted to meet or exceed the 66.0 dB(A) NAC under the No-Build Alternative. Once the project is built, 27 sites represented by receptors 1-1 through 1-27 are predicted to exceed the impact criterion.

The overall traffic noise levels increase by an average of 8.3 dB(A), with the average project-related noise level predicted to be 70.1 dB(A). Receptor 1-3 has the highest build-related noise level, 74.3 dB(A), a 10.3 dB(A) increase over the existing condition. None of the increases over existing are considered substantial.

Because the predicted noise levels exceed NAC for the 27 residences, they are considered impacted. Noise abatement was considered to mitigate these impacts, as summarized in **Section 3.4.1**.

3.3.2 Noise Study Area 2

NSA 2 is north of SR 408, across from NSA 1. Because there are no noise sensitive sites, this area was not analyzed for noise impacts. This NSA is illustrated in **Appendix D: Pages D-1 and D-2**.

3.3.3 Noise Study Area 3

NSA 3 is south of SR 408 from Pine Hills Road to Ortman Drive. Within this NSA are two existing eight-foot-tall cast-in-place barriers, one located along the mainline eastbound shoulder EOP and the other along the Pine Hills entry ramp shoulder EOP. The project involves removing the mainline shoulder barrier to make room for the Build Alternative improvements. Eighteen residences represented by receptors 3-1 through 3-18 were analyzed for project noise impacts. Much of NSA 3 east of the residential receptors comprises industrial land uses. This NSA, its associated receptors, and existing barriers are illustrated in **Appendix D: Pages D-2 through D-4**.

Currently, the average noise level for NSA 3 is 63.7 dB(A), with the highest noise level being 69.1 dB(A) at receptor 3-17. Currently, three sites represented by receptors 3-4, 3-17, and 3-18 are affected by traffic noise. These sites and receptor 3-3 are predicted to be impacted by the No-

Build Alternative. Once the project is built, the overall traffic noise levels increase by an average of 3.2 dB(A), with the average project-related noise level predicted to be 67.0 dB(A). Eleven sites are predicted to meet or exceed the NAC. Receptor 3-4 has the highest predicted build noise level (72.7 dB(A)). None of the increases over existing are considered substantial.

Because the predicted noise levels meet or exceed the 66.0 dB(A) NAC at eleven residential receptors, they are considered impacted. Noise abatement was considered to mitigate these impacts, as summarized in **Section 3.4.1**.

3.3.4 Noise Study Area 4

NSA 4 is north of SR 408 across from NSA 3. Within this NSA are two existing eight-foot-tall barriers. The barrier along the westbound mainline shoulder edge of pavement (EOP) is post and panel west of Pine Hills Road and cast-in-place east of Pine Hills Road. The proposed improvements involve expanding the SR 408; thus, the existing mainline shoulder barrier will be removed as part of the project. Eighteen residential sites, represented by receptors 4-1 through 4-18, were evaluated for project noise impacts. Much of NSA 4 east of the residential receptors comprises industrial land uses. This NSA, its associated receptors, and existing barriers are illustrated in **Appendix D: Pages D-2 through D-4**.

Currently, the average noise level for NSA 4 is 64.8 dB(A), with the highest noise level being 71.4 dB(A) at receptor 4-18. Six residences represented by receptors 4-4 through 4-8 and 4-18 are currently affected by traffic noise and are predicted to be impacted under the No-Build Alternative. Once the project is built, the overall traffic noise levels increase by an average of 3.4 dB(A), with the average project-related noise level predicted to be 68.1 dB(A). Fifteen sites represented by receptors 4-1 through 4-10, 4-12 through 4-15, and 4-18 are predicted to exceed the 66.0 dB(A) impact criterion. Receptor 4-18 has the highest predicted build noise level (73.0 dB(A)). None of the increases over existing are considered substantial.

Impacted receptor 4-18 is considered isolated; therefore, a barrier at this location cannot achieve the minimum noise reduction requirements outlined in **Section 2.4**. Because the predicted noise levels exceed NAC for the remaining seventeen residences, noise abatement was considered, as summarized in **Section 3.4.2**.

3.3.5 Noise Study Area 5

NSA 5 is south of SR 408 from Ortman Drive to Ferguson Drive. Within this NSA, three existing noise barriers are along the eastbound shoulder edge of pavement (EOP) and offset from SR 408, near the CFX right-of-way (ROW) line. The existing eight-foot-tall barriers (post and panel barrier and cast-in-place) adjacent to Ortman Drive and the eight-foot-tall post and panel barrier at the

eastern end of NSA 5 will be removed because of the project. The existing sixteen-foot-tall ROW barrier is not affected. Fifty-seven residential sites, represented by receptors 5-1 through 5-51, were analyzed for project noise impacts. This NSA, its associated receptors, and existing barriers are illustrated in **Appendix D: Pages D-4 and D-5**.

Currently, the average noise level for all NSA 5 receptors is 60.5 dB(A), with the highest noise level being 63.6 dB(A) at receptor 5-27. None of the sites are currently affected by traffic noise and are not predicted to be impacted under the No-Build Alternative. Once the project is built, the overall traffic noise levels increase by an average of 4.3 dB(A), with the average project-related noise level predicted to be 64.8 dB(A). Fourteen sites are predicted to meet or exceed the NAC under the Build Alternative. Receptor 5-21 has the highest predicted build noise level (71.2 dB(A)). None of the increases over existing are considered substantial.

Because the predicted noise levels for the nine sites meet or exceed the 66.0 dB(A) NAC, they are considered impacted. Noise abatement was considered to mitigate these impacts, as summarized in **Section 3.4.3.**

3.3.6 Noise Study Area 6

NSA 6 is north of SR 408, across from NSA 5. Because there are no noise sensitive sites, this area was not analyzed for noise impacts. This NSA is illustrated in **Appendix D: Pages D-4 through D-5**.

3.3.7 Noise Study Area 7

NSA 7 is south of SR 408 from Ferguson Drive to John Young Parkway. Within this NSA are two existing eight-foot-tall barriers. One barrier, which is a continuation of the barrier from NSA 5, is the post and panel in the western section and then transitions to a cast-in-place barrier in the eastern section. A second post and panel barrier is offset from the mainline EOP west of the John Young Parkway overpass. The project involves removing the entire barrier to accommodate the roadway expansion. Twenty-one residences, represented by receptors 7-1 through 7-21, were evaluated for noise impacts. This NSA, its associated receptors, and existing barriers are illustrated in **Appendix D: Pages D-5 and D-6**.

Currently, the average noise level in this NSA is 61.8 dB(A), with the highest noise level being 65.6 dB(A) at receptor 7-7. None of the sites are affected by traffic noise, nor are they predicted to be impacted by the No-Build Alternative. Once the project is built, the overall traffic noise levels increase by an average of 5.3 dB(A), with the average project-related noise level predicted to be 67.2 dB(A). Fourteen sites are predicted to meet or exceed the NAC under the Build Alternative.

Receptor 7-7 has the highest predicted build noise level (43.2 dB(A)). None of the increases over existing are considered substantial.

Because the predicted noise levels for the fourteen sites meet or exceed the 66.0 dB(A) NAC, they are considered impacted. Noise abatement was considered to mitigate these impacts, as summarized in **Section 3.4.1.**

3.3.8 Noise Study Area 8

NSA 8 is north of SR 408, across from NSA 7. Within this NSA, there are no existing noise barriers. Six residential sites represented by receptors 8-1 through 8-6 were analyzed for noise impacts. A large portion of NSA 8 west of the residential receptors comprises forested and industrial land uses. This NSA and its associated receptors are illustrated in **Appendix D: Pages D-5 and D-6**.

Currently, the average noise level for the analyzed sites in NSA 8 is 66.0 dB(A), with the highest noise level being 68.7 dB(A) at receptor 8-6. Receptors 8-1 and 8-6 are currently affected by traffic noise and are predicted to be impacted under the No-Build Alternative. Once the project is built, overall traffic noise levels increase by an average of 1.3 dB(A), with the average project-related noise level predicted to be 67.2 dB(A).). Five sites are predicted to meet or exceed the NAC under the Build Alternative. Receptor 8-6 has the highest predicted build noise level (70.0 dB(A)). None of the increases over existing are considered substantial.

Because the predicted noise levels exceed NAC for the five receptors, they are considered impacted. Noise abatement was considered to mitigate these impacts, as summarized in **Section 3.4.4**.

3.3.9 Noise Study Area 9

NSA 9 is south of SR 408 from John Young Parkway to Church Street. There are no existing barriers within this NSA. Three residential sites were analyzed for noise impacts. This NSA and its associated receptors are illustrated in **Appendix D: Pages D-5 and D-6**.

Currently, the average noise level for all NSA 9 receptors is 66.6 dB(A), with the highest noise level being 67.1 dB(A) at receptor 9-1. All three sites are currently affected by traffic noise and are predicted to meet or exceed the NAC under the No-Build Alternatives. After the project is built, the average noise level is predicted to be 67.7 dB(A), with the highest noise level being 67.9 at receptor 9-1. The average project-related noise increase over existing conditions is 1.1 dB(A). None of the increases over existing are considered substantial.

Because the predicted noise levels exceed NAC for the five receptors, they are considered impacted. Noise abatement was considered to mitigate these impacts, as summarized in **Section 3.4.5**.

3.3.10 Noise Study Area 10

NSA 10 is north of SR 408, across from NSA 9. Within this NSA are two existing eight-foot-tall barriers. One is the post and panel barrier offset from the westbound mainline shoulder EOP. The other is cast-in-place on the mechanically stabilized earth (MSE) wall along the John Young Parkway exit ramp. Twelve residences, represented by receptors 10-1 through 10-12, were evaluated for noise impacts. This NSA and its associated receptors are illustrated in **Appendix D: Pages D-5 and D-6**.

Currently, the average noise level for the analyzed sites in NSA 10 is 64.2 dB(A), with the highest noise level being 68.2 dB(A) at receptor 10-9. Receptors 10-9 through 10-12 are currently affected by traffic noise and are predicted to meet or exceed NAC under the No-Build Alternative. Once the project is built, the overall traffic noise levels increase by an average of 2.3 dB(A), with the average project-related noise level predicted to be 66.5 dB(A). Six sites are predicted to exceed the NAC under the Build Alternative. Receptor 10-9 has the highest predicted build noise level (69.5 dB(A)). None of the increases over existing are considered substantial.

Because the predicted noise levels exceed NAC for the six impacted receptors, they are considered impacted. Noise abatement was considered to mitigate these impacts, as summarized in **Section 3.4.4**.

3.3.11 Noise Study Area 11

NSA 11 is north of SR 408 from Church Street to the west of Tampa Avenue. An existing eight-foot-tall barrier is on the MSE wall adjacent to the westbound ramp/mainline. The proposed improvements to the westbound direction only include restriping the existing pavement; thus, they do not require the removal of the existing barrier, which is already at the maximum allowed height. Twenty-eight sites represented by receptors 11-1 through 11-25 were evaluated for noise impacts. The residences represented by receptors 11-18 through 11-20 are part of the two-story buildings. The noise analysis assigned a specific letter to indicate the floor on which a unit is located. The letter “a” represents ground-floor units while “b” represents 2nd-floor units. This NSA, its associated receptors, and existing barriers are illustrated in **Appendix D: Page D-7**.

Currently, the average noise level for the analyzed sites in NSA 11 is 63.9 dB(A), with the highest noise level being 67.7 dB(A) at receptor 11-25. Receptors 11-7 and 11-23 through 11-25 are currently affected by traffic noise and are predicted to meet or exceed NAC under the No-Build Alternative. Once the project is built, the overall traffic noise levels increase by an average of 0.8 dB(A), with the average project-related noise level predicted to be 64.7 dB(A). Eight sites are predicted to exceed the NAC under the Build Alternative. None of the increases over existing are considered substantial.

Since the existing noise wall is at the maximum allowed height [8 feet on top of MSE] and length for the NSA, additional abatement consideration for the eight impacted sites is not warranted.

3.4 Barrier Analysis

Four noise barriers were evaluated to mitigate the impacts resulting from the project.

3.4.1 Noise Barrier EB1

Barrier EB1 illustrated in **Appendix E - Pages E-1 and E-2** was evaluated parallel to the eastbound SR 408 as a two-segment barrier system to abate the project-related noise impacts for 27 NSA 1 and 11 NSA 3 receptors. The proposed barrier system replaces the existing 8-foot-tall mainline barrier with a 14-foot-tall barrier on the shoulder EOP [Segment 1] and 8 feet on the bridge over Pine Hills Road. Segment 2 consists of a new 8-foot-tall shoulder barrier along the Pine Hills entry ramp, which ties into the existing 8-foot-tall cast-in-place (CIP) barrier. As shown in **Table 4**, the Option 1 barrier system, at the maximum allowed heights of 14 and 8 feet, benefits 37 receptors (36 impacted and one non-impacted) and meets all acoustic and cost reasonableness criteria. Barrier EB1 is considered feasible and reasonable and is recommended for further consideration during the final design process.

Two legally permitted, conforming billboards (FDOT Tag Numbers: CF399 and CFR400) are located behind this barrier system. Any potential noise barrier/billboard conflict will be addressed during the final design process.

