

Traffic Noise Study Re-evaluation

Lake/Orange County Connector (SR 516)

From US 27 to SR 429

Lake and Orange Counties, Florida

CFX Project Numbers: 516-236; 516-237; 516-238

Prepared For:
Central Florida Expressway Authority

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1.0 INTRODUCTION

SR 516 (Lake/Orange County Connector) will be a new limited-access toll road extending from US 27 in Lake County to SR 429 (Daniel Webster Western Beltway) in Orange County.

In 2019 CFX completed a Project Development and Environment Study (PD&E), which included an evaluation of various corridors and alternatives for providing a connection between Lake and Orange Counties. The PD&E's preferred alternative proposed a tolled four-lane expressway on a new alignment within approximately 330 feet of right of way (ROW). The study also included an interchange with US 27, overpass at Cook Road, a full interchange with the proposed CR 455 extension, a partial interchange to the proposed Valencia Parkway, and a full interchange with SR 429. The PD&E Study culminated in a Project Environmental Impact Report (PEIR)¹, which was approved on November 1, 2019. The selected alternative consisted of three design segments:

- Segment 1: US 27 to Cook Road (CFX# 516-236)
- Segment 2: Cook Road to Lake/Orange County Line (CFX# 516-237)
- Segment 3: Lake/Orange County Line to SR 429 (CFX# 516-238)

A Noise Study Report (NSR)² was prepared as part of the PD&E Study. The NSR documented the evaluation of potential noise impacts and abatement options related to the proposed PD&E concept based on limited project-related information available at that time.

The objective of this Traffic Noise Study Re-evaluation is to summarize the traffic noise analyses conducted for the project's final design phase. The re-evaluation accounts for the current Florida Department of Transportation (FDOT) *Project Development & Environment Manual*³, current engineering and survey data, design changes, updated traffic forecasts, and the construction or permitting of potentially noise sensitive sites between the timeframe of NSR completion (May 2019) and PEIR approval (November 2019). Per the PD&E Manual, Chapter 18, the PEIR approval date is the Date of Public Knowledge (DPK). Unless major changes to the approved concept have occurred during the final design phase, CFX is not required to evaluate for noise impacts and abatement options to adjacent developments constructed or permitted (e.g., having received an active building permit) after the DPK.

Sites and communities not specifically identified in Appendix C of this report are either not within the project limits or are located too far from the roadway to be considered noise sensitive; thus, they were not included in the re-evaluation. The project study corridor is illustrated in **Figure 1** on page 3.

¹ CFX, *Project Environmental Impact Report* (November 2019)

² CFX, *Traffic Noise Study Report* (May 2019)

³ FDOT, *Project Development and Environment Manual*, Part 2, Chapter 18, (July 2020)

1.1 Build Condition Re-Evaluation

For the SR 516 mainline, the project will construct two 12-foot travel lanes in each direction separated by a variable-width grassed median. Twelve-foot paved shoulders will be constructed inside and outside the travel lanes in each direction. Auxiliary lanes will be included in various locations. The build condition will maintain the existing four-lane mainline SR 429 configuration.

CFX# 516-236: The design has not changed in the vicinity of the isolated residential receptor [identified as SFH-2 in the PD&E NSR]. SFH-2 was not predicted to have project-related noise impacts. Noise re-evaluation is not required.

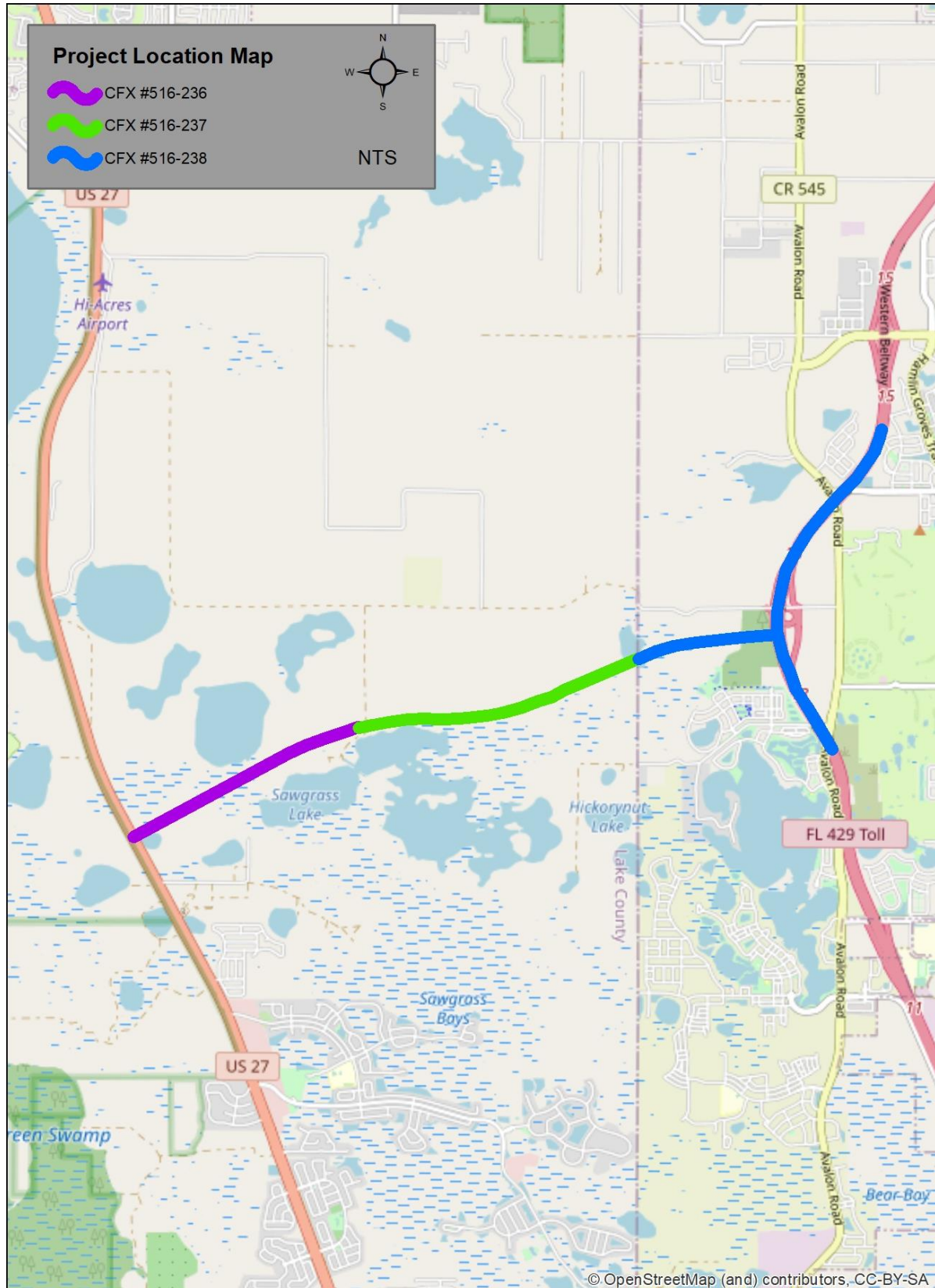
CFX #516-237: No noise-sensitive sites exist within this segment; thus, noise re-evaluation is not required.

CFX #516-238: Re-evaluation is required due to several design changes to the PD&E concept, including:

- SR 516 / Proposed Valencia Parkway partial interchange layout;
- SR 516 / SR 429 interchange layout;
- SR 516 EB to SR 429 SB – Ramp C – the realignment and extension further south to merge into SR 429 south CR 545 (Avalon Road). The PD&E concept had this ramp lane merging into SR 429 north of Old YMCA Road;
- SR 516 EB to SR 429 NB – Ramp D – the extension of Ramp D as an auxiliary lane to the north of Porter Road. The PD&E concept had this ramp lane ending south of CR 545 (Avalon Road);
- SR 429 SB to Schofield Road – Ramp K – ramp realigned and begins immediately south of CR 545 (Avalon Road). The PD&E concept had this ramp lane beginning further south.

The typical sections for CFX #516-238 are illustrated in **Appendix A**.

Figure 1: Project Location Map



2.0 METHODOLOGY

The traffic noise study re-evaluation conducted for this project is consistent with *Code of Federal Regulations* (C.F.R.), Title 23, § 772, Chapter 335, Section 335.17, *Florida Statutes*, FDOT PD&E 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 (2018) and the Build Condition (2045).

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.

The project engineering files and aerial photography georeferenced the Florida State Plane East coordinate system were used to determine the build alternative's locations for input into TNM. Roadway elevation data for the study was obtained from the design plans⁴. Data for the noise receptors and cross streets were obtained from the Florida Geographic Data Library⁵ and Google Earth⁶.

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 were derived from the PD&E NSR and the FDOT 2020 Generalized Service Volume Tables⁷.

⁴ CFX, *516-238-PLANS-01-ROADWAY-60.pdf*

⁵ University of Florida. Florida Geographic Data Library, <https://www.fgdl.org/metadataexplorer/about.html>

⁶ Google Earth 2022

⁷ FDOT, <https://www.fdot.gov/planning/systems/documents/sm/default.shtm>

2.3 NOISE ABATEMENT CRITERIA

Land use also plays an important role in traffic noise analysis. Noise sensitive receptors are any property where frequent exterior or interior human use occurs and where a lowered noise level would provide a benefit. The FDOT has established noise levels at which noise abatement must be considered for various land uses. As shown in **Table 1**, these levels are used to evaluate traffic noise and are referred to as Noise Abatement Criteria (NAC). The FDOT requires noise abatement consideration for noise levels that approach the FHWA criteria by one dB(A) for the corresponding Activity Category. The FDOT NAC for Activity Category B residential is 66.0 dB(A). Another criterion for determining project impacts that 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.

Table 2: Typical 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. (at 50 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:

- To be considered acoustically feasible, the barrier must reduce traffic-related noise levels by at least 5.0 dB(A) for at least two impacted receptors. 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/ft² 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, the total cost of a barrier that meets all acoustical criteria should not exceed the cost of \$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 264⁸, noise barrier heights are limited as follows:

- Noise barriers on bridges and retaining wall structures are limited to a maximum height of 8 feet;
- 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) located 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 the construction of a noise barrier. Sight distance is a safety issue 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 both the highway and affected property sides.