Table 4: Noise Barrier EB1 Evaluation Summary

NSAs 1 and 3: Barrier EB1 Evaluation Summary														
Evaluated Barrier Options				Number of Impacted Residential Sites	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites *1				Total Estimated Cost *4	Cost per Benefited Receptor *5	Recommended for further consideration in final design?
Option	Barrier Type/Location	Height (feet)*6	Length (feet)		5-5.9 dB(A)	6-6.9 dB(A)	≥ 7.0 dB(A) *2	Impacted	Other *3	Total	Avg / Max Reduction dB(A)			
1 *Illustrated*	Seg. 1 - m/l shoulder	14	2,993	38	8	1	27	36	1	37	8.6 / 12.3	$ 1,366,500	$ 36,932	Yes
	Seg. 1 - on structure	8	171											
	Seg. 2 - ramp shoulder	8	285											
2	Seg. 1 - m/l shoulder	14	2,584		9	4	23	36	0	36	7.8 / 11.9	$ 1,194,720	$ 33,187	Yes
	Seg. 1 - on structure	8	171											
	Seg. 2 - ramp shoulder	8	285											

*1 = Minimum of 5.0 dB(A) required to be considered benefited by noise barrier.
*2 = FDOT Noise Reduction Design Goal is 7.0 dB(A) at a minimum of 1 benefited receptor.
*3 = Refers to non-impacted noise-sensitive sites.
*4 = Based on FDOT Statewide average of $30 per square foot.
*5 = FDOT Reasonable Cost Guideline is $42,000.
*6 = 8-ft max on MSE/Bridge; 14-ft max on shoulder; 22-ft max at ROW or offset from shoulder.

3.4.2 Noise Barrier WB1

To abate for impacts to the 14 homes in NSA 4, Barrier WB1 was evaluated parallel to westbound SR 408 and placed at the westbound mainline shoulder EOP. The analysis included the existing 8-foot-tall barrier along the Pine Hills exit ramp for acoustical purposes but was not factored into the cost reasonableness calculations. The proposed barrier replaces the existing 8-foot-tall mainline barrier. As shown in **Table 5**, Option 5, at the maximum allowed heights, benefits 11 of the 14 impacted receptors, meets acoustic criteria, and is the CFX preferred option to carry forward into the project's final design phase. Thus, Barrier WB1, as illustrated in **Appendix E – Pages E-1 and E-2**, is recommended for further consideration during the project's final design phase.

Two legally permitted, conforming billboards (FDOT Tag Numbers: CE315 and CM805) are located behind this barrier system. Any potential noise barrier/billboard conflict will be addressed during the final design process.

Table 5: Noise Barrier WB1 Evaluation Summary

NSA 4: Barrier WB1 Evaluation Summary														
Evaluated Barrier Options				Number of Impacted Residential Sites	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites *1				Total Estimated Cost *4	Cost per Benefited Receptor *5	Recommended for further consideration in final design?
Option	Barrier Type/Location	Height (feet)*6	Length (feet)		5-5.9 dB(A)	6-6.9 dB(A)	≥ 7.0 dB(A) *2	Impacted	Other *3	Total	Avg / Max Reduction dB(A)			
1	Seg.1 m/l shoulder	0	0	14	1	1	0	2	0	2	5.8 / 6.3	$ 431,520	$ 215,760	No
	Seg.2 m/l shoulder	8	1,798											
2	Seg.1 m/l shoulder	10	1,620		3	1	1	5	0	5	5.9 / 7.3	$ 528,720	$ 105,744	No
	Seg.2 m/l shoulder	8	178											
3	Seg.1 m/l shoulder	12	1,620		3	3	2	8	0	8	6.4 / 8.4	$ 625,920	$ 78,240	No
	Seg.2 m/l shoulder	8	178											
4	Seg.1 m/l shoulder	14	1,620		5	4	2	11	0	11	6.4 / 8.9	$ 723,120	$ 65,738	No
	Seg.2 m/l shoulder	8	178											
5 *Illustrated*	Seg.1 m/l shoulder	14	1,017		5	4	2	11	0	11	6.3 / 8.9	$ 469,860	$ 42,715	Yes
	Seg.2 m/l shoulder	8	178											

*1 = Minimum of 5.0 dB(A) required to be considered benefited by noise barrier.
*2 = FDOT Noise Reduction Design Goal is 7.0 dB(A) at a minimum of 1 benefited receptor.
*3 = Refers to non-impacted noise-sensitive sites.
*4 = Based on FDOT Statewide average of $30 per square foot.
*5 = FDOT Reasonable Cost Guideline is $42,000.
*6 = 8-ft max on MSE/Bridge; 14-ft max on shoulder; 22-ft max at ROW or offset from shoulder.

3.4.3 Noise Barrier EB2

To abate for impacts to the 28 receptors in NSA 3 [14 residences] and NSA 5 [14 residences], Barrier EB2 was evaluated as a four-segment barrier system parallel to eastbound SR 408. The analyzed system incorporates the existing 16-foot-tall post and panel barrier, replaces the existing 8-foot tall barriers removed by the build alternative with 8-foot and 14-foot barriers on the shoulder EOP, depending on location, and extends the 16-foot-tall post and panel wall further west. As shown in Table 6, two barrier system options were evaluated, with the primary difference being that Option 1 maintains the Segment 3 section at a height of 8 feet. In contrast, Option 2 increases the height of the barrier to 14 feet, where an MSE wall is not proposed. The cost per benefited receptor calculations accounted only for the lengths of replacement barrier but used the benefits gained by the entire barrier system/length.

While both barrier system options meet acoustic feasibility and cost criteria, Option 2, as illustrated in **Appendix E – Pages E-3 and E-4**, benefits 52 homes, six more than Option 1. The four-segment Option 2 barrier system is recommended for further consideration during the project's final design phase.

One legally permitted, conforming billboard (FDOT Tag Number: AT785) is located behind this barrier system. Any potential noise barrier/billboard conflict will be addressed during the final design process.

Table 6: Noise Barrier EB2 Evaluation Summary

NSAs 5 and 7: Barrier EB2 Evaluation Summary														
Evaluated Barrier Options				Number of Impacted Residential Sites	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites *1				Total Estimated Cost *4	Cost per Benefited Receptor *5,7	Recommended for further consideration in final design?
Option	Barrier Type/Location	Height (feet)*6	Length (feet)		5-5.9 dB(A)	6-6.9 dB(A)	≥ 7.0 dB(A) *2	Impacted	Other *3	Total	Avg / Max Reduction dB(A)			
1	Seg. 1 - m/l shoulder	8	542	28	5	1	3	9	37	46	8.4 / 11.2	$ 1,506,240	$ 32,744	Yes
	Seg. 2 - post/panel	16	603											
	Seg. 3 - shoulder	8	3,257											
	Seg. 3 - shoulder	14	0											
	Seg. 4 - m/l shoulder	8	263											
	Seg. 4 - m/l shoulder	14	576											
2 Illustrated	Seg. 1 - m/l shoulder	8	542		10	1	3	14	38	52	8.0 / 11.2	$ 1,634,220	$ 31,427	Yes
	Seg. 2 - post/panel	16	603											
	Seg. 3 - shoulder	8	2,546											
	Seg. 3 - shoulder	14	711											
	Seg. 4 - m/l shoulder	8	263											
	Seg. 4 - m/l shoulder	14	576											

*1 = Minimum of 5.0 dB(A) required to be considered benefited by noise barrier.
*2 = FDOT Noise Reduction Design Goal is 7.0 dB(A) at a minimum of 1 benefited receptor.
*3 = Refers to non-impacted noise-sensitive sites.
*4 = Based on FDOT Statewide average of $30 per square foot.
*5 = FDOT Reasonable Cost Guideline is $42,000.
*6 = 8-ft max on MSE/Bridge; 14-ft max on shoulder; 22-ft max at ROW or offset from shoulder.
*7 = CPBR calculated using only the replacment barrier length but all receptors benefited by the entire barrier system.

3.4.4 Noise Barrier WB-A1

Barrier WB-A1 was evaluated as a three-segment barrier system to abate the project-related impacts to eleven receptors in NSA 8 [five residences] and NSA 10 [six residences] parallel to westbound SR 408 mainline and John Young Parkway entry/exit ramps. There are no existing barriers in this section. Depending on location, the barrier system was evaluated using the maximum allowed heights of eight and fourteen feet. As shown in **Table 7**, the barrier system only benefits four of the eleven impacted and four non-impacted residences. The estimated cost for the three-segment system equates to a cost per benefited receptor (CPBR) of $190,403, greatly exceeding the $42,000 CPBR threshold. Barrier WB-A1, as illustrated in **Appendix E – Pages E-4 and E-5**, does not meet the necessary cost reasonableness criterion; thus, it has been

removed from further consideration. At CFX's discretion, other options may be considered during the final design phase to provide a visual buffer between the residences and the expressway.

Table 7: Noise Barrier WB-A1 Evaluation Summary

NSAs 8 & 10: Barrier WB-A1 Evaluation Summary														
Evaluated Barrier Options				Number of Impacted Residential Sites	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites *1				Total Estimated Cost *4	Cost per Benefited Receptor *5	Recommended for further consideration in final design?
Option	Barrier Type/Location	Height (feet) *6	Length (feet)		5-5.9 dB(A)	6-6.9 dB(A)	≥ 7.0 dB(A) *2	Impacted	Other *3	Total	Avg / Max Reduction dB(A)			
1	Seg. 1 - ramp shoulder	14	1,041	11	1	0	3	4	4	8	6.3 / 7.0	$ 1,523,220	$ 190,403	No
	Seg. 2 - m/l shoulder	14	1,768											
	Seg. 2 - m/l shoulder	8	249											
	Seg. 3 - ramp shoulder	8	1,182											

*1 = Minimum of 5.0 dB(A) required to be considered benefited by noise barrier.
*2 = FDOT Noise Reduction Design Goal is 7.0 dB(A) at a minimum of 1 benefited receptor.
*3 = Refers to non-impacted noise-sensitive sites.
*4 = Based on FDOT Statewide average of $30 per square foot.
*5 = FDOT Reasonable Cost Guideline is $42,000.
*6 = 8-ft max on MSE/Bridge; 14-ft max on shoulder; 22-ft max at ROW or offset from shoulder.

3.4.5 Noise Barrier EB-A1

Barrier EB-A1 was evaluated as a two-segment barrier system to abate the project-related impacts to three receptors in NSA 9 parallel to the eastbound SR 408 mainline and John Young Parkway entry ramps. There are no existing barriers in this section. Depending on location, the barrier system was evaluated using the maximum allowed heights of eight and fourteen feet. As shown in **Table 8**, the barrier system cannot provide the required minimum 5 dB(A) reduction for any impacted residences. Barrier EB-A1, as illustrated in **Appendix E – Page E-5**, is not considered feasible; thus, it has been removed from further consideration. At CFX's discretion, other options may be considered during the final design phase to provide a visual buffer between the residences and the expressway.

Table 8: Noise Barrier WB3 Evaluation Summary

NSAs 9: Barrier EB-A1 Evaluation Summary														
Evaluated Barrier Options				Number of Impacted Residential Sites	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites *1				Total Estimated Cost *4	Cost per Benefited Receptor *5	Recommended for further consideration in final design?
Option	Barrier Type/Location	Height (feet)*6	Length (feet)		5-5.9 dB(A)	6-6.9 dB(A)	≥ 7.0 dB(A) *2	Impacted	Other *3	Total	Avg / Max Reduction dB(A)			
1	Seg. 1 m/l shoulder	14	657	3	0	0	0	0	0	0	< 5.0	$ 426,180	n/a	No
	Seg. 2 ramp shoulder	8	626											

*1 = Minimum of 5.0 dB(A) required to be considered benefited by noise barrier.
*2 = FDOT Noise Reduction Design Goal is 7.0 dB(A) at a minimum of 1 benefited receptor.
*3 = Refers to non-impacted noise-sensitive sites.
*4 = Based on FDOT Statewide average of $30 per square foot.
*5 = FDOT Reasonable Cost Guideline is $42,000.
*6 = 8-ft max on MSE/Bridge; 14-ft max on shoulder; 22-ft max at ROW or offset from shoulder.

4.0 CONCLUSION

Of the 191 analyzed residential sites, 18 are currently affected by traffic noise. The noise levels associated with the 2045 No-Build Alternative are predicted to meet or exceed the 66.0 dB(a) NAC at 19 sites.

The analysis concluded that once the project is built, which requires the removal of a majority of the existing walls, the overall traffic noise levels will increase by an average of 4.0 dB(A), with the average project-related noise level predicted to be 66.9 dB(A). The 2045 Build Alternative's noise levels are predicted to meet or exceed the applicable NAC at 95 sites. The greatest noise level increase is predicted to be 10.3 dB(A) in NSA 1. None of the increases are considered substantial (i.e., 15 dB(A) or more over existing levels).

As required, noise abatement consideration was given to all 95 impacted sites. Five noise barrier systems were evaluated to abate the project-related impacts. Barrier systems WB-A1 and EB-A1 are not deemed feasible and reasonable for impacted receptors 8-5, 10-6, 10-8 through 10-12, and 9-1 through 9-3. Receptor 4-18 is considered isolated; therefore, a barrier at this location cannot achieve the minimum noise reduction requirement. Consequently, a barrier was not analyzed for this location.

Barriers EB1, WB1, and EB2, as described in **Table 9**, were evaluated to abate the remaining impacted receptors in NSAs 1, 3, 4, 5, and 7 and are the CFX preferred options recommended for further consideration during the final design process.

Barrier EB1 is predicted to abate impacts to 37 residences (36 impacted and one non-impacted). Effective noise reduction for receptors 3-17 and 3-18 is not possible.

Barrier WB1 is predicted to abate impacts to 11 impacted residences. Effective noise reduction for the three impacted receptors, 4-8 through 4-10, is not possible.

Barrier EB2 is predicted to abate impacts to 52 residences (14 impacted and 38 non-impacted. Effective noise reduction for the 14 residences represented by receptors 5-23 through 5-27, 5-49 through 5-51, 7-1, 7-5, 7-9, 7-12, 7-13, and 7-16 is not possible.

As described in **Table 9**, noise barriers EB1, WB1, and EB2 are the CFX preferred options recommended for further consideration during the final design process. For areas where barriers are not feasible and reasonable, but barriers currently exist, CFX will evaluate other options for providing visual buffers between the residences and the expressway during the final design process.

Table 9: CFX Project #408-174 PD&E Noise Barrier Recommendations

Noise Study Area	Barrier ID	Barrier Height (ft) *2	Barrier Length (ft)	Barrier Location	Estimated Barrier Cost *1	Recommended for Further Evaluation?
1 and 3	EB1	8 & 14	456 [8'] 2,993 [14']	m/l shoulder; on bridge; ramp shoulder	$1,366,500	Yes
4	WB1	8 & 14	178 [8'] 1,017 [14']	m/l shoulder; on bridge	$469,860	Yes
5 and 7	EB2	8, 14 & 16	3,351 [8'] 1,287 [14'] 603 [16']	m/l shoulder; ramp sholder ROW post/panel	$1,634,220	Yes
8 and 10	WB-A1	8 & 14	1,431 [8'] 2,809 [14']	m/l shoulder; ramp shoulder	$1,523,220	No
9	EB-A1	8 & 14	626 [8'] 657 [14']	m/l shoulder; ramp shoulder	$426,180	No

**1 = Based on FDOT Statewide average of $30 per square foot.*

**2 = 8-ft max on MSE/Bridge; 14-ft max on shoulder; 22-ft max at ROW or offset from shoulder.*

4.1 Statement of Likelihood

The Central Florida Expressway Authority is committed to the construction of feasible and reasonable noise abatement measures (Noise Barriers EB1, WB1, and EB2) identified in **Table 9,** contingent upon the following conditions:

- Final recommendations on the construction of abatement measures are determined during the project's final design and through the public involvement process.
- Detailed noise analyses during the final design process support the need, feasibility, and reasonableness of providing abatement.
- Cost analysis indicates that the cost of the noise barrier(s) will not exceed the cost reasonable criterion.
- Community input supporting types, heights, and locations of the noise barrier(s) is provided to CFX.
- Safety and engineering aspects as related to the roadway user and the adjacent property owner have been reviewed, and any conflicts or issues resolved.

Any potential noise barrier/billboard [legally permitted and conforming] conflict will be addressed during the final desing process.

5.0 CONSTRUCTION NOISE AND VIBRATION IMPACTS

Construction of the proposed roadway improvements is not expected to have significant vibration or construction noise impacts. Applying the FDOT Standard Specifications for Road and Bridge Construction is anticipated to minimize or eliminate most potential short-term noise and vibration impacts. Should any construction noise or vibration issues arise during construction, the Project Engineer, in concert with the CFX Noise Specialist and the Contractor, will investigate additional methods of controlling these impacts.

6.0 COMMUNITY COORDINATION

6.1 Noise Impact Contours

To aid in promoting land use compatibility, this report, which provides information that can be used to protect future land development from becoming incompatible with anticipated traffic noise levels, can be used by Orange County and officials. In addition, generalized noise impact contours for the Build Alternative have been developed, identifying the distances between the Build Alternative and the location where traffic noise levels approach the NAC for Activity Categories A, B, C, and E. The contour distances provided in **Table 10** do not account for any reduction in noise levels that berms, privacy walls, or intervening structures may provide. These

distances also do not account for any increase in noise levels caused by local roads not included in the modeling, variation in the noise path, increased roadway elevation, or increased elevation of a noise sensitive site (e.g., second-floor patio). To minimize the potential for incompatible land use, future noise sensitive land uses should be located beyond these distances.

Table 10: Critical Distance Impact Contours

Impact Contours		
Activity Category *1	**Corresponding Noise Abatement Criterion**	**Approximate Distance to SR 408**[*2]
Category A	56 dB(A)	1,280 ft
Category B and C	66 dB(A)	440 ft
Category E	71 dB(A)	235 ft

*1 Activity Categories as defined in 23 CFR 772.
*2 Does not account for variation caused by topography, local roads, intervening structures, etc.

6.2 Public Meetings

A public meeting was held for this project on February 28, 2023. Any comments received during the public meeting comment period about the PD&E Study in general and those pertinent to the noise analysis will be documented under separate cover.

The noise barriers proposed in this PD&E Study will be reevaluated during the final design process. CFX will hold a meeting to present the proposed noise barriers that continue to meet criteria and other pertinent project construction-related information to the public. To aid in the decision-making process, CFX will directly solicit the opinions of the property owners and renters found to benefit (e.g., receive a minimum 5 dB(A) reduction in noise) from the proposed noise barrier. The CFX decision-making process and survey results for this project will be documented under separate cover.

7.0 REFERENCES

FHWA. *Code of Federal Regulations*, Title 23 Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise." July 13, 2010.

FHWA. *Highway Traffic Noise: Analysis and Abatement Guidance, FHWA-HEP-10-025.* December 2011.

FHWA. *Recommended Best Practices for the Use of the FHWA Traffic Noise Model (TNM*. December 8, 2015.

FDOT. A+ Plus Aerial Photo Look-Up System. 2022.

FDOT. *FDOT Design Manual*

FDOT. *Project Development and Environment Manual:* Part II, Chapter 18. Effective July 1, 2020.

FDOT. *Standard Specifications for Road and Bridge Construction*.

FDOT. *Traffic Noise Modeling and Analysis Practitioners Handbook*. December 2018.

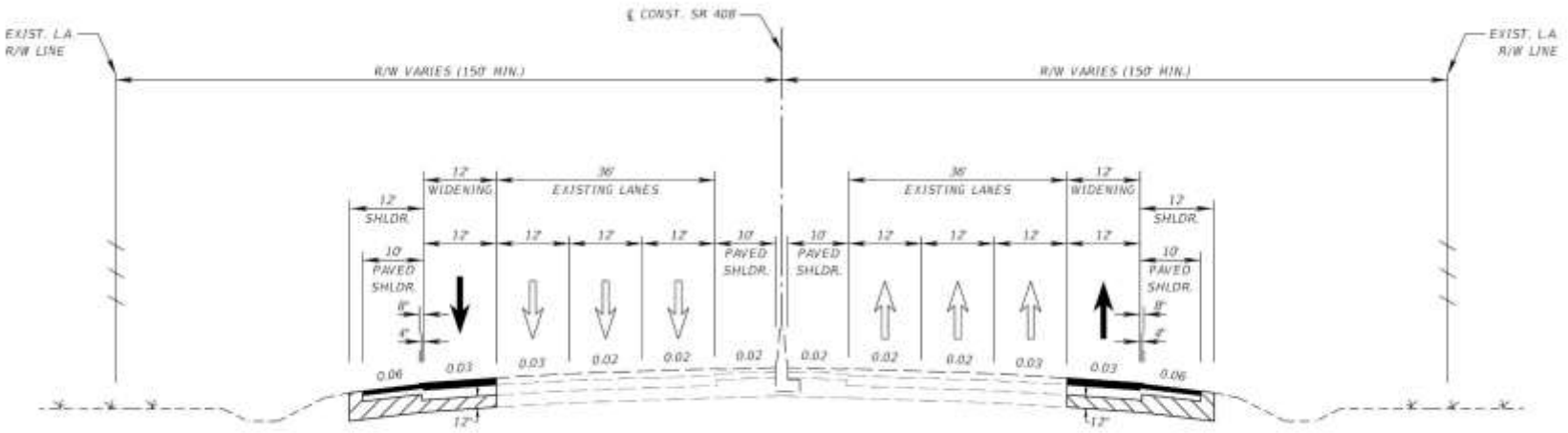
Google Earth, @2022 Google. Imagery and elevation data.

Section 335.17, *Florida Statutes. State Highway Construction; Means of Noise Abatement.* 2012.

USGS. National Map 2022; https://apps.nationalmap.gov/lidar-explorer/#/.

Appendix A:

Typical Sections


℄ CONST. SR 408
EXIST. LA R/W LINE
R/W VARIES (150' MIN.)
R/W VARIES (150' MIN.)
EXIST. LA R/W LINE
12' WIDENING
36' EXISTING LANES
36' EXISTING LANES
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Appendix B:

Noise Study Traffic Data

Noise Analysis Traffic Data - SR 408, from Kirkman Road to Church Street
2022 Existing Conditions

Freeway Mainline														
Mainline Segment	Number of Lanes	Two-Way AADT	Two-Way LOS C AADT	Peak Hour Peak Direction	LOS C Peak Hour Peak Direction	Design Hr. % T	Design Hr. % MT	Design Hr. % HT	Design Hr. % Buses	Design Hr. % Motorcycles	Standard K-factor	D-factor	Posted Speed (mph)
SR 408													
West of Kirkman Road	8	98,200	116,500	5,008	5,320	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From Kirkman Road to Pine Hills Road	8	98,550	116,500	4,952	5,320	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From Pine Hills Road to Old Winter Garden Road	6	106,700	87,400	5,322	3,990	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From Old Winter Garden Road to John Young Parkway	6	113,850	87,400	5,544	3,990	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From John Young Parkway to Tampa Avenue	8	116,550	116,500	5,588	5,320	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60

SR 408 Ramps													
SR 408 Ramps	Number of Lanes	One-Way AADT	One-Way LOS C AADT	Peak Hour Peak Direction	LOS C Peak Hour Peak Direction	Design Hr. % T	Design Hr. % MT	Design Hr. % HT	Design Hr. % Buses	Design Hr. % Motorcycles	K-factor	D-factor	Operational Speed (mph)
Kirkman Road													
Eastbound off	1	5,150	12,900	530	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	54.9%	45
Westbound on	1	5,150	12,900	416	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	54.9%	45
Eastbound on	1	5,325	12,500	600	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.6%	52.6%	45
Westbound off	1	5,325	12,500	533	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.6%	52.6%	45
Pine Hills Road													
Eastbound on	1	4,075	13,200	370	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	53.5%	45
Westbound off	1	4,075	13,200	338	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	53.5%	45
Old Winter Garden Road													
Eastbound on	1	3,575	11,100	382	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.5%	60.5%	45
Westbound off	1	3,575	11,100	411	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.5%	60.5%	45
John Young Parkway													
Eastbound off	1	4,325	11,000	386	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	64.3%	45
Westbound on	1	4,325	11,000	601	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	64.3%	45
Eastbound on	1	5,675	10,300	662	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	8.8%	69.8%	45
Westbound off	1	5,675	10,300	478	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	8.8%	69.8%	45
Tampa Avenue													
Eastbound off	1	2,450	10,200	250	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	10.5%	59.7%	45
Westbound on	1	2,450	10,200	250	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	10.5%	59.7%	45

Arterials and Cross Streets													
Arterial Segment	Number of Lanes	Two-Way AADT	Two-Way LOS C AADT	Peak Hour Peak Direction	LOS C Peak Hour Peak Direction	Design Hr. % T	Design Hr. % MT	Design Hr. % HT	Design Hr. % Buses	Design Hr. % Motorcycles	K-factor	D-factor	Posted Speed (mph)
Kirkman Road													
North of SR 408	6	29,200	61,100	1,415	3,070	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	55.8%	45
South of SR 408	6	32,800	62,400	1,809	3,070	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	54.6%	45
Pine Hills Road													
North of SR 408	4	19,100	16,000	926	790	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	54.1%	35
South of SR 408	4	16,100	38,800	738	1,900	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	54.4%	40
Old Winter Garden Road													
East of SR 408 westbound off-ramp	4	11,100	36,200	999	1,900	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	55.4%	45
John Young Parkway													
North of SR 408	6	42,900	61,800	2,127	3,070	4.00%	1.23%	2.22%	0.64%	0.08%	9.0%	56.2%	45
South of SR 408	6	34,800	64,100	1,858	3,070	4.00%	1.23%	2.22%	0.64%	0.08%	9.0%	53.2%	45
Tampa Avenue													
North of SR 408	2	8,900	7,700	410	370	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	53.2%	30
South of SR 408	2	9,300	7,700	580	370	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	53.2%	30

AADT: Annual Average Daily Traffic MT: Medium Trucks HT: Heavy Trucks

(1) Number of lanes were obtained from field observations and aerial maps. Number of lanes shown are based on direction with fewer lanes. Noise analysis to consider correct lanage per guidelines.
(2) Traffic data is obtained from the operational analysis for the SR 408 (Kirkman Road to Church Street) PD&E study.
(3) Peak hour demand and LOS C peak hour maximum service volumes are provided directionally.
(4) LOS C targets are based on the FDOT 2020 Quality/Level of Service Handbook tables, and adjusted for local conditions.
(5) LOS C AADTs are estimated using K and D factors and the design hour peak direction LOS C maximum service volumes.
(6) The vehicle classification factors are obtained from Florida Traffic Online.
(7) Posted speed data are obtained by field observations.