⁸ FDOT, *FDOT Design Manual*

3.0 TRAFFIC NOISE ANALYSIS

3.1 Identification of Noise Sensitive Sites

Using **Table 1** as a guide, all noise sensitive land uses within the study corridor fall under Activity Category B - Residential.

Though there are numerous areas where site development is underway (e.g., mass grading), the remainder of the corridor is considered Activity Category G undeveloped land. A records search of these parcels, conducted in September 2022, did not identify any active permits for buildings considered noise sensitive in the areas where site development earthwork is being completed.

The noise analysis identified eight Noise Study Areas (NSA) containing 319 noise sensitive sites. Project aerials illustrating the corridor, NSAs, and all noise sensitive sites are included in **Appendix C**.

Sites and communities not specifically identified in **Appendix B** and **Appendix C** of this report are either not within the project limits or are located too far from the roadway to be considered noise sensitive; thus, they were not included in the re-evaluation.

3.2 Predicted Noise Levels

A detailed summary of the noise impact analysis is provided in Appendix B. This matrix details the TNM-predicted noise levels for the existing condition and the 2045 Build Alternative with a four-lane SR 429 configuration. A summary of the results is provided in **Table 3**.

Currently, 56 residential receptors experience noise levels that meet or exceed the 66.0 dB(A) FDOT NAC with the highest noise level being 72.8 dB(A) at receptor 4-1.2c in NSA 4.

CFX Project #516-238 – with four-lane SR 429 configuration

With the traffic increase associated with the current design, 121 receptor sites are predicted to meet or exceed the 66.0 FDOT NAC; thus, they are considered noise impacted by the project. No sites are predicted to experience a substantial increase (15.0 dB(A) or greater) over the existing condition.

Overall, the noise levels increase an average of 1.9 dB(A) over existing conditions across the study corridor, with the highest noise level being 74.6 dB(A) at receptor 4-2.1c. The greatest increase, 8.4 dB(A), is predicted at receptor 3-13 in NSA 3.

CFX Project #516-238 – with future eight-lane SR 429 configuration

To ensure noise barriers were sized appropriately to address future expansion, additional analysis was conducted to account for an eight-lane future widening of SR 429. With the traffic increase associated with a future eight-lane widening, 207 receptor sites are predicted to meet or exceed the 66.0 dB(A) FDOT NAC. No sites are predicted to experience a substantial increase (15.0 dB(A) or greater) over the existing condition.

Overall, the noise levels associated with a future expansion increase by an average of 4.7 dB(A) over existing conditions across the study corridor. The highest noise level is 77.9 dB(A) at receptor 4-1.2c. The greatest increase, 9.3 dB(A), is predicted at receptor 3-13.

Table 3: CFX #516-238 Re-evaluation Impact Analysis Summary

NSA	Analyzed Receptors	Existing Condition	2045 with 4-lane SR 429	2045 with 8-lane SR 429
1 <i>Waterleigh Marina Bay</i>	14	2	6	13
2	n/a	n/a	n/a	n/a
3 <i>Hawksmoor</i>	47	0	5	26
4 <i>Alta at Horizon West Apartments</i>	144	54	74	111
5	n/a	n/a	n/a	n/a
6	n/a	n/a	n/a	n/a
7 <i>Lakeside at Hamlin</i>	46	0	12	22
8 <i>Hamlin Reserve</i>	67	0	24	35

Each site predicted to be impacted due to CFX Project #516-238 requires noise abatement consideration. CFX determined it is prudent to evaluate barriers for both the four-lane and eight-lane configurations at this time. This allows the noise barriers that meet applicable acoustic and cost criteria to be built as a part of this project, but with appropriate dimensions to address the future condition. Due to this project's construction and design timelines relative to the future condition design contracting, CFX may choose to build the barriers in whole or in part as part of this project. For example, if a two-segment barrier is proposed, CFX can build one segment with the current project and then build the second segment with the future project. Additional detail on the abatement consideration and barrier analyses is discussed in **Section 3.3**.

3.3 Noise Abatement Consideration

Across the CFX Project #516-238 corridor, several noise barrier scenarios were evaluated for the predicted impacts.

The criteria discussed in **Section 2.3** were utilized to determine if barriers met the applicable acoustic and cost reasonableness parameters used by the CFX during the decision-making process. The following barriers are discussed in detail in this section.

- Barrier SB-A1 – Waterleigh / Marina Bay / Hawksmoor subdivisions
- Barrier SB-A2 – Hawksmoor subdivision
- Barrier NB-A1 – Alta at Horizon West Apartments
- Barrier SB-1 – Lakeside at Hamlin subdivision
- Barrier NB-1 – Hamlin Reserve

The analysis and results for each barrier are discussed in detail in **Section 3.3.1** through **Section 3.3.5**.

3.3.1 *Barrier SB-A1 - NSAs 1 and 3*

Barrier SB-A1 was evaluated as a four-segment barrier system to lessen traffic noise for the impacted homes in the Waterleigh, Marina Bay, and Hawksmoor subdivisions. SR 429 is elevated through this area, with the distances to the receptor sites ranging from approximately 290 feet to 670 feet from the nearest edge of pavement (EOP).

A noise barrier's ability to provide effective noise reduction relies on its location relative to the noise source and the noise receiver. The optimal location for a noise barrier is either near the source or the receiver. When a barrier is placed more in the middle of the two, it becomes less effective. The vertical differences between the receptors and elevated roadway preclude locating stand-alone post and panel barriers at or near the ROW line that can meet applicable acoustic criteria (i.e., minimum 5 dB(A) reduction). Thus, a four-segment system was analyzed for the four-lane and eight-lane configurations with barrier segments located at the southbound shoulder EOP and offset from the EOP [to account for future expansion]. As described on the following page in **Table 4** and **Table 5**, the barrier system cannot meet acoustic and cost reasonableness criteria for either configuration and has been removed from further consideration. This barrier option is illustrated in **Appendix D – Pages D-1 and D-2**.

Table 4: Barrier SB-A1 Evaluation Summary (4-lane configuration)

NSA 1 & 3: Barrier SB-A1 Evaluation Summary [4 lanes]													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
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. Noise Reduction dB(A)		
Option 1	SB-A1a offset from shoulder	22	1,171	11	0	0	0	0	0	0	< 5.0	\$ 1,927,500	n/a
	SB-A1b MSE/Bridge	8	776										
	SB-A1c offset from shoulder	22	508										
	SB-A1d MSE/Bridge	8 & 14	2,278										

*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 = Barrier analyses does not account for impacts from future expansion.

Table 5: Barrier SB-A1 Evaluation Summary (8-lane configuration)

NSA 1 & 3: Barrier SB-A1 Evaluation Summary													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
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. Noise Reduction dB(A)		
Option 1	SB-A1a offset from shoulder	22	1,171	39	1	0	0	1	1	2	5.8	\$ 1,927,500	\$ 963,750
	SB-A1b MSE/Bridge	8	776										
	SB-A1c offset from shoulder	22	508										
	SB-A1d MSE/Bridge	8	1,798										

*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 = Barrier analyses conducted to account for impacts from future expansion.

3.3.2 Barrier SB-A2 – NSA 3

Barrier SB-A2 was evaluated as a single ROW barrier and a two-segment ROW barrier system to lessen traffic noise for the impacted homes in the Hawksmoor subdivision.

As discussed in the previous section, a noise barrier's ability to provide effective noise reduction relies on its location relative to the noise source and the noise receiver. There are two dry ponds located between SR 429 and the receptors. The CFX ROW line varies approximately 190 to 250 feet to the nearest EOP. Likewise, the CFX ROW line varies approximately 80 to 430 feet from the adjacent receptors. Additionally, a substantial portion of the pond backslope is significantly lower than the adjacent homes. This drop in elevation causes the ROW barrier to be at a lower elevation for hundreds of feet, thus, drastically reducing its abatement potential.

As described in **Table 6** and **Table 7**, the analyzed barrier options cannot meet acoustic and cost reasonableness criteria for either condition. Furthermore, all impacted sites were permitted for construction after the project's original Date of Public Knowledge (DPK), November 1, 2019. Thus, the evaluated options do not meet applicable FDOT/CFX criteria and have been removed from further consideration. An illustration of this barrier option is provided in **Appendix D – Page D-2**.

Table 6: Barrier SB-A2 Evaluation Summary (4-lane configuration)

NSA 3: Barrier SB-A2 Evaluation Summary [4 lanes]													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
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. Noise Reduction dB(A)		
Option 1	ROW	22	1,394	5	0	0	0	0	0	0	< 5.0	\$920,040	n/a

*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 = Barrier analyses does not account for impacts from future expansion.

Table 7: Barrier SB-A2 Evaluation Summary (8-lane configuration)

NSA 3: Barrier SB-A2 Evaluation Summary													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
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. Noise Reduction dB(A)		
Option 1	SB-A2a ROW	22	1,394	26	3	0	0	3	0	3	5.2	\$1,412,400	\$470,800
	SB-A2b ROW	22	746										

*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 = Barrier analyses conducted to account for impacts from future expansion.

3.3.3 Barrier NB-A1 – NSA 4

Barrier NB-A1 was evaluated as a single ROW barrier to lessen traffic noise for the impacted Alta at Horizon West apartments, currently under construction. A barrier located at the edge of the shoulder pavement was also evaluated. However, the shoulder barrier height is limited to 8 feet because it is located on top of the Mechanically Stabilized Earth (MSE) wall and bridge structure. Thus, the shoulder option did not provide meaningful noise reduction and was not considered for further analysis.

As described in **Table 8** and **Table 9** the ROW barrier option meets the minimum acoustic [e.g., 5 db(A) reduction at a minimum of two receptors] and cost reasonableness criteria but cannot meet the FDOT 7.0 dB(A) Noise Reduction Design Goal (NRDG) requirement. Furthermore, the apartment construction was permitted after the project's DPK. Thus, this option does not meet applicable FDOT/CFX criteria and has been removed from further consideration. An illustration of this barrier option is provided in **Appendix D – Page D-2**.