Noise Analysis Traffic Data - SR 408, from Kirkman Road to Church Street
2045 No Build Conditions

Freeway Mainline

Mainline Segment	Number of Lanes	Two-Way AADT	Two-Way LOS C AADT	Peak Hour Peak Direction	LOS C Peak Hour Peak Direction	Design Hr. % T	Design Hr. % MT	Design Hr. % HT	Design Hr. % Buses	Design Hr. % Motorcycles	Standard K-factor	D-factor	Posted Speed (mph)
SR 408													
West of Kirkman Road	8	150,700	116,920	7,230	5,320	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From Kirkman Road to Pine Hills Road	8	151,100	116,920	7,190	5,320	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From Pine Hills Road to Old Winter Garden Road	6	162,100	87,400	7,720	3,990	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From Old Winter Garden Road to John Young Parkway	6	171,200	87,400	8,020	3,990	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From John Young Parkway to Tampa Avenue	8	174,600	116,920	8,070	5,320	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60

SR 408 Ramps

SR 408 Ramps	Number of Lanes	One-Way AADT	One-Way LOS C AADT	Peak Hour Peak Direction	LOS C Peak Hour Peak Direction	Design Hr. % T	Design Hr. % MT	Design Hr. % HT	Design Hr. % Buses	Design Hr. % Motorcycles	K-factor	D-factor	Operational Speed (mph)
Kirkman Road													
Eastbound off	1	6,800	12,900	700	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	54.9%	45
Westbound on	1	6,800	12,900	670	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	54.9%	45
Eastbound on	1	7,000	12,500	680	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.6%	52.6%	45
Westbound off	1	7,000	12,500	710	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.6%	52.6%	45
Pine Hills Road													
Eastbound on	1	5,500	13,200	530	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	53.5%	45
Westbound off	1	5,500	13,200	530	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	53.5%	45
Old Winter Garden Road													
Eastbound on	1	4,550	11,100	382	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.5%	50.5%	45
Westbound off	1	4,550	11,100	411	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.5%	50.5%	45
John Young Parkway													
Eastbound off	1	5,450	11,000	550	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	54.3%	45
Westbound on	1	5,450	11,000	530	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	54.3%	45
Eastbound on	1	7,150	10,300	662	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	8.8%	49.8%	45
Westbound off	1	7,150	10,300	474	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	8.8%	49.8%	45
Tampa Avenue													
Eastbound off	1	3,200	10,200	400	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	10.5%	59.7%	45
Westbound on	1	3,200	10,200	400	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	10.5%	59.7%	45
Eastbound on	1	4,200	13,900	385	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	7.7%	59.7%	45
Westbound off	1	4,200	13,900	385	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	7.7%	59.7%	45

Arterials and Cross Streets

Arterial Segment	Number of Lanes	Two-Way AADT	Two-Way LOS C AADT	Peak Hour Peak Direction	LOS C Peak Hour Peak Direction	Design Hr. % T	Design Hr. % MT	Design Hr. % HT	Design Hr. % Buses	Design Hr. % Motorcycles	K-factor	D-factor	Posted Speed (mph)
Kirkman Road													
North of SR 408	6	41,300	61,100	1,770	3,070	2.00%	1.09%	0.75%	0.20%	0.18%	9.0%	55.8%	45
South of SR 408	6	38,300	62,400	2,020	3,070	2.00%	1.09%	0.75%	0.20%	0.18%	9.0%	54.6%	45
Pine Hills Road													
North of SR 408	4	25,400	15,000	1,270	730	2.00%	1.09%	0.75%	0.20%	0.18%	9.0%	54.1%	35
South of SR 408	4	20,600	38,800	1,020	1,900	2.00%	1.09%	0.75%	0.20%	0.18%	9.0%	54.4%	40
Old Winter Garden Road													
East of SR 408 westbound off-ramp	4	13,350	36,200	1,190	1,900	2.00%	1.09%	0.75%	0.20%	0.18%	9.0%	58.4%	45
John Young Parkway													
North of SR 408	6	54,500	61,800	2,690	3,070	4.00%	1.23%	2.22%	0.54%	0.08%	9.0%	55.2%	45
South of SR 408	6	43,800	64,100	2,120	3,070	4.00%	1.23%	2.22%	0.54%	0.08%	9.0%	53.2%	45
Tampa Avenue													
North of SR 408	2	12,900	7,700	605	370	2.00%	1.09%	0.75%	0.20%	0.18%	9.0%	53.2%	30
South of SR 408	2	14,400	7,700	605	370	2.00%	1.09%	0.75%	0.20%	0.18%	9.0%	53.2%	30

AADT: Annual Average Daily Traffic MT: Medium Trucks HT: Heavy Trucks

(1) Number of lanes were obtained from field observations and aerial maps. Number of lanes shown are based on direction with fewer lanes. Noise analysis to consider correct lanes per guidelines.
(2) Traffic data is obtained from the operational analysis for the SR 408 (Kirkman Road to Church Street) PD&E study.
(3) Peak hour demand and LOS C peak hour maximum service volumes are provided directionally.
(4) LOS C targets are based on the FDOT 2020 Quality/Level of Service Handbook tables, and adjusted for local conditions.
(5) LOS C AADTs are estimated using K and D factors and the design hour peak direction LOS C maximum service volumes.
(6) The vehicle classification factors are obtained from Florida Traffic Online.
(7) Posted speed data are obtained by field observations.

Noise Analysis Traffic Data - SR 408, from Kirkman Road to Church Street
2045 Build Conditions

Freeway Mainline													
Mainline Segment	Number of Lanes	Two-Way AADT	Two-Way LOS C AADT	Peak Hour Peak Direction	LOS C Peak Hour Peak Direction	Design Hr. % T	Design Hr. % MT	Design Hr. % HT	Design Hr. % Buses	Design Hr. % Motorcycles	Standard K-factor	D-factor	Posted Speed (mph)
SR 408													
West of Kirkman Road	8	150,700	116,500	7,250	5,120	2.00%	0.61%	1.15%	0.23%	0.02%	9.5%	53.7%	60
From Kirkman Road to Pine Hills Road	10	151,100	145,700	7,190	6,850	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From Pine Hills Road to Old Winter Garden Road	10	162,100	145,700	7,720	6,850	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From Old Winter Garden Road to John Young Parkway	10	171,200	145,700	8,020	6,850	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60
From John Young Parkway to Tampa Avenue	10	174,800	145,700	8,070	6,850	2.00%	0.61%	1.15%	0.23%	0.02%	8.5%	53.7%	60

SR 408 Ramps													
SR 408 Ramps	Number of Lanes	One-Way AADT	One-Way LOS C AADT	Peak Hour Peak Direction	LOS C Peak Hour Peak Direction	Design Hr. % T	Design Hr. % MT	Design Hr. % HT	Design Hr. % Buses	Design Hr. % Motorcycles	K-factor	D-factor	Operational Speed (mph)
Kirkman Road													
Eastbound off	1	6,800	12,900	700	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	54.9%	45
Westbound on	1	6,800	12,900	670	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	54.9%	45
Eastbound on	1	7,000	12,500	660	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.6%	52.6%	45
Westbound off	2	7,000	25,000	710	2,540	2.00%	0.61%	1.15%	0.23%	0.02%	9.6%	52.6%	45
Pine Hills Road													
Eastbound on	1	5,500	13,200	530	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	53.5%	45
Westbound off	2	5,500	26,400	530	2,540	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	53.5%	45
Old Winter Garden Road													
Eastbound on	1	4,550	11,100	362	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.5%	60.5%	45
Westbound off	1	4,550	11,100	411	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.5%	60.5%	45
John Young Parkway													
Eastbound off	2	5,450	22,000	550	2,540	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	56.3%	45
Westbound on	1	5,450	11,000	630	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	9.0%	56.3%	45
Eastbound on	1	7,150	10,300	662	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	8.8%	59.8%	45
Westbound off	1	7,150	10,300	478	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	8.8%	59.8%	45
Tampa Avenue													
Eastbound off	1	3,200	10,200	400	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	10.5%	59.7%	45
Westbound on	1	3,200	10,200	400	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	10.5%	59.7%	45
Eastbound on	1	4,200	13,900	385	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	7.7%	59.7%	45
Westbound off	1	4,200	13,900	385	1,270	2.00%	0.61%	1.15%	0.23%	0.02%	7.7%	59.7%	45

Arterials and Cross Streets													
Arterial Segment	Number of Lanes	Two-Way AADT	Two-Way LOS C AADT	Peak Hour Peak Direction	LOS C Peak Hour Peak Direction	Design Hr. % T	Design Hr. % MT	Design Hr. % HT	Design Hr. % Buses	Design Hr. % Motorcycles	K-factor	D-factor	Posted Speed (mph)
Kirkman Road													
North of SR 408	6	41,300	61,100	1,770	3,070	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	55.8%	45
South of SR 408	6	38,300	62,400	2,020	3,070	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	54.6%	45
Pine Hills Road													
North of SR 408	4	25,400	15,000	1,270	730	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	54.1%	35
South of SR 408	4	20,600	38,800	1,020	1,900	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	54.4%	40
Old Winter Garden Road													
East of SR 408 westbound off-ramp	4	13,300	36,200	1,190	1,900	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	58.4%	45
John Young Parkway													
North of SR 408	8	54,500	61,800	2,690	3,070	4.00%	1.23%	2.22%	0.54%	0.06%	9.0%	59.2%	45
South of SR 408	8	43,800	64,100	2,120	3,070	4.00%	1.23%	2.22%	0.54%	0.06%	9.0%	53.2%	45
Tampa Avenue													
North of SR 408	2	12,900	7,700	605	370	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	53.2%	30
South of SR 408	2	14,400	7,700	805	370	2.00%	1.05%	0.75%	0.20%	0.18%	9.0%	53.2%	30

AADT: Annual Average Daily Traffic *MT: Medium Trucks* *HT: Heavy Trucks*

(1) Number of lanes for freeway segments and ramps were obtained from the design concept. Number of lanes for arterials were obtained from field observations and aerial maps. Number of lanes shown are based on direction with fewer lanes. Noise analysis to consider correct lane per guidelines.
(2) Traffic data is obtained from the operational analysis for the SR 408 (Kirkman Road to Church Street) PD&E study.
(3) Peak hour demand and LOS C peak hour maximum service volumes are provided directionally.
(4) LOS C targets are based on the FDOT 2020 Quality/Level of Service Handbook tables, and adjusted for local conditions.
(5) LOS C AADTs are estimated using K and D factors and the design hour peak direction LOS C maximum service volumes.
(6) The vehicle classification factors are obtained from Florida Traffic Online.
(7) Posted speed data are obtained by field observations.

Appendix C:

Noise Impact Comparison Matrix

Noise Impact Comparison Matrix

Noise Sensitive Sites			Predicted Noise Levels (dB(A)) *Red = Noise Level above NAC*				
Receptor ID	**# Sites Represented**	**Impact Criterion (dB(A))**	**2022 Existing**	**2045 No-Build Alternative**	**2045 Build Alternative**	**Build Change From Existing**	***Consider Abatement***
NSA 1: South of SR 408 from Kirkman Rd to Pine Hills Rd. - Illustrated on Pages D-1 and D-2 - Appendix D							
1-1	1	66.0	63.7	64.1	***74.0***	10.3	***Yes***
1-2	1	66.0	64.3	64.8	***74.3***	10.0	***Yes***
1-3	1	66.0	64.6	65.1	***74.3***	9.7	***Yes***
1-4	1	66.0	64.1	64.6	***73.2***	9.1	***Yes***
1-5	1	66.0	63.5	64.0	***72.7***	9.2	***Yes***
1-6	1	66.0	61.8	62.3	***70.4***	8.6	***Yes***
1-7	1	66.0	62.6	63.1	***72.1***	9.5	***Yes***
1-8	1	66.0	63.0	63.5	***72.2***	9.2	***Yes***
1-9	1	66.0	63.3	63.9	***72.3***	9.0	***Yes***
1-10	1	66.0	62.8	63.3	***70.9***	8.1	***Yes***
1-11	1	66.0	62.3	62.8	***69.9***	7.6	***Yes***
1-12	1	66.0	61.6	62.0	***70.0***	8.4	***Yes***
1-13	1	66.0	62.0	62.5	***70.7***	8.7	***Yes***
1-14	1	66.0	62.2	62.8	***70.8***	8.6	***Yes***
1-15	1	66.0	61.6	62.1	***69.1***	7.5	***Yes***
1-16	1	66.0	61.3	61.8	***68.3***	7.0	***Yes***
1-17	1	66.0	60.9	61.5	***67.8***	6.9	***Yes***
1-18	1	66.0	60.8	61.1	***68.3***	7.5	***Yes***
1-19	1	66.0	60.8	61.2	***69.0***	8.2	***Yes***
1-20	1	66.0	61.1	61.6	***69.4***	8.3	***Yes***
1-21	1	66.0	61.0	61.6	***69.5***	8.5	***Yes***
1-22	1	66.0	60.1	60.4	***67.3***	7.2	***Yes***
1-23	1	66.0	60.0	60.4	***67.7***	7.7	***Yes***
1-24	1	66.0	60.2	60.7	***68.3***	8.1	***Yes***
1-25	1	66.0	60.1	60.6	***68.3***	8.2	***Yes***
1-26	1	66.0	60.2	60.7	***68.3***	8.1	***Yes***
1-27	1	66.0	60.0	60.5	***66.7***	6.7	***Yes***
1-28	1	66.0	59.8	60.3	65.7	5.9	-
NSA Summary	***28***		***61.8***	***62.3***	***70.1***	***8.3***	***27***
NSA 2: North of SR 408 from Kirkman Rd to Pine Hills Rd. - Illustrated on Pages D-1 and D-2 - Appendix D							