Table 8: Barrier NB-A1 Evaluation Summary (4-lane configuration)

NSA 4: Barrier NB-A1 Evaluation Summary [4 lanes]													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
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. Noise Reduction dB(A)		
Option 1	ROW	22	1,316	74	19	4	0	23	11	34	5.5	\$ 868,560	\$ 25,546
Option 2	MSE/Bridge	8	2,506		0	0	0	0	0	0	0.0	\$ 601,440	n/a

*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 = Barrier analyses does not account for impacts from future expansion.

Table 9: Barrier NB-A1 Evaluation Summary (8-lane configuration)

NSA 4: Barrier NB-A1 Evaluation Summary													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
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. Noise Reduction dB(A)		
Option 1	ROW	22	1,316	111	28	2	0	30	1	31	5.4	\$ 868,560	\$ 28,018
Option 3	MSE/Bridge	8	2,506		0	0	0	0	0	0	5.3	\$ 601,440	n/a

*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 = Barrier analyses conducted to account for impacts from future expansion.

3.3.4 *Barrier SB1 – NSA 7*

Several scenarios were evaluated to lessen traffic noise for the impacted homes in the Lakeside at Hamlin subdivision. This homes in this subdivision are currently under various states of active building construction. This area was outside the PD&E's project limits; thus it was not analyzed during the PD&E study. Because the CFX #516-238 project limits has been extended further to the north this area was included in this re-evaluation and analyzed for project related impacts.

A noise barrier located at the existing edge of the southbound shoulder pavement was not evaluated because the future expansion would render it sacrificial if built at this time.

Two options were evaluated for the 4-lane SR 429 configuration, each consisting of a single barrier offset from the existing shoulder EOP. Barrier heights ranging from 14 to 22 feet provide ample abatement and are within FDOT cost reasonableness criteria. However, these options do not account for the impacts predicted for the expansion.

- 4-lane configuration
 - Option 1
 - single barrier
 - location = offset from existing shoulder EOP
 - 14 feet tall – 1,115 feet long
 - provides abatement to 24 sites (12 impacted)
 - Option 2
 - Single barrier
 - Location = offset from existing shoulder EOP
 - 22 feet tall – 1,115 feet long
 - provides abatement to 27 sites (12 impacted)
 - Details on these options are provided in **Table 10**.

Table 10: Barrier SB-1 Evaluation Summary (4-lane configuration)

NSA 7: Barrier SB1 Evaluation Summary [4 lanes]													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
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. Noise Reduction dB(A)		
Option 1	offset from shoulder	14	1,115	12	0	0	12	12	12	24	5.6	\$ 468,300	\$ 19,513
Option 2	offset from shoulder	22	1,115		0	0	12	12	15	27	6.0	\$ 735,900	\$ 27,256

*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 = Barrier analyses does not account for impacts from future expansion

Five options were evaluated for the 8-lane SR 429 configuration, each consisting of a barrier offset from the existing shoulder EOP and a second barrier adjacent to the CFX ROW on the backside of the dry pond. This two-segment barrier system was evaluated with various height and length combinations to determine the optimized dimensions to account for current project impacts and to address the predicted impacts of future expansion.

- 8-lane configuration
 - Options 1 through 5 consists of a two-segment barrier system, with Segment SB1a having various height and length options available and Segment SB1b having a consistent height and length for all five options.
 - Segment SB1a
 - location = offset from existing shoulder EOP
 - heights range from 14 to 22 feet tall
 - lengths range from 1,783 to 1,061 feet long
 - Segment SB1b
 - location = 10 feet inside CFX ROW
 - heights range from 20 to 22 feet tall
 - length = 1,783 feet long
 - These options abate traffic noise related to the future expansion configuration. Details on these options are provided in **Table 11**.

As described in **Table 10**, the Barrier SB1 Option 5 barrier system provides the maximum abatement amount (21 impacted and 22 non-impacted), meets the FDOT NRDG and cost criteria, and is currently the CFX preferred option to carry forward into the project's final design and bid plans. The barrier system, as analyzed, overlaps of the adjacent CFX project to the north. Thus, it is anticipated that Segment SB1a will be constructed with CFX Project #516-238 and that Segment SB1b will be re-evaluated during the adjoining project's final design process. An illustration of this barrier system is provided in **Appendix D – Page D-3**.

Table 11: Barrier SB1 Evaluation Summary (8-lane configuration)

NSA 7: Barrier SB1 Evaluation Summary													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
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. Noise Reduction dB(A)		
Option 1	SB1a offset from shoulder	14	1,462	21	1	11	9	21	22	43	6.8	\$ 1,790,820	\$ 41,647
	SB1b ROW	22	1,783										
Option 1a	SB1a offset from shoulder	14	1,462		1	11	9	21	22	43	6.5	\$ 1,683,840	\$ 39,159
	SB1b ROW	20	1,783										
Option 2	SB1a offset from shoulder	16	1,308		1	5	15	21	22	43	6.8	\$ 1,804,620	\$ 41,968
	SB1b ROW	22	1,783										
Option 2a	SB1a offset from shoulder	16	1,308		1	5	15	21	22	43	6.5	\$ 1,697,640	\$ 39,480
	SB1b ROW	20	1,783										
Option 3	SB1a offset from shoulder	18	1,061		1	5	15	21	22	43	6.5	\$ 1,749,720	\$ 40,691
	SB1b ROW	22	1,783										
Option 3a	SB1a offset from shoulder	18	1,308		1	8	12	21	22	43	6.3	\$ 1,776,120	\$ 41,305
	SB1b ROW	20	1,783										
Option 4	SB1a offset from shoulder	20	1,061		1	3	17	21	22	43	6.7	\$ 1,813,380	\$ 42,172
	SB1b ROW	22	1,783										
Option 5	SB1a offset from shoulder	22	1,061		1	1	19	21	22	43	6.5	\$ 1,877,040	\$ 43,652
	SB1b ROW	22	1,783										

*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 = Barrier analyses conducted to account for impacts from future expansion.

3.3.5 Barrier NB1 – NSA 8

Several scenarios were evaluated to lessen traffic noise for the impacted homes in the Hamlin Reserve subdivision. Though this area was not analyzed during the PD&E study, it is included in this re-evaluation due to the change in project limits.

A barrier located at the existing edge of the northbound shoulder pavement was not evaluated because the future expansion would render it sacrificial if built at this time.

One option was evaluated for the 4-lane SR 429 configuration. Due to the presence of a high-power transmission line and the CFX Project #516-238 northern project limits, this option was evaluated as a single barrier near the CFX ROW line on the back side of the dry pond

- 4-lane configuration
 - Option 1
 - single barrier
 - location = 10 feet inside the CFX ROW line
 - 22 feet tall – 773 feet long
 - provides abatement to 24 sites (18 impacted)
 - Details on this option are provided in **Table 12**.

Table 12: Barrier NB1 Evaluation Summary (4-lane configuration)

NSA 8: - Barrier NB1 Evaluation Summary [4 lanes]													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
PD&E 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. Noise Reduction dB(A)		
Option 1	ROW	22	773	24	2	2	14	18	6	24	8.3	\$ 510,180	\$ 21,258

*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 = Barrier analyses does not account for impacts from future expansion

Three options were evaluated for the 8-lane SR 429 configuration, each consisting of a ROW barrier adjacent to the CFX ROW with a gap for the overhead transmission line. This barrier was evaluated at various heights to determine the optimized dimensions that can provide the maximum abatement amount for the future expansion's predicted impacts.

- 8-lane configuration
 - Options 1 through 3 each consist of a two-segment system to allow a gap for the overhead powerline.
 - Segment NB1a
 - location = 10 feet inside CFX ROW; south of the powerline on the back side of the pond
 - heights range from 18 to 22 feet tall
 - length = 773 feet
 - Segment NB1b
 - location = 10 feet inside CFX ROW; north of powerline
 - heights range from 18 to 22 feet tall
 - length = 1,553 feet
 - These options abate traffic noise related to the future expansion configuration. Details on these options are provided in **Table 10**.

As described in **Table 13**, Barrier NB1 Option 1 provides the maximum abatement amount for 48 sites (28 impacted and 20 non-impacted), meets the FDOT NRDG and cost criteria, and is currently the CFX preferred option to carry forward into the project's final design and bid plans. The barrier system, as analyzed, overlaps of the adjacent CFX project to the north. Thus, it is anticipated that Segment NB1a will be constructed with 516-238 and that segment NB1b will be re-evaluated during the adjoining project's final design process to ensure it meets all applicable criteria. This barrier system is illustrated in **Appendix D – Pages D-4 and D-5**.

Table 13: Barrier NB1 Evaluation Summary (8-lane configuration)

NSA 8: - Barrier NB1 Evaluation Summary													
Evaluated Barrier Options				Number of Impacted Sites ^{*7}	Number of Impacted Sites Within a Noise Reduction Range			Number of Benefited Sites ^{*1}				Total Estimated Cost ^{*4}	Cost per Benefited Receptor ^{*5}
PD&E 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. Noise Reduction dB(A)		
Option 1	NB1a ROW	22	773	35	5	13	10	28	20	48	6.6	\$ 1,535,160	\$ 31,983
	NB1b ROW	22	1,553										
Option 2	NB1a ROW	20	773		9	12	6	27	14	41	6.3	\$ 1,395,600	\$ 34,039
	NB1b ROW	20	1,553										
Option 3	NB1a ROW	18	773		10	8	4	22	10	32	6.2	\$ 1,256,040	\$ 39,251
	NB1b ROW	18	1,553										

*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 = Barrier analyses conducted to account for impacts from future expansion.

3.4 CFX Project #516-238 Re-evaluation Summary and Recommendations

For this re-evaluation, traffic noise impacts were predicted for 121 noise-sensitive sites due to CFX Project #516-238, which includes maintaining SR 429 as a 4-lane facility. Noise barriers were considered for these impacts. CFX is planning to add capacity to this corridor in the future. Thus, the barrier analyses performed for this re-evaluation accounted for the current 4-lane condition associated with CFX Project #516-238 and the future 8-lane condition. This methodology aids CFX in their noise wall decision-making process to ensure walls that are needed now will be built to account for the future widened condition.