Noise Impact Comparison Matrix

Noise Sensitive Sites			Predicted Noise Levels (dB(A)) *Red = Noise Level above NAC*				
Receptor ID	**# Sites Represented**	**Impact Criterion (dB(A))**	**2022 Existing**	**2045 No-Build Alternative**	**2045 Build Alternative**	**Build Change From Existing**	***Consider Abatement***
No noise sensitive sites							
NSA 3: South of SR 408 from Pine Hills Rd to Ortman Dr - Illustrated on Pages D-2 through D-4 - Appendix D							
3-1	1	66.0	65.0	65.8	***69.0***	4.0	***Yes***
3-2	1	66.0	65.0	65.6	***68.4***	3.4	***Yes***
3-3	1	66.0	65.4	***66.0***	***68.4***	3.0	***Yes***
3-4	1	66.0	***67.3***	***68.0***	***72.7***	5.4	***Yes***
3-5	1	66.0	63.0	63.5	***67.1***	4.1	***Yes***
3-6	1	66.0	63.5	64.0	***67.1***	3.6	***Yes***
3-7	1	66.0	63.6	64.1	***66.6***	3.0	***Yes***
3-8	1	66.0	64.0	64.4	***67.1***	3.1	***Yes***
3-9	1	66.0	61.9	62.5	***66.0***	4.1	***Yes***
3-10	1	66.0	62.1	62.6	65.4	3.3	-
3-11	1	66.0	62.6	63.1	65.5	2.9	-
3-12	1	66.0	61.8	62.2	64.3	2.5	-
3-13	1	66.0	62.3	62.6	64.7	2.4	-
3-14	1	66.0	61.8	62.4	65.9	4.1	-
3-15	1	66.0	61.1	61.6	64.6	3.5	-
3-16	1	66.0	61.1	61.6	64.3	3.2	-
3-17	1	66.0	***69.1***	***69.3***	***70.5***	1.4	***Yes***
3-18	1	66.0	***66.3***	***66.4***	***67.7***	1.4	***Yes***
NSA Summary	***18***		***63.7***	***64.2***	***67.0***	***3.2***	***11***
NSA 4: North of SR 408 from Pine Hills Rd to Ortman Dr - Illustrated on Pages D-2 through D-4 - Appendix D							
4-1	1	66.0	62.4	62.9	***66.8***	4.4	***Yes***
4-2	1	66.0	63.4	63.9	***68.6***	5.2	***Yes***
4-3	1	66.0	64.0	64.6	***69.6***	5.6	***Yes***
4-4	1	66.0	***67.0***	***67.6***	***71.6***	4.6	***Yes***
4-5	1	66.0	***67.6***	***68.2***	***70.9***	3.3	***Yes***
4-6	1	66.0	***67.1***	***67.6***	***70.0***	2.9	***Yes***
4-7	1	66.0	***66.5***	***67.0***	***69.1***	2.6	***Yes***
4-8	1	66.0	***66.4***	***66.8***	***68.7***	2.3	***Yes***

Noise Impact Comparison Matrix

Noise Sensitive Sites			Predicted Noise Levels (dB(A)) *Red = Noise Level above NAC*				
Receptor ID	**# Sites Represented**	**Impact Criterion (dB(A))**	**2022 Existing**	**2045 No-Build Alternative**	**2045 Build Alternative**	**Build Change From Existing**	***Consider Abatement***
4-9	1	66.0	65.6	65.9	***67.8***	2.2	***Yes***
4-10	1	66.0	64.3	64.6	***66.3***	2.0	***Yes***
4-11	1	66.0	63.1	63.3	65.0	1.9	-
4-12	1	66.0	62.6	63.1	***67.3***	4.7	***Yes***
4-13	1	66.0	62.8	63.3	***67.0***	4.2	***Yes***
4-14	1	66.0	63.1	63.6	***66.9***	3.8	***Yes***
4-15	1	66.0	63.1	63.6	***66.5***	3.4	***Yes***
4-16	1	66.0	63.0	63.4	65.9	2.9	-
4-17	1	66.0	62.7	63.1	65.4	2.7	-
4-18	1	66.0	***71.4***	***71.4***	***73.0***	1.6	***Yes***
NSA Summary	***18***		***64.8***	***65.2***	***68.1***	***3.4***	***15***
NSA 5: South of SR 408 from Ortman Dr to Ferguson Dr - Illustrated on Pages D-4 and D-5 - Appendix D							
5-1	1	66.0	62.6	62.6	***67.8***	5.2	***Yes***
5-2	1	66.0	62.9	62.9	***68.2***	5.3	***Yes***
5-3	1	66.0	62.9	62.9	***68.5***	5.6	***Yes***
5-4	1	66.0	60.7	60.7	65.4	4.7	-
5-5	1	66.0	60.5	60.5	64.3	3.8	-
5-6	1	66.0	60.4	60.4	63.9	3.5	-
5-7	1	66.0	60.3	60.3	63.6	3.3	-
5-8	1	66.0	60.2	60.2	63.3	3.1	-
5-9	1	66.0	60.7	60.7	63.3	2.6	-
5-10	1	66.0	60.6	60.6	63.2	2.6	-
5-11	1	66.0	60.6	60.6	63.1	2.5	-
5-12	1	66.0	60.4	60.4	62.8	2.4	-
5-13	1	66.0	60.4	60.4	62.7	2.3	-
5-14	1	66.0	60.4	60.5	62.8	2.4	-
5-15	1	66.0	60.4	60.4	62.8	2.4	-
5-16	1	66.0	60.5	60.5	63.0	2.5	-
5-17	1	66.0	60.6	60.6	63.1	2.5	-
5-18	1	66.0	60.6	60.6	63.2	2.6	-
5-19	1	66.0	60.6	60.6	63.5	2.9	-
5-20	1	66.0	60.7	60.7	65.0	4.3	-

Noise Impact Comparison Matrix

Noise Sensitive Sites			Predicted Noise Levels (dB(A)) *Red = Noise Level above NAC*				
Receptor ID	**# Sites Represented**	**Impact Criterion (dB(A))**	**2022 Existing**	**2045 No-Build Alternative**	**2045 Build Alternative**	**Build Change From Existing**	***Consider Abatement***
5-21	1	66.0	63.7	63.7	***71.2***	7.5	***Yes***
5-22	1	66.0	63.1	63.1	***70.6***	7.5	***Yes***
5-23	1	66.0	62.2	62.2	***69.4***	7.2	***Yes***
5-24	1	66.0	61.7	61.7	***68.8***	7.1	***Yes***
5-25	1	66.0	62.2	62.2	***68.8***	6.6	***Yes***
5-26	1	66.0	62.5	62.5	***69.1***	6.6	***Yes***
5-27	1	66.0	63.6	63.6	***69.8***	6.2	***Yes***
5-28	1	66.0	60.0	60.0	64.6	4.6	-
5-29	1	66.0	60.0	60.0	65.3	5.3	-
5-30	1	66.0	59.3	59.3	64.7	5.4	-
5-31	1	66.0	59.3	59.3	64.7	5.4	-
5-32	1	66.0	59.8	59.8	65.5	5.7	-
5-33	1	66.0	59.5	59.5	64.4	4.9	-
5-34	1	66.0	58.8	58.8	63.0	4.2	-
5-35	1	66.0	58.7	58.7	62.6	3.9	-
5-36	1	66.0	58.6	58.6	62.2	3.6	-
5-37	1	66.0	59.3	59.3	62.4	3.1	-
5-38	1	66.0	60.0	60.0	62.8	2.8	-
5-39	1	66.0	59.4	59.4	62.3	2.9	-
5-40	1	66.0	58.9	58.9	62.0	3.1	-
5-41	1	66.0	58.3	58.3	61.3	3.0	-
5-42	1	66.0	57.9	57.9	60.7	2.8	-
5-43	7	66.0	57.8	57.8	60.8	3.0	-
5-44	1	66.0	58.4	58.4	61.8	3.4	-
5-45	1	66.0	59.0	59.0	62.8	3.8	-
5-46	1	66.0	60.0	60.0	64.8	4.8	-
5-47	1	66.0	60.7	60.7	65.7	5.0	-
5-48	1	66.0	62.1	62.1	***68.5***	6.4	***Yes***
5-49	1	66.0	60.5	60.5	***66.0***	5.5	***Yes***
5-50	1	66.0	61.4	61.4	***67.7***	6.3	***Yes***
5-51	1	66.0	62.0	62.0	***68.4***	6.4	***Yes***
NSA Summary	***57***		***60.5***	***60.5***	***64.8***	***4.3***	***14***

Noise Impact Comparison Matrix

Noise Sensitive Sites			Predicted Noise Levels (dB(A)) *Red = Noise Level above NAC*				
Receptor ID	**# Sites Represented**	**Impact Criterion (dB(A))**	**2022 Existing**	**2045 No-Build Alternative**	**2045 Build Alternative**	**Build Change From Existing**	***Consider Abatement***
NSA 6: North of SR 408 from Ortman Dr to Ferguson Dr - Illustrated on Pages D-4 and D-5 - Appendix D							
No noise sensitive sites							
NSA 7: South of SR 408 from Ferguson Dr to John Young Pkwy - Illustrated on Pages D-5 and D-6 - Appendix D							
7-1	1	66.0	60.2	60.2	***66.3***	6.1	***Yes***
7-2	1	66.0	60.9	60.9	***68.2***	7.3	***Yes***
7-3	1	66.0	59.7	59.8	65.8	6.1	-
7-4	1	66.0	60.9	60.9	***67.0***	6.1	***Yes***
7-5	1	66.0	62.5	62.6	***68.6***	6.1	***Yes***
7-6	1	66.0	64.4	64.4	***71.0***	6.6	***Yes***
7-7	1	66.0	65.6	65.7	***73.2***	7.6	***Yes***
7-8	1	66.0	63.2	63.3	***69.5***	6.3	***Yes***
7-9	1	66.0	60.6	60.7	***66.3***	5.7	***Yes***
7-10	1	66.0	64.0	64.0	***70.1***	6.1	***Yes***
7-11	1	66.0	63.2	63.3	***68.6***	5.4	***Yes***
7-12	1	66.0	62.6	62.7	***67.6***	5.0	***Yes***
7-13	1	66.0	61.9	62.0	***66.5***	4.6	***Yes***
7-14	1	66.0	60.0	60.1	64.6	4.6	-
7-15	1	66.0	62.8	63.1	***68.0***	5.2	***Yes***
7-16	1	66.0	61.7	61.9	***66.1***	4.4	***Yes***
7-17	1	66.0	61.6	61.8	65.7	4.1	-
7-18	1	66.0	61.3	61.5	65.1	3.8	-
7-19	1	66.0	60.9	61.1	64.4	3.5	-
7-20	1	66.0	60.8	61.0	64.0	3.2	-
7-21	1	66.0	59.8	59.9	63.7	3.9	-
NSA Summary	***21***		***61.8***	***61.9***	***67.2***	***5.3***	***14***
NSA 8: North of SR 408 from Ferguson Dr to John Young Pkwy - Illustrated on Pages D-5 and D-6 - Appendix D							
8-1	1	66.0	***66.7***	***66.8***	***67.9***	1.2	***Yes***
8-2	1	66.0	65.8	65.9	***67.2***	1.4	***Yes***
8-3	1	66.0	64.7	64.8	65.9	1.2	-
8-4	1	66.0	65.2	65.4	***66.4***	1.2	***Yes***