3.4.1 Barrier Analysis Summary

Barrier SB-A1 was evaluated as a four-segment barrier system for the Waterleigh, Marina Bay, and Hawksmoor subdivisions in NSAs 1 and 3. This barrier system, at maximum heights, was determined not to meet FDOT/CFX acoustic and cost reasonableness criteria.

Barrier SB-A2 was evaluated as a single post and panel barrier on the back side of the dry pond between SR 429 and the receptors in the Hawksmoor subdivision. This barrier was determined not to meet FDOT/CFX criteria.

Barrier NB-A1 was evaluated for the Alta at Horizon West apartment complex, which is under construction. It was determined that neither a post and panel barrier located at the ROW line nor a barrier located on the northbound mainline/shoulder EOP could meet FDOT/CFX criteria.

Barrier SB1 was evaluated as a single barrier and two-segment barrier system for the Lakeside at Hamlin subdivision in NSA 7. Though this subdivision was not in existence during the PD&E, the change in final design project limits (e.g., extended further north) necessitated its inclusion in this noise re-evaluation. The two-segment barrier system accounts for the future 8-lane expansion of SR 429 and meets FDOT/CFX acoustic and cost reasonableness criteria. It is anticipated that the construction of this system will be phased, with the first segment being constructed with CFX Project #516-238 and the second segment being re-evaluated and constructed with the future expansion project.

Barrier NB1 was evaluated as a single barrier and two-segment barrier system for the Hamlin Reserve subdivision. This subdivision existed during the PD&E but was not within the PD&E project limits. The change in final design project limits necessitated its inclusion in this noise re-evaluation. The two-segment barrier system accounts for the future 8-lane expansion of SR 429 and meets FDOT/CFX acoustic and cost reasonableness criteria. It is anticipated that the construction of this system will be phased, with the first segment being constructed with CFX Project #516-238 and the second segment being re-evaluated and constructed with the future expansion project.

Illustrations of the analyzed barrier configurations are provided in **Appendix E**. The recommended barrier configurations are provided in **Table 4**.

Table 14: Project #516-238 Noise Barrier Recommendations

Noise Study Area	Impacted Development	Barrier ID	Barrier Height (ft)	Barrier Length (ft)	Impacted / Benefited Receptors ^{*1}	Impacted / Not-Benefited Receptors ^{*1}	Total Benefited ^{*1}	Average Noise Reduction ^{*1}	Barrier Offset	Estimated Barrier Cost ^{*2}
NSA 7	Lakeside at Hamlin	SB1a	22	1,061	21	1	43	6.5	Offset from EOP	\$1,877,040
		SB1b	22	1,783					10' inside FDOT ROW	
NSA 8	Hamlin Reserve	NB1a	22	773	28	12	48	6.6	10' inside FDOT ROW	\$1,535,160
		NB1b	22	1,553					10' inside FDOT ROW	

^{*1} Barrier analyses conducted to account for impacts from future expansion.

^{*2} Based on FDOT \$30/square foot statewide average.

4.0 CONSTRUCTION NOISE AND VIBRATION IMPACTS

Construction of the proposed roadway improvements is not expected to have significant vibration or construction noise impacts. It is anticipated that applying the *FDOT Standard Specifications for Road and Bridge Construction* will minimize or eliminate most of the potential short-term construction 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.

5.0 COMMUNITY COORDINATION

5.1 Public Meetings

Before making any final decisions on the proposed noise barrier, CFX will hold a meeting in which the proposed barriers for CFX #516-238, along with other pertinent project construction-related information, will be presented to the public. To aid in the decision-making process, CFX will directly solicit the opinions of the property owners and renters who benefit from the proposed noise barriers. The solicitation of viewpoints will be conducted as part of the meeting and mailed survey. The CFX decision-making process and survey results will be documented under separate cover.

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

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

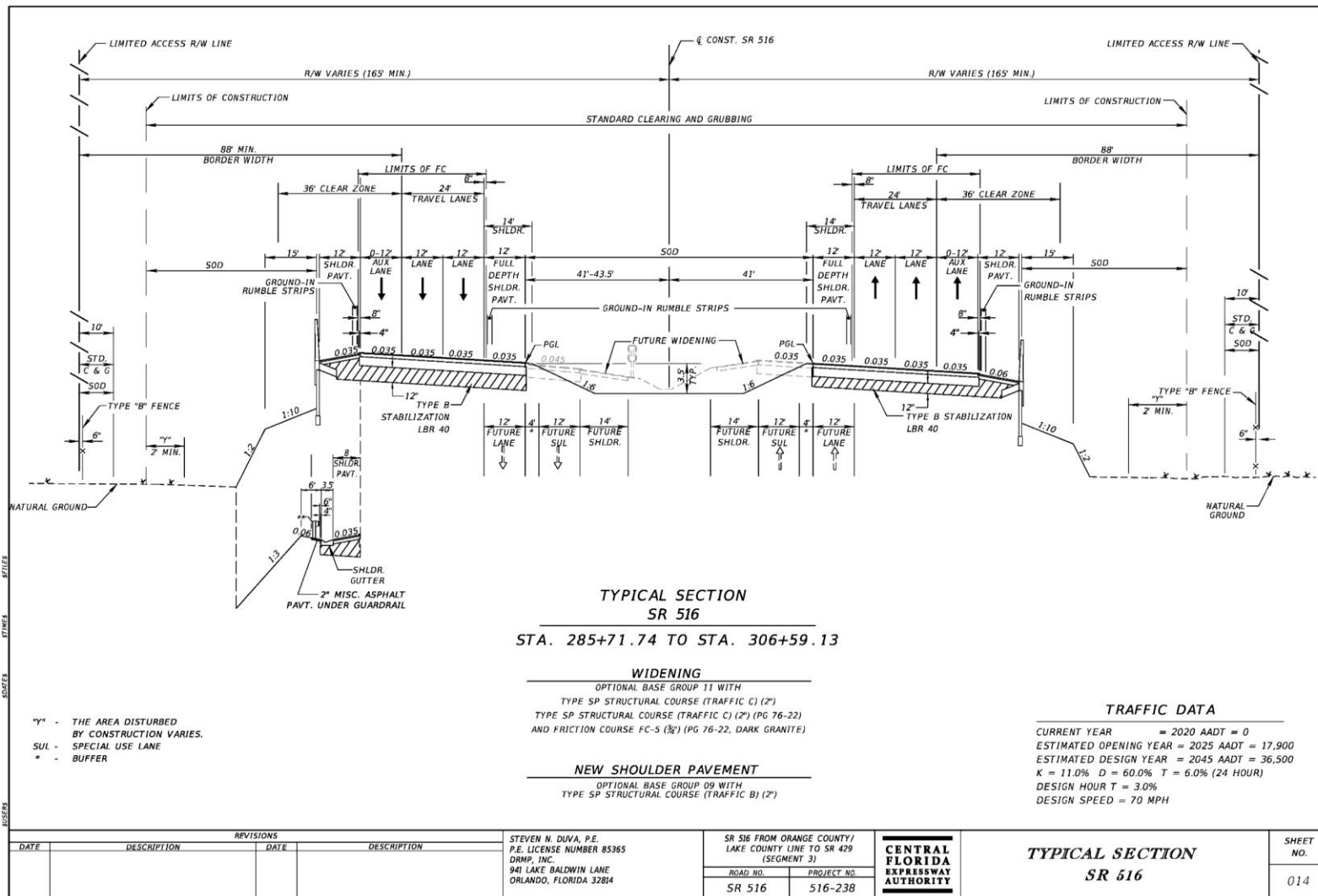
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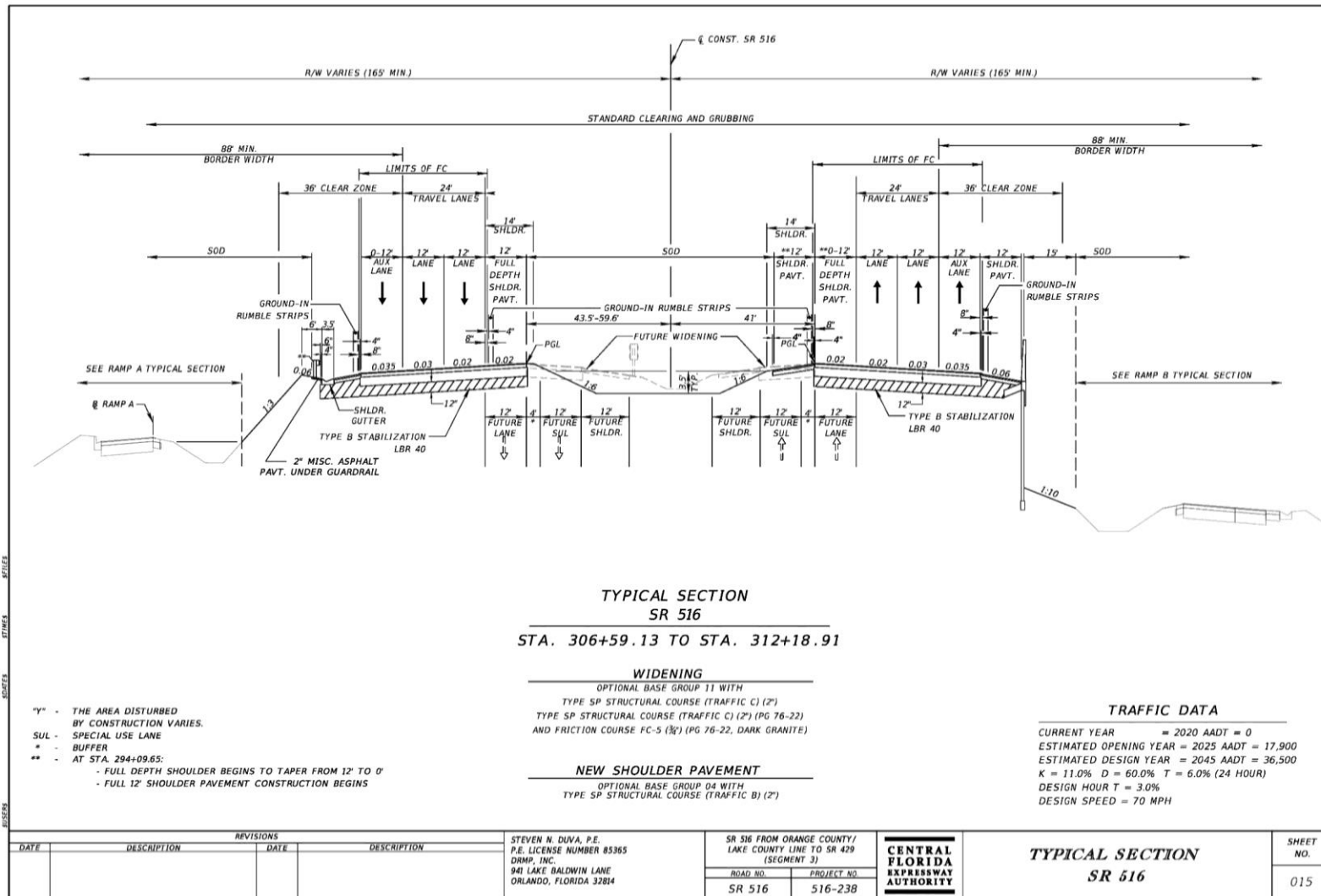
Google Earth, @2022 Google. Imagery and elevation data.