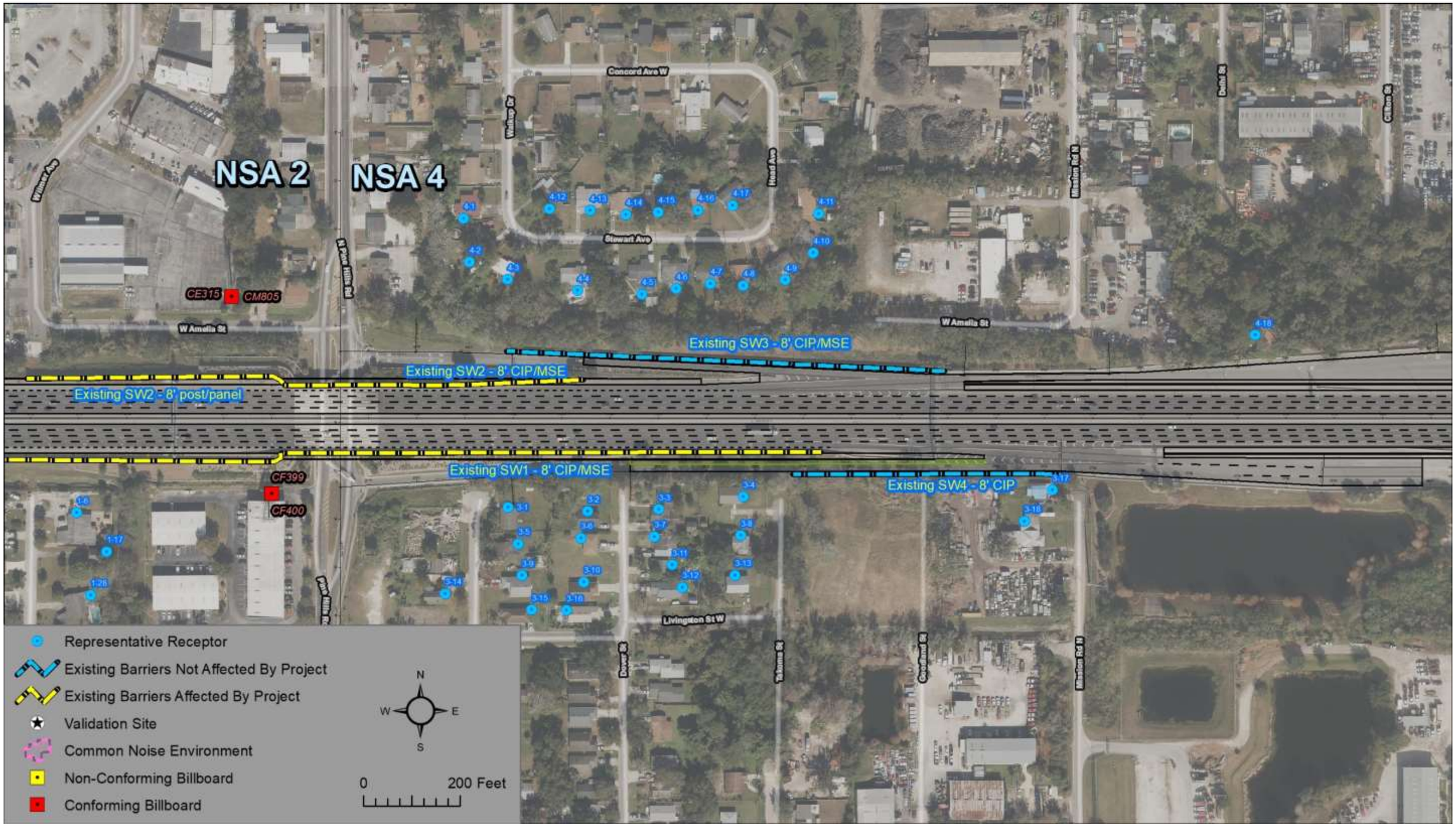
Noise Impact Comparison Matrix							
Noise Sensitive Sites			Predicted Noise Levels (dB(A)) *Red = Noise Level above NAC*				
Receptor ID	# Sites Represented	Impact Criterion (dB(A))	2022 Existing	2045 No-Build Alternative	2045 Build Alternative	Build Change From Existing	*Consider Abatement*
8-5	1	66.0	64.8	65.0	***66.0***	1.2	***Yes***
8-6	1	66.0	***68.7***	***69.0***	***70.0***	1.3	***Yes***
NSA Summary	***6***		***66.0***	***66.2***	***67.2***	***1.3***	***5***
NSA 9: South of SR 408 from John Young Pkwy to Church St - Illustrated on Pages D-5 and D-6 - Appendix D							
9-1	1	66.0	***67.1***	***67.2***	***67.9***	0.8	***Yes***
9-2	1	66.0	***66.7***	***66.8***	***68.3***	1.6	***Yes***
9-3	1	66.0	***66.1***	***66.2***	***67.0***	0.9	***Yes***
NSA Summary	***3***		***66.6***	***66.7***	***67.7***	***1.1***	***3***
NSA 10: North of SR 408 from John Young Pkwy to Church St - Illustrated on Pages D-5 and D-6 - Appendix D							
10-1	1	66.0	60.7	60.8	63.7	3.0	-
10-2	1	66.0	61.1	61.2	64.6	3.5	-
10-3	1	66.0	62.6	62.6	65.3	2.7	-
10-4	1	66.0	62.2	62.2	65.1	2.9	-
10-5	1	66.0	62.6	62.6	65.6	3.0	-
10-6	1	66.0	63.5	63.5	***66.1***	2.6	***Yes***
10-7	1	66.0	63.4	63.4	65.9	2.5	-
10-8	1	66.0	65.6	65.7	***67.5***	1.9	***Yes***
10-9	1	66.0	***68.2***	***68.2***	***69.5***	1.3	***Yes***
10-10	1	66.0	***68.0***	***68.0***	***69.4***	1.4	***Yes***
10-11	1	66.0	***66.3***	***66.3***	***67.9***	1.6	***Yes***
10-12	1	66.0	***66.2***	***66.2***	***67.8***	1.6	***Yes***
NSA Summary	***12***		***64.2***	***64.2***	***66.5***	***2.3***	***6***
NSA 11: North of SR 408 from Church St to Tampa Ave- Illustrated on Page D-7 - Appendix D							
11-1	1	66.0	63.0	63.0	63.9	0.9	-
11-2	1	66.0	63.0	63.0	63.9	0.9	-
11-3	1	66.0	62.9	62.9	63.9	1.0	
11-4	1	66.0	63.7	63.7	64.4	0.7	
11-5	1	66.0	63.9	63.9	64.7	0.8	

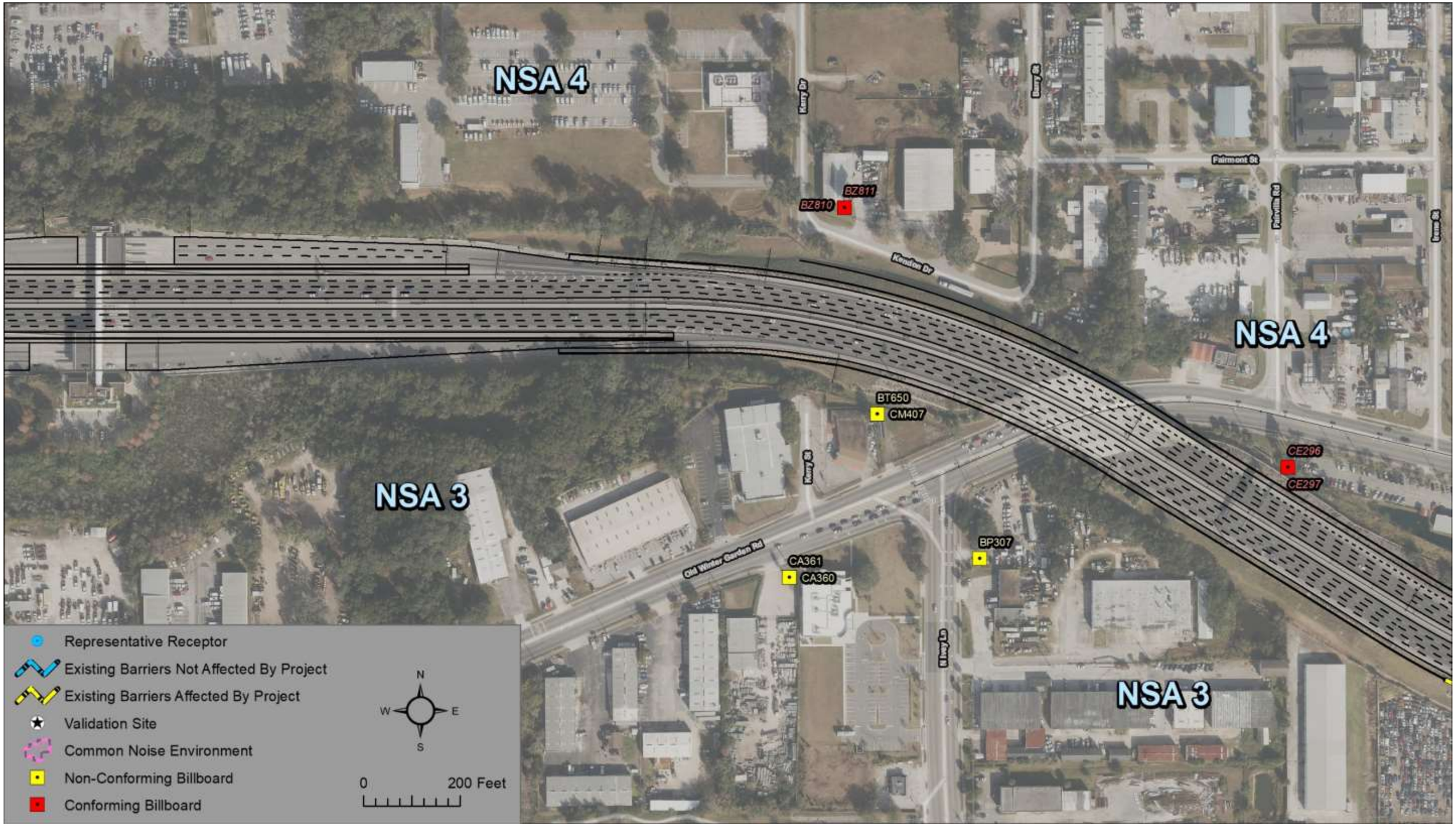
Noise Impact Comparison Matrix							
Noise Sensitive Sites			**Predicted Noise Levels (dB(A))** *Red = Noise Level above NAC*				
Receptor ID	**# Sites Represented**	**Impact Criterion (dB(A))**	**2022 Existing**	**2045 No-Build Alternative**	**2045 Build Alternative**	**Build Change From Existing**	***Consider Abatement***
11-6	1	66.0	65.4	65.4	**66.0**	0.6	***Yes***
11-7	1	66.0	**66.1**	**66.0**	**66.7**	0.6	***Yes***
11-8	1	66.0	65.7	65.6	**66.4**	0.7	***Yes***
11-9	1	66.0	63.7	63.7	64.5	0.8	
11-10	1	66.0	63.4	63.4	64.1	0.7	
11-11	1	66.0	62.8	62.8	63.6	0.8	
11-12	1	66.0	62.9	62.9	63.7	0.8	
11-13	1	66.0	62.6	62.6	63.4	0.8	
11-14	1	66.0	62.4	62.4	63.3	0.9	
11-15	1	66.0	61.9	61.8	62.8	0.9	
11-16	1	66.0	61.9	61.8	62.8	0.9	
11-17	1	66.0	61.6	61.5	62.5	0.9	
11-18a	1	66.0	63.1	63.0	63.9	0.8	
11-18b	1	66.0	65.3	65.3	**66.2**	0.9	***Yes***
11-19a	1	66.0	62.8	62.7	63.5	0.7	-
11-19b	1	66.0	65.0	64.9	65.9	0.9	-
11-20a	1	66.0	62.4	62.4	63.2	0.8	-
11-20b	1	66.0	64.6	64.5	65.5	0.9	-
11-21	1	66.0	63.2	63.1	64.0	0.8	-
11-22	1	66.0	65.5	65.4	**66.2**	0.7	***Yes***
11-23	1	66.0	**66.1**	**66.1**	**66.9**	0.8	***Yes***
11-24	1	66.0	**66.9**	**66.8**	**67.6**	0.7	***Yes***
11-25	1	66.0	**67.7**	**67.6**	**68.4**	0.7	***Yes***
NSA Summary	***28***		***63.9***	***63.9***	***64.7***	***0.8***	***8***

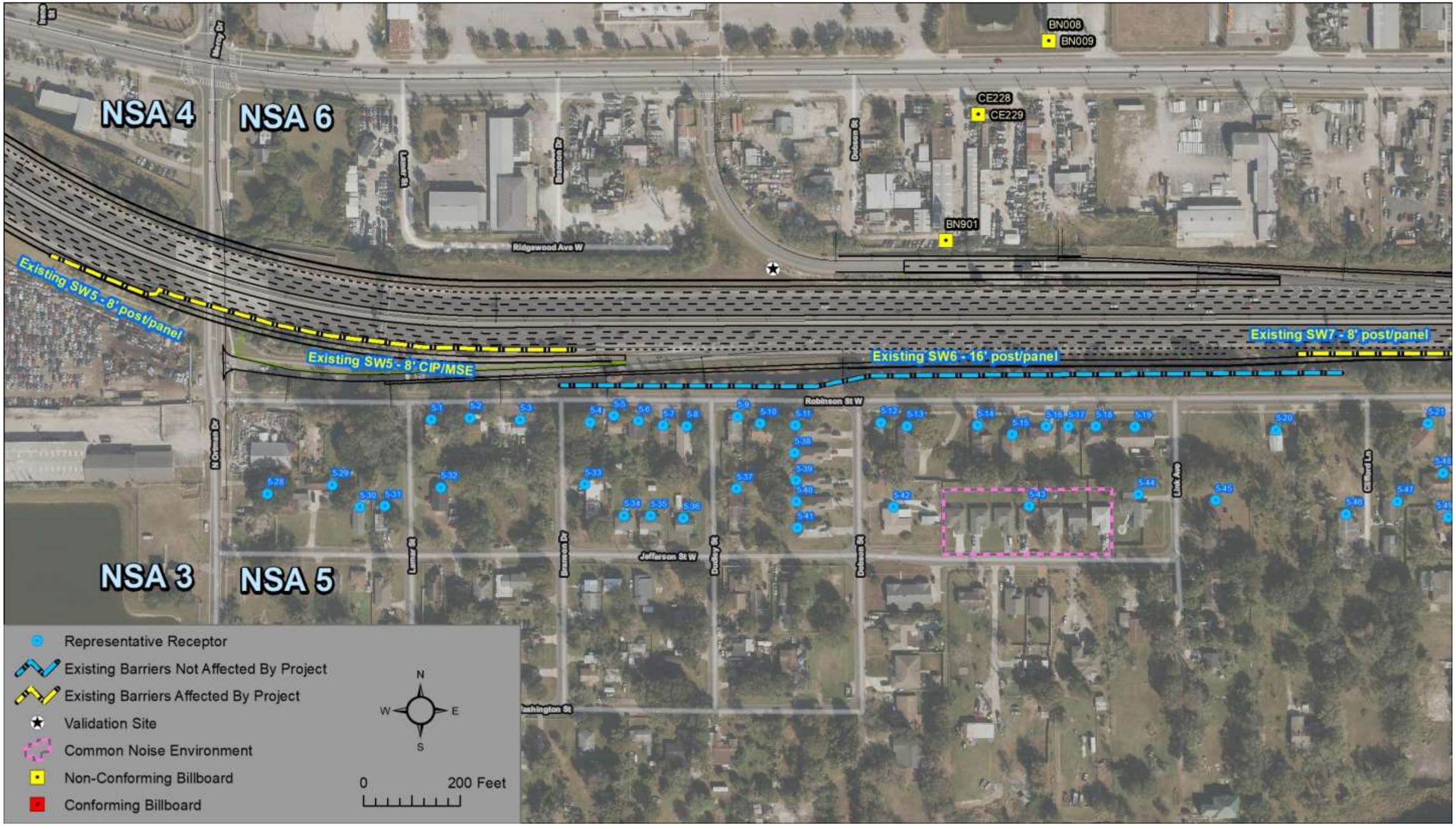
Appendix D:

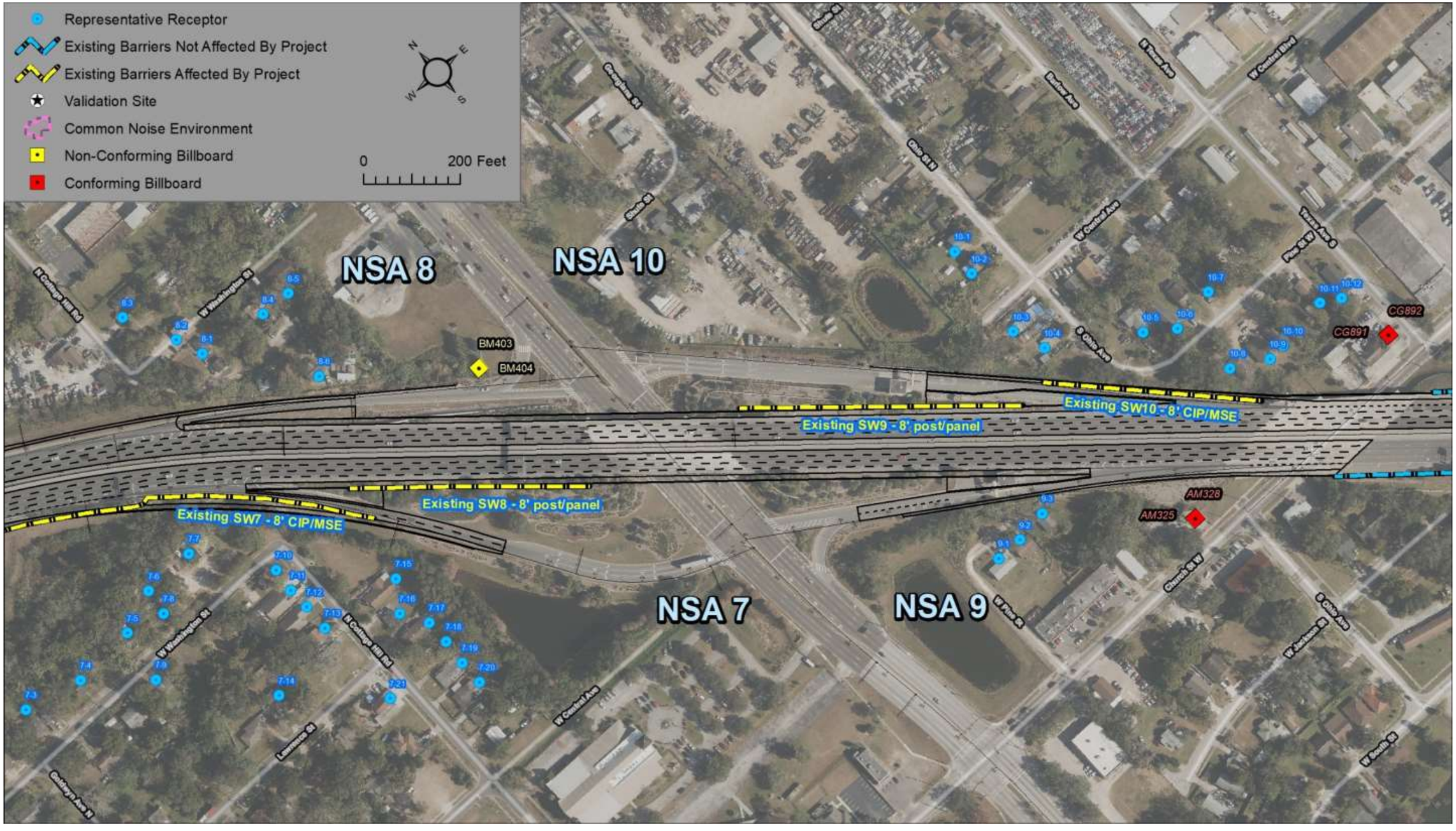
Project Aerials

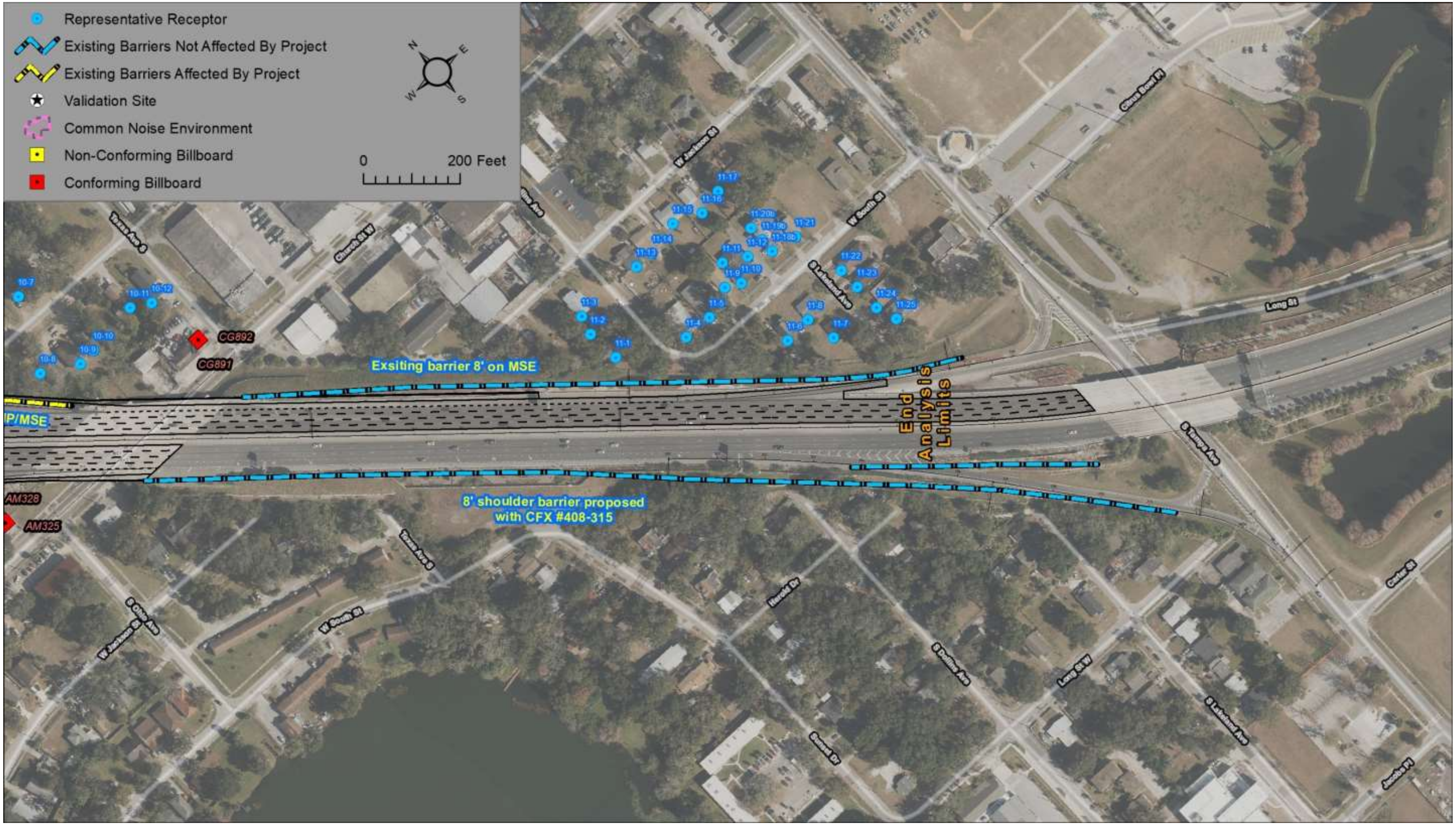

Concord Ave W
CI611
BA485
BA486
Begin Analysis Limits
NSA 2
Existing SW1 - 8' post/panel
NSA 1
Representative Receptor
Existing Barriers Not Affected By Project
Existing Barriers Affected By Project
Validation Site
Common Noise Environment
Non-Conforming Billboard
Conforming Billboard
N
W
E
S
0
200 Feet


NSA 2
NSA 4
Concord Ave W
Stewart Ave
W Amelia St
Livingston St W
Existing SW1 - 8' CIP/MSE
Existing SW2 - 8' CIP/MSE
Existing SW2 - 8' post/panel
Existing SW3 - 8' CIP/MSE
Existing SW4 - 8' CIP
CE315
CM805
CF399
CF400
Representative Receptor
Existing Barriers Not Affected By Project
Existing Barriers Affected By Project
Validation Site
Common Noise Environment
Non-Conforming Billboard
Conforming Billboard
N
W
E
S
0
200 Feet


NSA 4
NSA 4
NSA 3
NSA 3
Kenny Dr
Kenny St
Fairmont St
Fairville Rd
Kenston Dr
Old Winter Garden Rd
N Kenny St
BZ811
BZ810
BT650
CM407
CE296
CE297
BP307
CA361
CA360
Representative Receptor
Existing Barriers Not Affected By Project
Existing Barriers Affected By Project
Validation Site
Common Noise Environment
Non-Conforming Billboard
Conforming Billboard
N
W
E
S
0
200 Feet


NSA 4
NSA 6
NSA 3
NSA 5
BN008
BN009
CE228
CE229
BN901
Existing SW5 - 8' post/panel
Existing SW5 - 8' CIP/MSE
Existing SW6 - 16' post/panel
Existing SW7 - 8' post/panel
Ridgewood Ave W
Robinson St W
Jefferson St W
Lamar St
Bronson Dr
Dudley St
Dotham St
Link Ave
Clifford Ln
N Orpman Dr
Representative Receptor
Existing Barriers Not Affected By Project
Existing Barriers Affected By Project
Validation Site
Common Noise Environment
Non-Conforming Billboard
Conforming Billboard
N
W
E
S
0
200 Feet

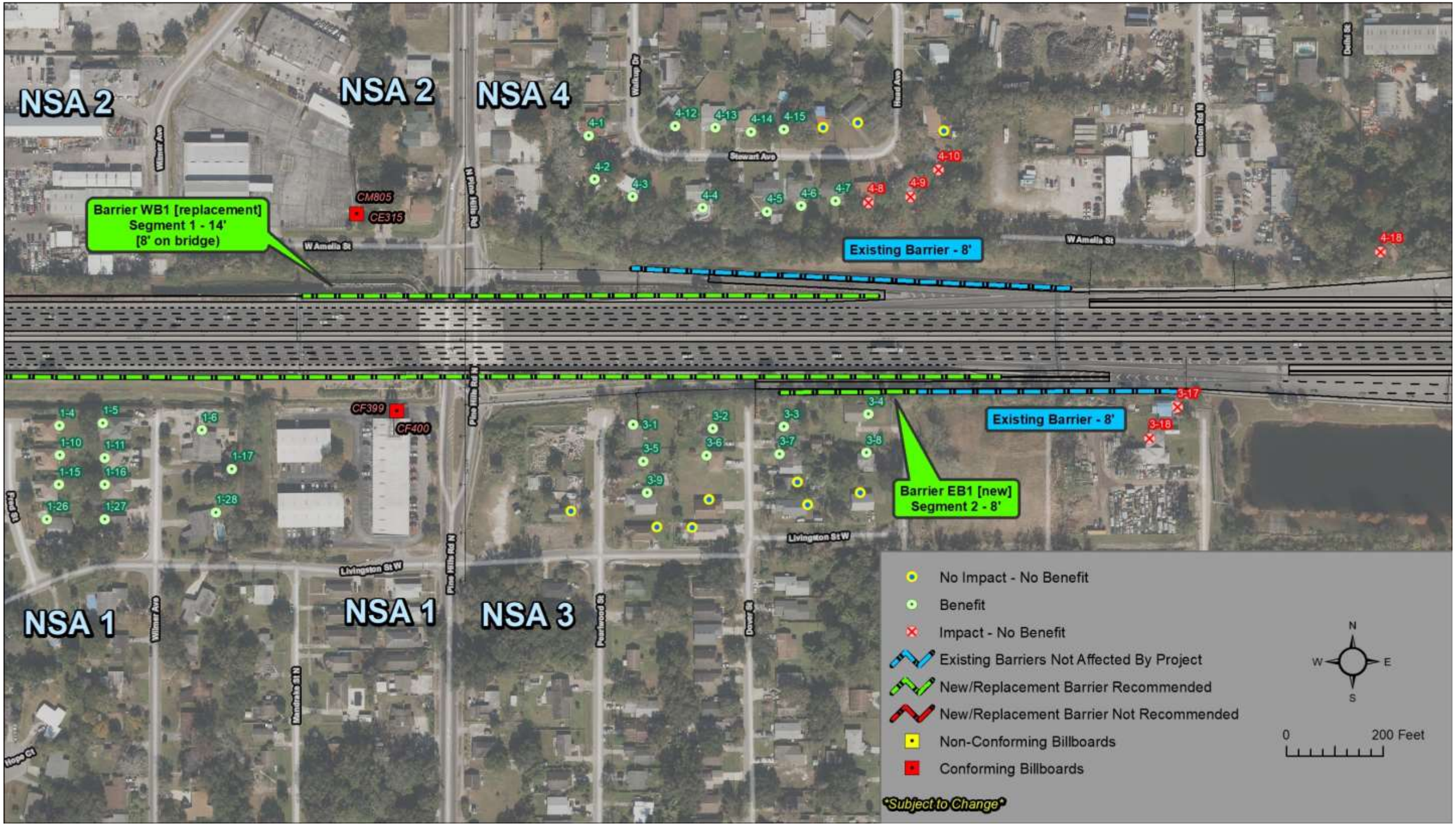

Representative Receptor
Existing Barriers Not Affected By Project
Existing Barriers Affected By Project
Validation Site
Common Noise Environment
Non-Conforming Billboard
Conforming Billboard
N
E
W
S
0
200 Feet
NSA 8
NSA 10
NSA 7
NSA 9
BM403
BM404
CG892
CG891
AM328
AM325
Existing SW10 - 8' CIP/MSE
Existing SW9 - 8' post/panel
Existing SW8 - 8' post/panel
Existing SW7 - 8' CIP/MSE
N College Hill Rd
W Washington St
W Central Ave
S Ohio Ave
W Church St
W Church St W
W Pine St
W Lawrence St
W Gentry St
Lawrence St
Gholson Ave N