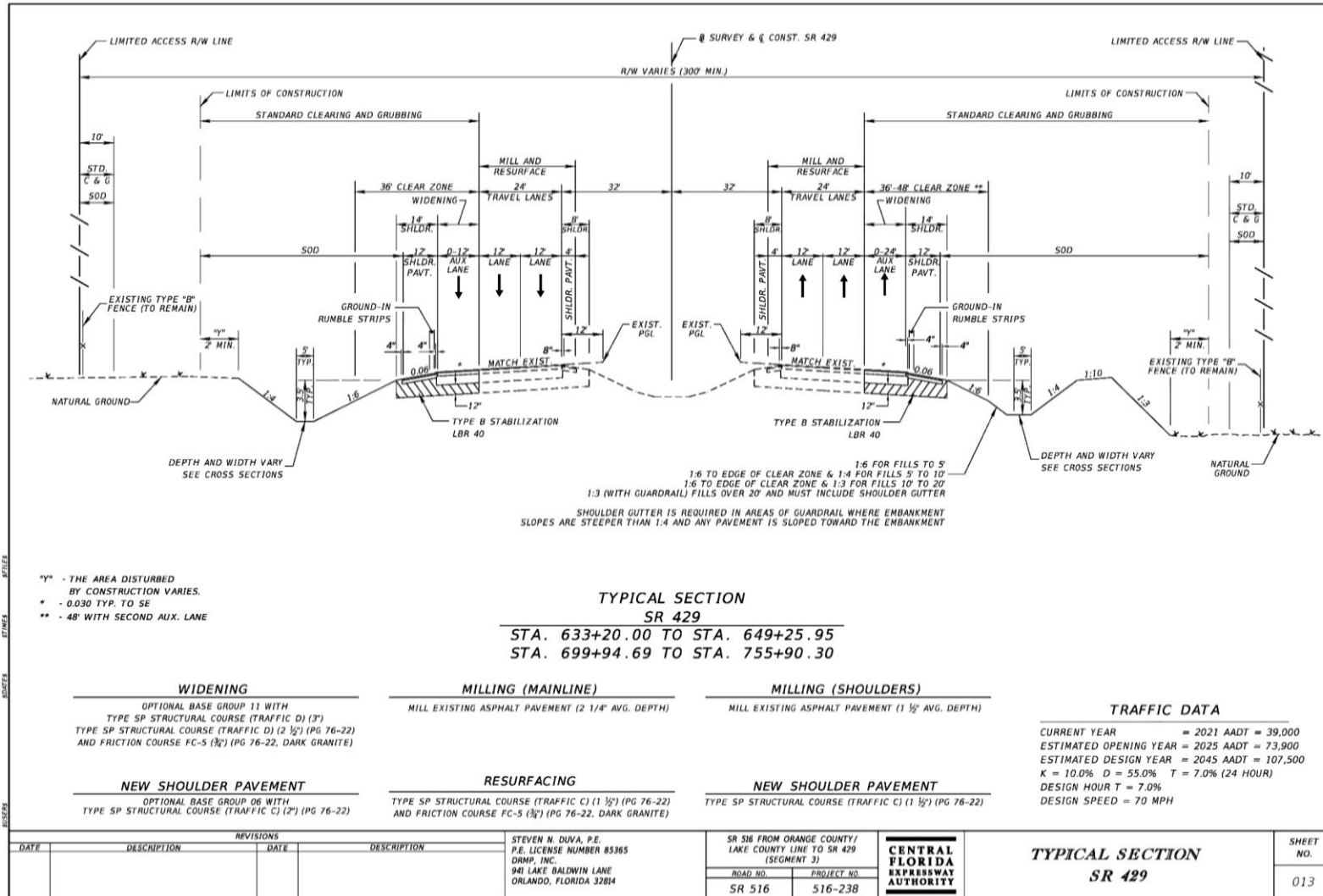
Section 335.17, *Florida Statutes. State Highway Construction; Means of Noise Abatement*. 2012.

Appendix A:

Typical Sections







Appendix B:

Noise Impact Comparison Matrix [CFX #516-238]

Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
NSA 1: Beginning project limits to Old YMCA Road (west of SR 429) - Illustrated on Page C-2 - Appendix C						
Waterleigh / Marina Bay						
1-1	1	66.0	65.3	66.5	1.2	Yes
1-2	1	66.0	65.1	66.4	1.3	Yes
1-3	1	66.0	65.7	66.9	1.2	Yes
1-4	1	66.0	66.0	67.3	1.3	Yes
1-5	1	66.0	66.3	67.6	1.3	Yes
1-6	1	66.0	62.3	64.3	2.0	-
1-7	1	66.0	62.4	64.4	2.0	-
1-8	1	66.0	59.8	62.5	2.7	-
1-9	1	66.0	61.9	64.4	2.5	-
1-10	1	66.0	63.3	65.7	2.4	-
1-11	1	66.0	63.6	66.0	2.4	Yes
1-12	1	66.0	63.2	65.8	2.6	-
1-13	1	66.0	61.7	64.8	3.1	-
1-14	1	66.0	61.0	64.0	3.0	-
NSA Summary (Totals/Averages)	14		63.4	65.5	2.1	6
NSA 2: Beginning project limits to Old YMCA Road (east of SR 429) - Illustrated on Page C-2 - Appendix C						
<i>No noise sensitive sites</i>						
NSA 3: Old YMCA Road to Schofield Road (west of SR 429) - Illustrated on Page C-3 - Appendix C						
Hawksmoor						
3-1.1	1	66.0	57.2	60.6	3.4	-
3-1.2	1	66.0	57.4	60.7	3.3	-
3-1.3	1	66.0	57.6	60.9	3.3	-
3-1.4	1	66.0	57.7	60.9	3.2	-
3-2.1	1	66.0	58.4	61.5	3.1	-
3-2.2	1	66.0	58.4	61.5	3.1	-
3-2.3	1	66.0	58.5	61.5	3.0	-
3-2.4	1	66.0	58.5	61.5	3.0	-
3-3.1	1	66.0	59.0	62.0	3.0	-
3-3.2	1	66.0	59.2	62.1	2.9	-
3-3.3	1	66.0	59.2	62.2	3.0	-
3-3.4	1	66.0	59.3	62.2	2.9	-
3-4.1	1	66.0	60.3	63.1	2.8	-

Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
3-4.2	1	66.0	60.4	63.3	2.9	-
3-4.3	1	66.0	60.5	63.5	3.0	-
3-4.4	1	66.0	60.7	63.6	2.9	-
3-4.5	1	66.0	60.8	63.8	3.0	-
3-4.6	1	66.0	60.7	63.8	3.1	-
3-5.1	1	66.0	61.1	63.9	2.8	-
3-5.2	1	66.0	61.6	64.0	2.4	-
3-5.3	1	66.0	61.9	64.3	2.4	-
3-5.4	1	66.0	62.5	64.8	2.3	-
3-5.5	1	66.0	62.7	65.2	2.5	-
3-5.6	1	66.0	63.0	65.4	2.4	-
3-6.1	1	66.0	63.2	65.8	2.6	-
3-6.2	1	66.0	63.4	66.0	2.6	Yes
3-6.3	1	66.0	63.6	66.3	2.7	Yes
3-6.4	1	66.0	63.8	66.4	2.6	Yes
3-6.5	1	66.0	63.9	66.6	2.7	Yes
3-6.6	1	66.0	64.0	66.6	2.6	Yes
3-7.1	1	66.0	61.4	63.8	2.4	-
3-7.2	1	66.0	61.0	63.6	2.6	-
3-7.3	1	66.0	60.6	63.1	2.5	-
3-7.4	1	66.0	60.1	62.7	2.6	-
3-7.5	1	66.0	59.7	62.6	2.9	-
3-7.6	1	66.0	59.4	62.2	2.8	-
3-8.1	1	66.0	58.8	61.6	2.8	-
3-8.2	1	66.0	58.4	61.3	2.9	-
3-8.3	1	66.0	58.1	60.9	2.8	-
3-8.4	1	66.0	57.8	60.4	2.6	-
3-8.5	1	66.0	57.4	60.2	2.8	-
3-8.6	1	66.0	57.1	60.0	2.9	-
3-9	1	66.0	51.3	55.1	3.8	-
3-10	1	66.0	49.0	52.5	3.5	-
3-11	1	66.0	46.9	50.8	3.9	-
3-12	1	66.0	45.4	50.3	4.9	-
3-13	1	66.0	43.0	51.4	8.4	-

Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
NSA Summary (Totals/Averages)		47	58.8	61.8	3.0	5
NSA 4: Old YMCA Road to Schofield Road (east of SR 429) - Illustrated on Page C-3 - Appendix C						
Alta at Horizon West (apartments)						
4-1.1a	1	66.0	66.5	69.0	2.5	Yes
4-1.1b	1	66.0	71.3	73.4	2.1	Yes
4-1.1c	1	66.0	72.1	74.4	2.3	Yes
4-1.2a	1	66.0	66.9	69.7	2.8	Yes
4-1.2b	1	66.0	72.1	74.2	2.1	Yes
4-1.2c	1	66.0	72.8	75.2	2.4	Yes
4-1.3a	1	66.0	63.4	66.5	3.1	Yes
4-1.3b	1	66.0	67.6	69.9	2.3	Yes
4-1.3c	1	66.0	69.0	71.3	2.3	Yes
4-1.4a	1	66.0	63.7	67.1	3.4	Yes
4-1.4b	1	66.0	68.7	70.9	2.2	Yes
4-1.4c	1	66.0	70.2	72.5	2.3	Yes
4-1.5a	1	66.0	62.5	65.5	3.0	-
4-1.5b	1	66.0	66.5	68.7	2.2	Yes
4-1.5c	1	66.0	68.2	70.4	2.2	Yes
4-1.6a	1	66.0	61.9	65.4	3.5	-
4-1.6b	1	66.0	66.7	68.9	2.2	Yes
4-1.6c	1	66.0	68.7	71.0	2.3	Yes
4-1.7a	1	66.0	61.8	64.5	2.7	-
4-1.7b	1	66.0	65.4	67.7	2.3	Yes
4-1.7c	1	66.0	67.2	69.4	2.2	Yes
4-1.8a	1	66.0	60.3	64.0	3.7	-
4-1.8b	1	66.0	65.0	67.4	2.4	Yes
4-1.8c	1	66.0	67.2	69.5	2.3	Yes
4-1.9a	1	66.0	61.2	63.9	2.7	-
4-1.9b	1	66.0	64.6	66.9	2.3	Yes
4-1.9c	1	66.0	66.3	68.5	2.2	Yes
4-1.10a	1	66.0	59.0	63.3	4.3	-
4-1.10b	1	66.0	63.6	65.9	2.3	-
4-1.10c	1	66.0	65.7	68.0	2.3	Yes
4-1.11a	1	66.0	60.6	63.4	2.8	-

Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
4-1.11b	1	66.0	63.7	66.1	2.4	Yes
4-1.11c	1	66.0	65.4	67.7	2.3	Yes
4-1.12a	1	66.0	57.8	62.6	4.8	-
4-1.12b	1	66.0	62.2	64.5	2.3	-
4-1.12c	1	66.0	64.2	66.5	2.3	Yes
4-2.1a	1	66.0	66.2	68.6	2.4	Yes
4-2.1b	1	66.0	71.2	73.4	2.2	Yes
4-2.1c	1	66.0	72.2	74.6	2.4	Yes
4-2.2a	1	66.0	66.5	68.5	2.0	Yes
4-2.2b	1	66.0	71.7	73.7	2.0	Yes
4-2.2c	1	66.0	72.6	74.9	2.3	Yes
4-2.3a	1	66.0	61.9	65.3	3.4	-
4-2.3b	1	66.0	66.9	69.3	2.4	Yes
4-2.3c	1	66.0	68.7	71.0	2.3	Yes
4-2.4a	1	66.0	63.3	64.9	1.6	-
4-2.4b	1	66.0	68.3	70.2	1.9	Yes
4-2.4c	1	66.0	69.9	72.2	2.3	Yes
4-2.5a	1	66.0	60.2	64.1	3.9	-
4-2.5b	1	66.0	65.3	67.7	2.4	Yes
4-2.5c	1	66.0	67.4	69.7	2.3	Yes
4-2.6a	1	66.0	61.5	63.4	1.9	-
4-2.6b	1	66.0	66.5	68.4	1.9	Yes
4-2.6c	1	66.0	68.6	70.7	2.1	Yes
4-2.7a	1	66.0	58.4	62.8	4.4	-
4-2.7b	1	66.0	63.7	66.1	2.4	Yes
4-2.7c	1	66.0	65.8	68.1	2.3	Yes
4-2.8a	1	66.0	60.0	62.0	2.0	-
4-2.8b	1	66.0	65.1	66.8	1.7	Yes
4-2.8c	1	66.0	67.2	69.3	2.1	Yes
4-2.9a	1	66.0	56.9	61.7	4.8	-
4-2.9b	1	66.0	62.2	64.8	2.6	-
4-2.9c	1	66.0	64.3	66.7	2.4	Yes
4-2.10a	1	66.0	58.7	61.0	2.3	-
4-2.10b	1	66.0	63.9	65.7	1.8	-

Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
4-2.10c	1	66.0	65.9	68.0	2.1	Yes
4-2.11a	1	66.0	55.5	60.4	4.9	-
4-2.11b	1	66.0	60.9	63.5	2.6	-
4-2.11c	1	66.0	62.8	65.3	2.5	-
4-2.12a	1	66.0	57.4	60.1	2.7	-
4-2.12b	1	66.0	62.7	64.5	1.8	-
4-2.12c	1	66.0	64.6	66.7	2.1	Yes
4-3.1a	1	66.0	65.9	67.4	1.5	Yes
4-3.1b	1	66.0	70.4	72.4	2.0	Yes
4-3.1c	1	66.0	71.7	74.0	2.3	Yes
4-3.2a	1	66.0	66.6	67.0	0.4	Yes
4-3.2b	1	66.0	70.9	72.2	1.3	Yes
4-3.2c	1	66.0	72.1	74.3	2.2	Yes
4-3.3a	1	66.0	61.0	64.1	3.1	-
4-3.3b	1	66.0	66.1	68.4	2.3	Yes
4-3.3c	1	66.0	68.2	70.4	2.2	Yes
4-3.4a	1	66.0	63.9	63.3	-0.6	-
4-3.4b	1	66.0	68.0	68.4	0.4	Yes
4-3.4c	1	66.0	69.5	71.2	1.7	Yes
4-3.5a	1	66.0	59.5	62.9	3.4	-
4-3.5b	1	66.0	64.6	67.0	2.4	Yes
4-3.5c	1	66.0	66.9	69.1	2.2	Yes
4-3.6a	1	66.0	62.1	61.5	-0.6	-
4-3.6b	1	66.0	66.4	66.4	0.0	Yes
4-3.6c	1	66.0	68.2	69.4	1.2	Yes
4-3.7a	1	66.0	58.0	61.6	3.6	-
4-3.7b	1	66.0	63.2	65.6	2.4	-
4-3.7c	1	66.0	65.3	67.7	2.4	Yes
4-3.8a	1	66.0	60.7	60.3	-0.4	-
4-3.8b	1	66.0	65.2	65.0	-0.2	-
4-3.8c	1	66.0	66.9	67.6	0.7	Yes
4-3.9a	1	66.0	56.6	60.5	3.9	-
4-3.9b	1	66.0	61.8	64.2	2.4	-
4-3.9c	1	66.0	64.0	66.3	2.3	Yes

Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
4-3.10a	1	66.0	59.5	58.9	-0.6	-
4-3.10b	1	66.0	64.1	63.7	-0.4	-
4-3.10c	1	66.0	65.7	66.1	0.4	Yes
4-3.11a	1	66.0	55.4	59.5	4.1	-
4-3.11b	1	66.0	60.6	62.9	2.3	-
4-3.11c	1	66.0	62.6	65.1	2.5	-
4-3.12a	1	66.0	58.3	57.6	-0.7	-
4-3.12b	1	66.0	63.1	62.3	-0.8	-
4-3.12c	1	66.0	64.6	64.7	0.1	-
4-4.1a	1	66.0	65.6	63.0	-2.6	-
4-4.1b	1	66.0	69.7	68.6	-1.1	Yes
4-4.1c	1	66.0	71.5	71.8	0.3	Yes
4-4.2a	1	66.0	63.0	57.4	-5.6	-
4-4.2b	1	66.0	66.7	62.4	-4.3	-
4-4.2c	1	66.0	68.9	66.6	-2.3	Yes
4-4.3a	1	66.0	63.1	61.4	-1.7	-
4-4.3b	1	66.0	67.5	67.0	-0.5	Yes
4-4.3c	1	66.0	69.3	69.8	0.5	Yes
4-4.4a	1	66.0	59.9	54.4	-5.5	-
4-4.4b	1	66.0	63.1	57.8	-5.3	-
4-4.4c	1	66.0	65.3	61.9	-3.4	-
4-4.5a	1	66.0	61.9	60.9	-1.0	-
4-4.5b	1	66.0	66.5	66.1	-0.4	Yes
4-4.5c	1	66.0	68.2	68.8	0.6	Yes
4-4.6a	1	66.0	58.8	53.6	-5.2	-
4-4.6b	1	66.0	61.8	56.3	-5.5	-
4-4.6c	1	66.0	63.9	60.4	-3.5	-
4-4.7a	1	66.0	60.4	60.2	-0.2	-
4-4.7b	1	66.0	65.3	65.1	-0.2	-
4-4.7c	1	66.0	67.0	67.5	0.5	Yes
4-4.8a	1	66.0	57.8	53.1	-4.7	-
4-4.8b	1	66.0	60.7	55.3	-5.4	-
4-4.8c	1	66.0	62.7	59.2	-3.5	-
4-4.9a	1	66.0	59.3	59.4	0.1	-

Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
4-4.9b	1	66.0	64.3	64.0	-0.3	-
4-4.9c	1	66.0	66.0	66.4	0.4	Yes
4-4.10a	1	66.0	56.9	52.5	-4.4	-
4-4.10b	1	66.0	59.8	54.4	-5.4	-
4-4.10c	1	66.0	61.8	58.3	-3.5	-
4-4.11a	1	66.0	58.1	58.6	0.5	-
4-4.11b	1	66.0	63.3	63.0	-0.3	-
4-4.11c	1	66.0	64.9	65.3	0.4	-
4-4.12a	1	66.0	56.0	52.0	-4.0	-
4-4.12b	1	66.0	58.9	53.7	-5.2	-
4-4.12c	1	66.0	60.9	57.5	-3.4	-
NSA Summary (Totals/Averages)	144		64.5	65.5	1.0	74
NSA 5: Schofield Road to Avalon Road (west of SR 429) - Illustrated on Page C-4 and C-5 - Appendix C						
<i>No noise sensitive sites</i>						
NSA 6: Schofield Road to Avalon Road (east of SR 429) - Illustrated on Page C-4 and C-5 - Appendix C						
6-1	1	66.0	58.1	63.8	5.7	-
NSA Summary (Totals/Averages)	1		58.1	63.8	5.7	0
<i>No noise sensitive sites</i>						
NSA 7: Avalon Road to Project ending limits (west of SR 429) - Illustrated on Page C-6 - Appendix C						
<i>Lakeside at Hamlin</i>						
7-1	1	66.0	64.2	65.9	1.7	-
7-2	1	66.0	64.3	66.0	1.7	Yes
7-3	1	66.0	64.4	66.0	1.6	Yes
7-4	1	66.0	64.4	66.1	1.7	Yes
7-5	1	66.0	64.5	66.1	1.6	Yes
7-6	1	66.0	64.6	66.2	1.6	Yes
7-7	1	66.0	64.5	66.1	1.6	Yes
7-8	1	66.0	64.4	66.1	1.7	Yes
7-9	1	66.0	64.4	66.1	1.7	Yes
7-10	1	66.0	64.3	66.1	1.8	Yes
7-11	1	66.0	64.2	66.0	1.8	Yes
7-12	1	66.0	64.3	66.1	1.8	Yes

Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
7-13	1	66.0	64.3	66.1	1.8	Yes
7-14	1	66.0	63.5	65.2	1.7	-
7-15	1	66.0	63.0	64.8	1.8	-
7-16	1	66.0	63.0	64.9	1.9	-
7-17	1	66.0	62.8	64.8	2.0	-
7-18	1	66.0	62.5	64.5	2.0	-
7-19	1	66.0	62.0	63.8	1.8	-
7-20	1	66.0	61.3	63.1	1.8	-
7-21	1	66.0	62.0	63.8	1.8	-
7-22	1	66.0	60.4	62.6	2.2	-
7-23	1	66.0	60.7	62.9	2.2	-
7-24	1	66.0	59.7	61.9	2.2	-
7-25	1	66.0	61.3	63.4	2.1	-
7-26	1	66.0	60.8	63.1	2.3	-
7-27	1	66.0	60.2	62.5	2.3	-
7-28	1	66.0	60.1	62.4	2.3	-
7-29	1	66.0	60.1	62.5	2.4	-
7-30	1	66.0	59.9	62.3	2.4	-
7-31	1	66.0	59.4	61.9	2.5	-
7-32	1	66.0	58.8	61.3	2.5	-
7-33	1	66.0	59.2	61.6	2.4	-
7-34	1	66.0	59.4	61.8	2.4	-
7-35	1	66.0	61.1	63.2	2.1	-
7-36	1	66.0	60.3	62.6	2.3	-
7-37	1	66.0	60.8	63.0	2.2	-
7-38	1	66.0	59.2	61.5	2.3	-
7-39	1	66.0	60.8	63.0	2.2	-
7-40	1	66.0	60.2	62.5	2.3	-
7-41	1	66.0	60.5	62.8	2.3	-
7-42	1	66.0	59.9	62.3	2.4	-
7-43	1	66.0	59.9	62.2	2.3	-
7-44	1	66.0	60.4	62.7	2.3	-
7-45	1	66.0	56.9	59.2	2.3	-
7-46	1	66.0	56.1	58.4	2.3	-

Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
NSA Summary (Totals/Averages)		46	61.6	63.6	2.1	12
NSA 8: Avalon Road to Project ending limits (west of SR 429) - Illustrated on Page C-6 - Appendix C						
<i>Ashton Woods</i>						
8-1.1	1	66.0	60.9	64.4	3.5	-
8-1.2	1	66.0	61.2	64.8	3.6	-
8-1.3	1	66.0	61.6	65.0	3.4	-
8-1.4	1	66.0	61.9	65.3	3.4	-
8-1.5	1	66.0	62.1	65.6	3.5	-
8-1.6	1	66.0	62.4	65.8	3.4	-
8-1.7	1	66.0	62.7	66.1	3.4	Yes
8-1.8	1	66.0	63.0	66.3	3.3	Yes
8-2.1	1	66.0	63.6	66.8	3.2	Yes
8-2.2	1	66.0	63.7	67.0	3.3	Yes
8-2.3	1	66.0	63.9	67.2	3.3	Yes
8-2.4	1	66.0	64.0	67.3	3.3	Yes
8-2.5	1	66.0	64.1	67.5	3.4	Yes
8-2.6	1	66.0	64.3	67.6	3.3	Yes
8-2.7	1	66.0	64.5	67.8	3.3	Yes
8-2.8	1	66.0	64.6	67.9	3.3	Yes
8-3.1	1	66.0	64.8	68.2	3.4	Yes
8-3.2	1	66.0	64.9	68.3	3.4	Yes
8-3.3	1	66.0	64.9	68.5	3.6	Yes
8-3.4	1	66.0	64.9	68.5	3.6	Yes
8-3.5	1	66.0	65.0	68.6	3.6	Yes
8-3.6	1	66.0	65.1	68.8	3.7	Yes
8-3.7	1	66.0	65.1	69.0	3.9	Yes
8-3.8	1	66.0	65.2	69.1	3.9	Yes
8-4.1	1	66.0	63.7	67.7	4.0	Yes
8-4.2	1	66.0	63.4	67.5	4.1	Yes
8-4.3	1	66.0	63.1	67.2	4.1	Yes
8-4.4	1	66.0	62.9	66.9	4.0	Yes
8-4.5	1	66.0	62.8	66.5	3.7	Yes
8-5.1	1	66.0	62.5	66.0	3.5	Yes
8-5.2	1	66.0	61.5	65.2	3.7	-

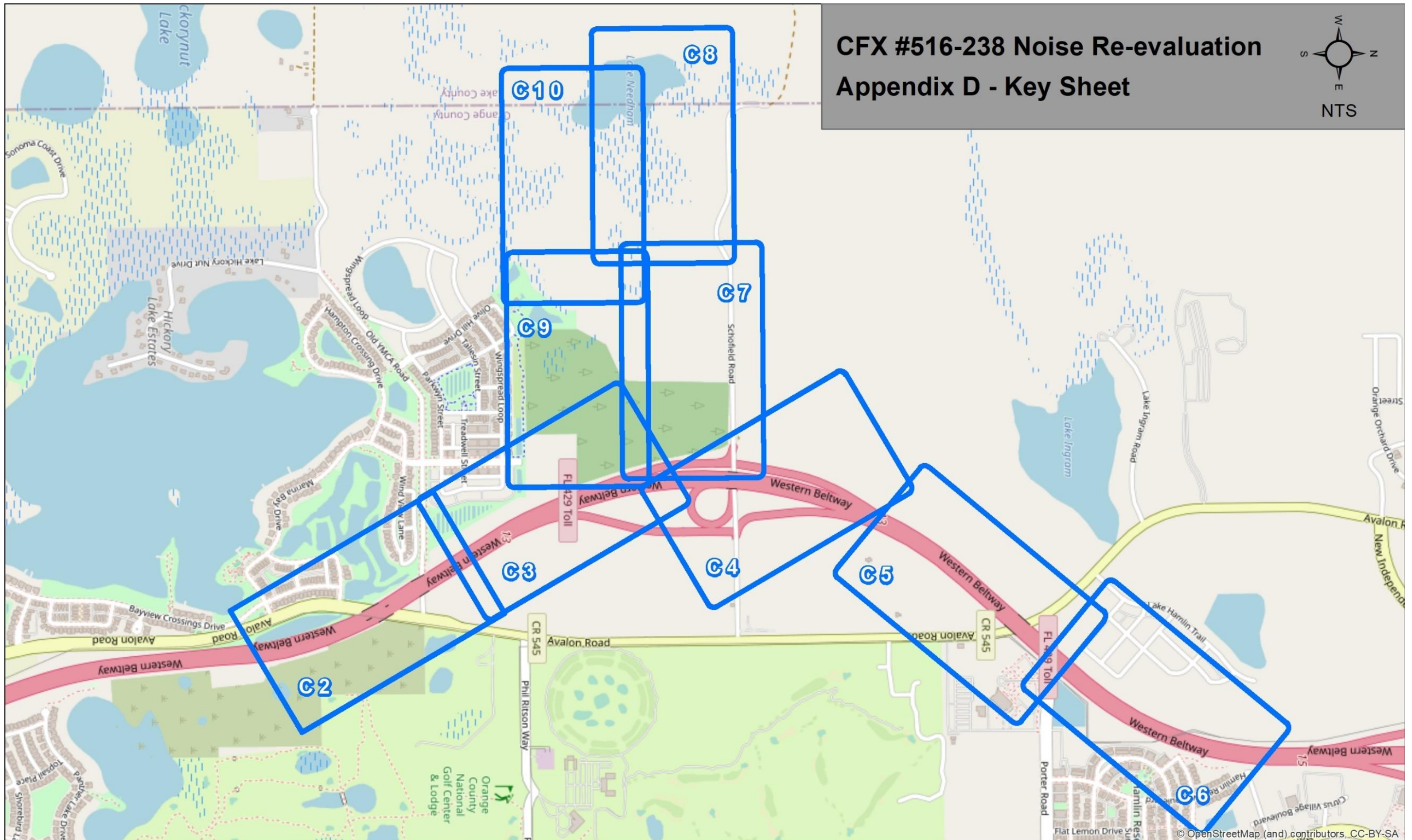
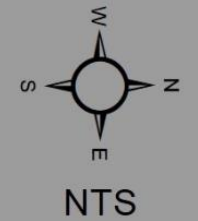
Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
8-5.3	1	66.0	61.0	64.9	3.9	-
8-5.4	1	66.0	60.4	64.3	3.9	-
8-5.5	1	66.0	60.1	64.1	4.0	-
8-5.6	1	66.0	59.8	63.7	3.9	-
8-5.7	1	66.0	59.6	63.4	3.8	-
8-6	1	66.0	52.1	54.6	2.5	-
8-7	1	66.0	55.4	57.5	2.1	-
8-8	1	66.0	55.0	57.1	2.1	-
8-9	1	66.0	60.5	63.1	2.6	-
8-10	1	66.0	59.3	61.8	2.5	-
8-11	1	66.0	58.1	60.7	2.6	-
8-12	1	66.0	56.9	59.3	2.4	-
8-13	1	66.0	56.2	58.5	2.3	-
8-14	1	66.0	55.4	57.7	2.3	-
8-15	1	66.0	63.1	65.2	2.1	-
8-16	1	66.0	61.0	63.0	2.0	-
8-17	1	66.0	59.3	61.5	2.2	-
8-18	1	66.0	58.6	60.8	2.2	-
8-19	1	66.0	57.6	59.8	2.2	-
8-20	1	66.0	55.7	58.1	2.4	-
8-21	1	66.0	56.2	58.6	2.4	-
8-22	1	66.0	56.8	59.2	2.4	-
8-23	1	66.0	57.4	59.7	2.3	-
8-24	1	66.0	58.2	60.3	2.1	-
8-25	1	66.0	58.9	61.0	2.1	-
8-26	1	66.0	59.9	62.0	2.1	-
8-27	1	66.0	61.3	63.3	2.0	-
8-28	1	66.0	62.9	64.9	2.0	-
8-29	1	66.0	60.2	62.4	2.2	-
8-30	1	66.0	58.7	60.9	2.2	-
8-31	1	66.0	57.5	59.7	2.2	-
8-32	1	66.0	56.6	58.8	2.2	-
8-33	1	66.0	55.5	57.7	2.2	-
8-34	1	66.0	54.7	56.9	2.2	-