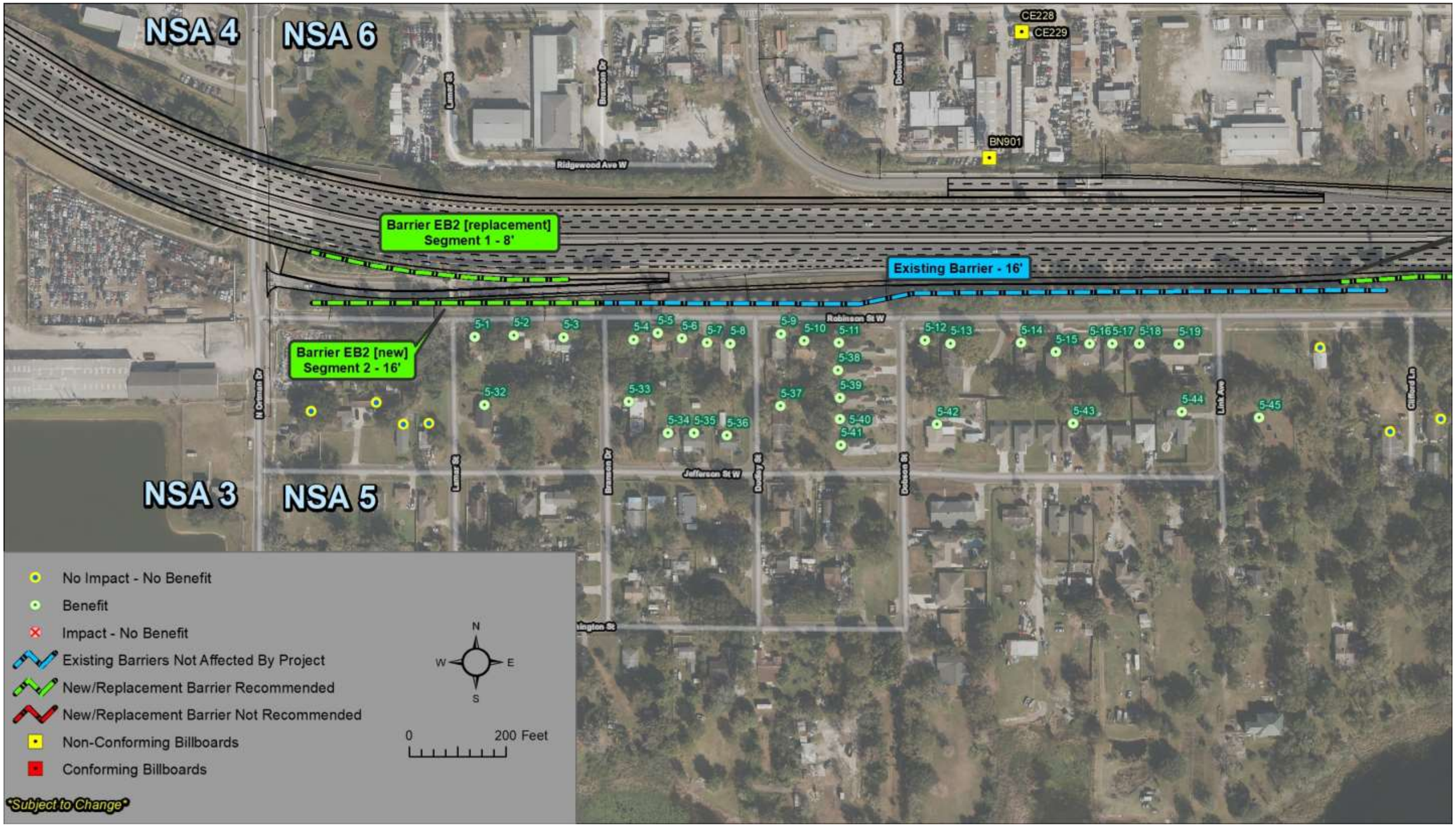

Representative Receptor
Existing Barriers Not Affected By Project
Existing Barriers Affected By Project
Validation Site
Common Noise Environment
Non-Conforming Billboard
Conforming Billboard
0
200 Feet
N
E
W
S
Exsiting barrier 8' on MSE
8' shoulder barrier proposed
with CFX #408-315
End
Analysis
Limits
CG892
CG891
AM328
AM325
P/MSE
Long St

Appendix E:

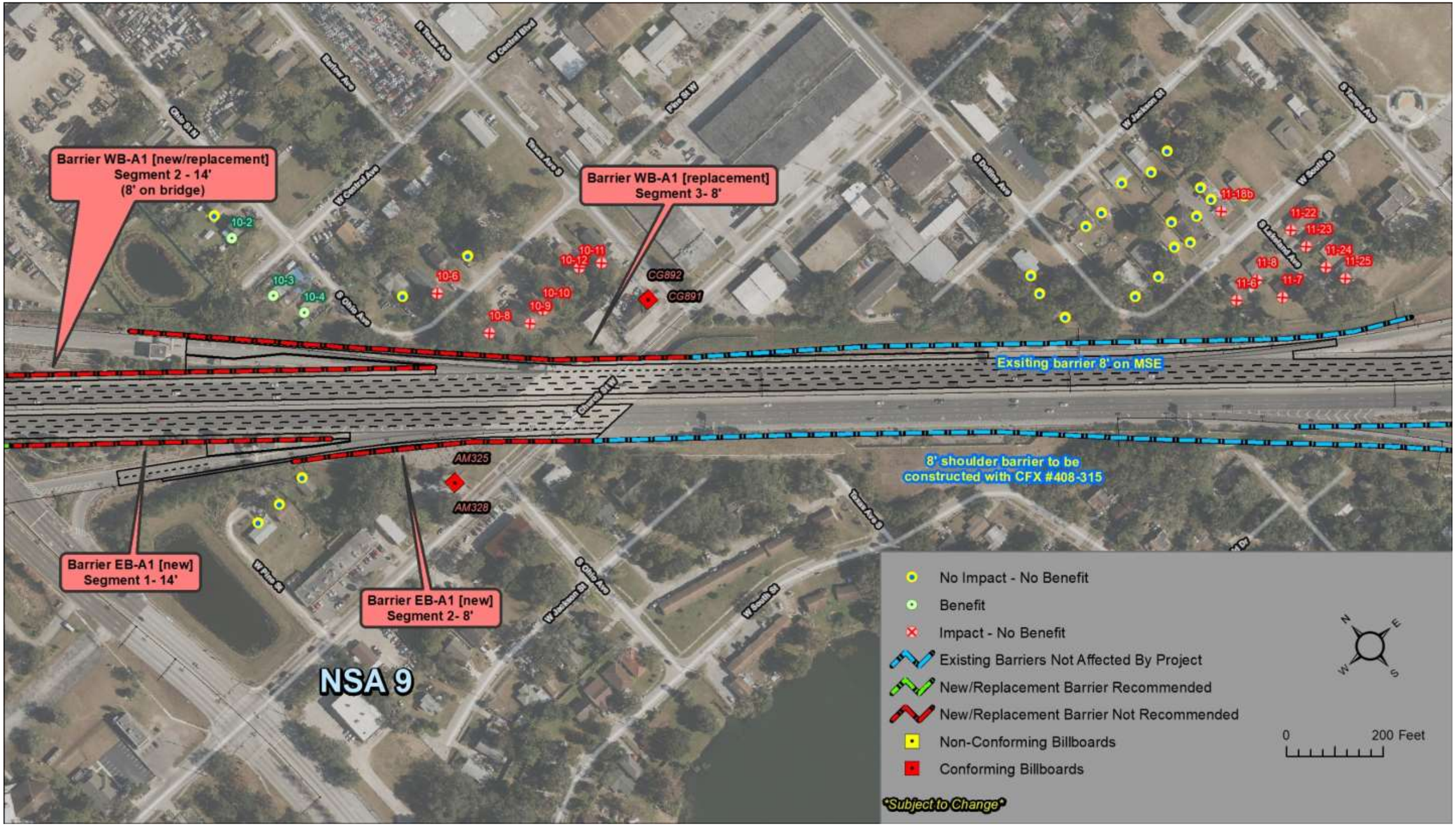
Noise Barrier Maps


No Impact - No Benefit
Benefit
Impact - No Benefit
Existing Barriers Not Affected By Project
New/Replacement Barrier Recommended
New/Replacement Barrier Not Recommended
Non-Conforming Billboards
Conforming Billboards
Subject to Change
N
W
E
S
0
200 Feet
NSA 2
NSA 2
NSA 4
Barrier WB1 [replacement]
Segment 1 - 14'
[8' on bridge)
CM805
CE315
W Amelia St
4-1
4-2
Barrier EB1 [replacement]
Segment 1 - 14'
(8' on bridge)
1-1
1-2
1-3
1-4
1-5
1-6
1-7
1-8
1-9
1-10
1-11
1-12
1-13
1-14
1-15
1-16
1-17
1-18
1-19
1-20
1-21
1-22
1-23
1-24
1-25
1-26
1-27
1-28
CF400
CF399
Livingston St W
NSA 1
NSA 1
NSA 3


NSA 2
NSA 2
NSA 4
NSA 1
NSA 1
NSA 3
Barrier WB1 [replacement]
Segment 1 - 14'
[8' on bridge)
Existing Barrier - 8'
Existing Barrier - 8'
Barrier EB1 [new]
Segment 2 - 8'
CM805
CE315
CF399
CF400
W Amelia St
Livingston St W
Wilmer Ave
Pine Hills Rd N
Mandrake St N
Purdwood St
Dover St
Hope Ct
Stewart Ave
Hurd Ave
Mission Rd N
Delhi St
Wilshop Dr
No Impact - No Benefit
Benefit
Impact - No Benefit
Existing Barriers Not Affected By Project
New/Replacement Barrier Recommended
New/Replacement Barrier Not Recommended
Non-Conforming Billboards
Conforming Billboards
Subject to Change
N
W
E
S
0
200 Feet


NSA 4
NSA 6
NSA 3
NSA 5
CE228
CE229
BN901
Ridgewood Ave W
Jefferson St W
Robinson St W
Barrier EB2 [replacement]
Segment 1 - 8'
Existing Barrier - 16'
Barrier EB2 [new]
Segment 2 - 16'
5-1
5-2
5-3
5-4
5-5
5-6
5-7
5-8
5-9
5-10
5-11
5-12
5-13
5-14
5-15
5-16
5-17
5-18
5-19
5-32
5-33
5-34
5-35
5-36
5-37
5-38
5-39
5-40
5-41
5-42
5-43
5-44
5-45
No Impact - No Benefit
Benefit
Impact - No Benefit
Existing Barriers Not Affected By Project
New/Replacement Barrier Recommended
New/Replacement Barrier Not Recommended
Non-Conforming Billboards
Conforming Billboards
"Subject to Change"
N
W
E
S
0
200 Feet


Barrier EB2 [replacement]
Segment 3 - 8'
Barrier EB2 [replacement]
Segment 3 - 14'
Barrier WB-A1 [new]
Segment 1 - 14'
Barrier WB-A1 [new/replacement]
Segment 2 - 14'
(8' on bridge)
Barrier EB2 [replacement]
Segment 3 - 8'
Barrier EB2 [replacement]
Segment 3 - 8'
Barrier EB2 [replacement/new]
Segment 4 - 14'
(8' on bridge)
NSA 5
NSA 7
AT785
Robinson St W
Jefferson St W
W Washington St
W Central Ave
Lawrence St
Old Winter Garden Rd
N College Hill Rd
Lemonn Dr
Ferguson Dr
Bayshore Dr
Calloway Ave N
BM403
BM404
No Impact - No Benefit
Benefit
Impact - No Benefit
Existing Barriers Not Affected By Project
New/Replacement Barrier Recommended
New/Replacement Barrier Not Recommended
Non-Conforming Billboards
Conforming Billboards
"Subject to Change"
N
W
E
S
0
200 Feet


Barrier WB-A1 [new/replacement]
Segment 2 - 14'
(8' on bridge)
Barrier WB-A1 [replacement]
Segment 3- 8'
Exsiting barrier 8' on MSE
8' shoulder barrier to be
constructed with CFX #408-315
Barrier EB-A1 [new]
Segment 1- 14'
Barrier EB-A1 [new]
Segment 2- 8'
NSA 9
10-2
10-3
10-4
10-6
10-8
10-9
10-10
10-11
10-12
CG892
CG891
AM325
AM328
11-18b
11-22
11-23
11-24
11-25
11-8
11-6
11-7
No Impact - No Benefit
Benefit
Impact - No Benefit
Existing Barriers Not Affected By Project
New/Replacement Barrier Recommended
New/Replacement Barrier Not Recommended
Non-Conforming Billboards
Conforming Billboards
"Subject to Change"
0
200 Feet