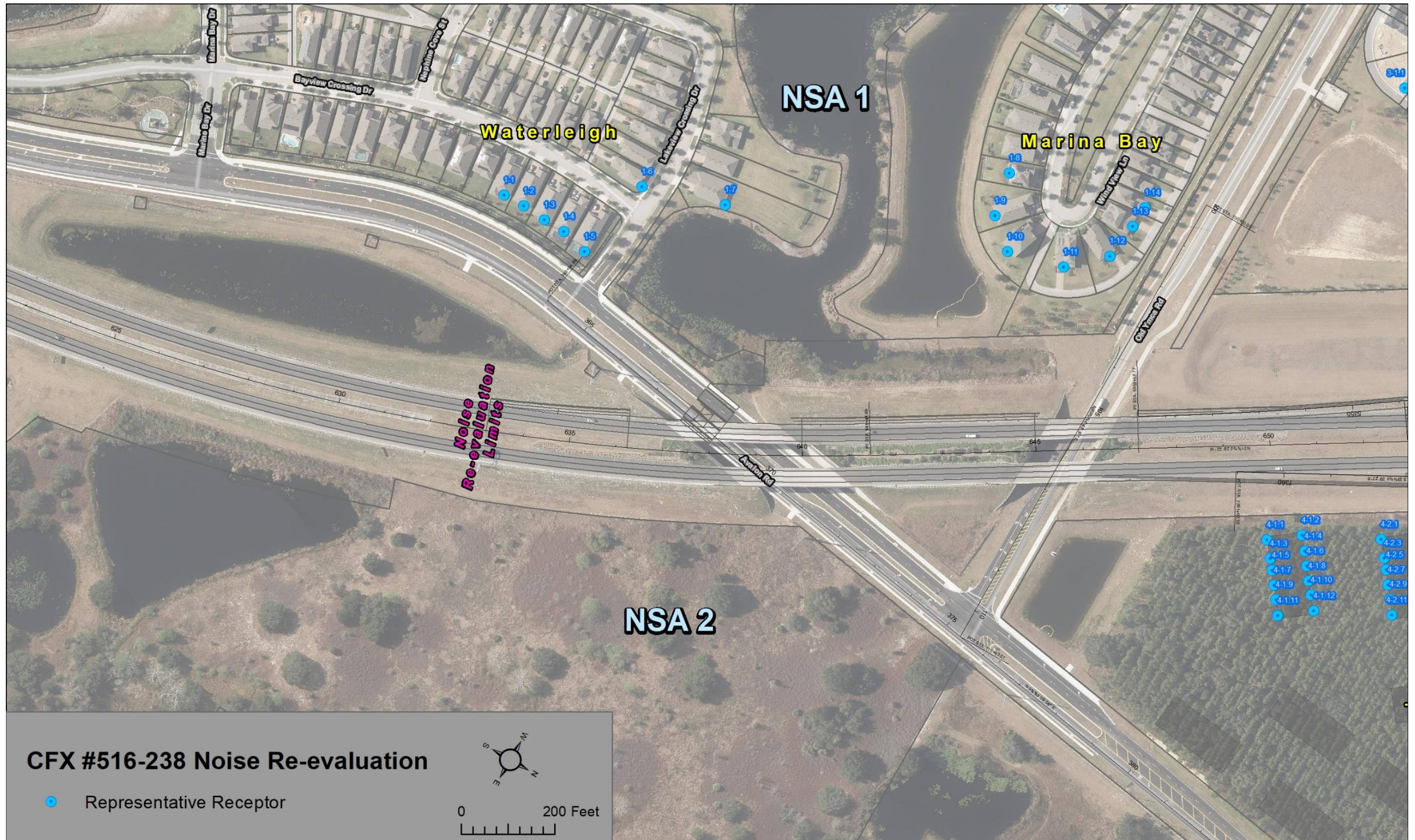
Noise Sensitive Sites			CFX #516-238 with 4-lane SR 429 Predicted Noise Levels (dB(A)) <i>Red = Noise Level above NAC</i>			
Receptor ID	# Sites Represented	NAC Impact Criterion (dB(A))	2018 Existing	2045 Build Alternative	Build Change From Existing	Consider Abatement
8-35	1	66.0	54.2	56.5	2.3	-
8-36	1	66.0	53.8	56.1	2.3	-
NSA Summary (Totals/Averages)		67	60.5	63.5	3.0	24

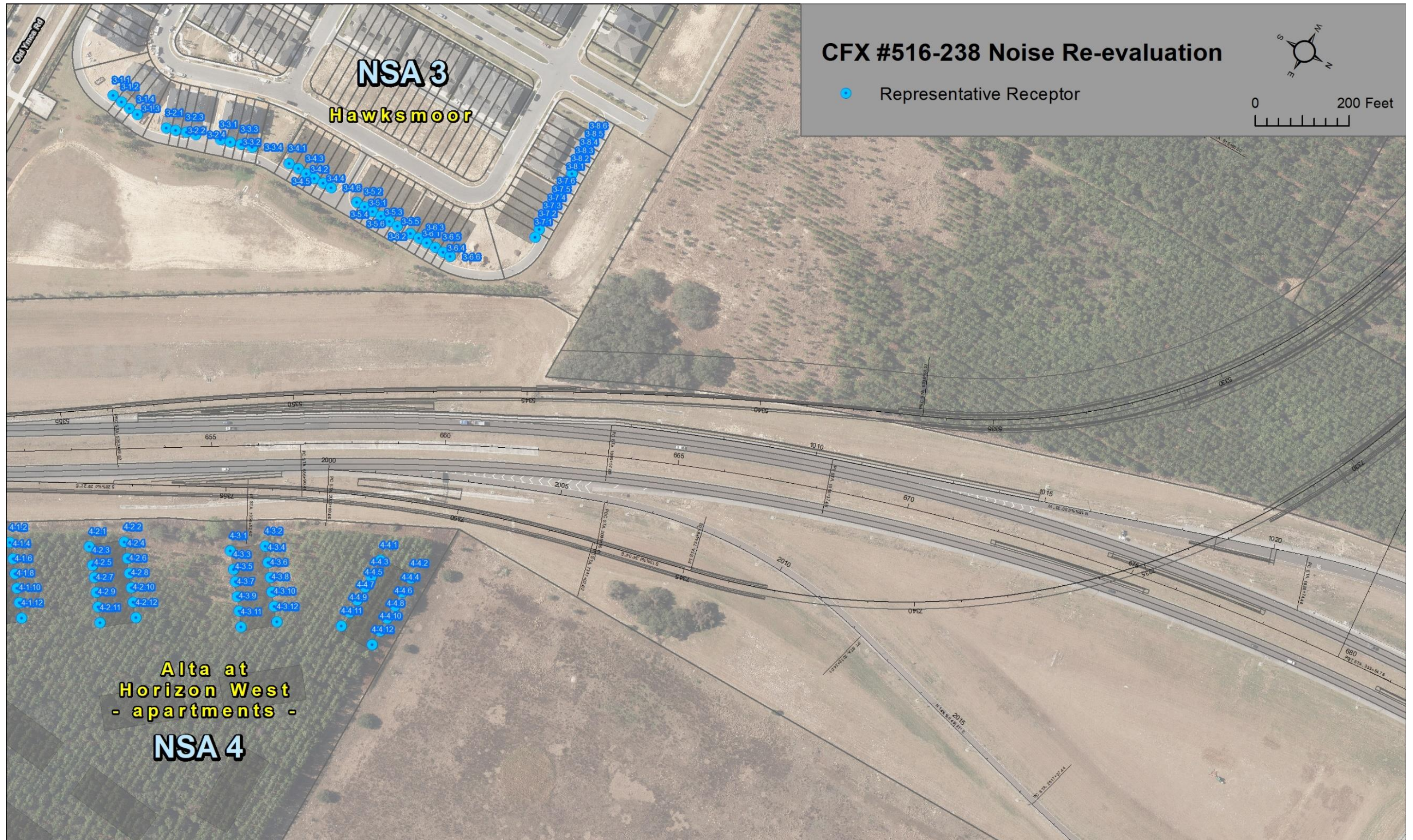
Appendix C:

Project Aerials [CFX #516-238]

CFX #516-238 Noise Re-evaluation Appendix D - Key Sheet





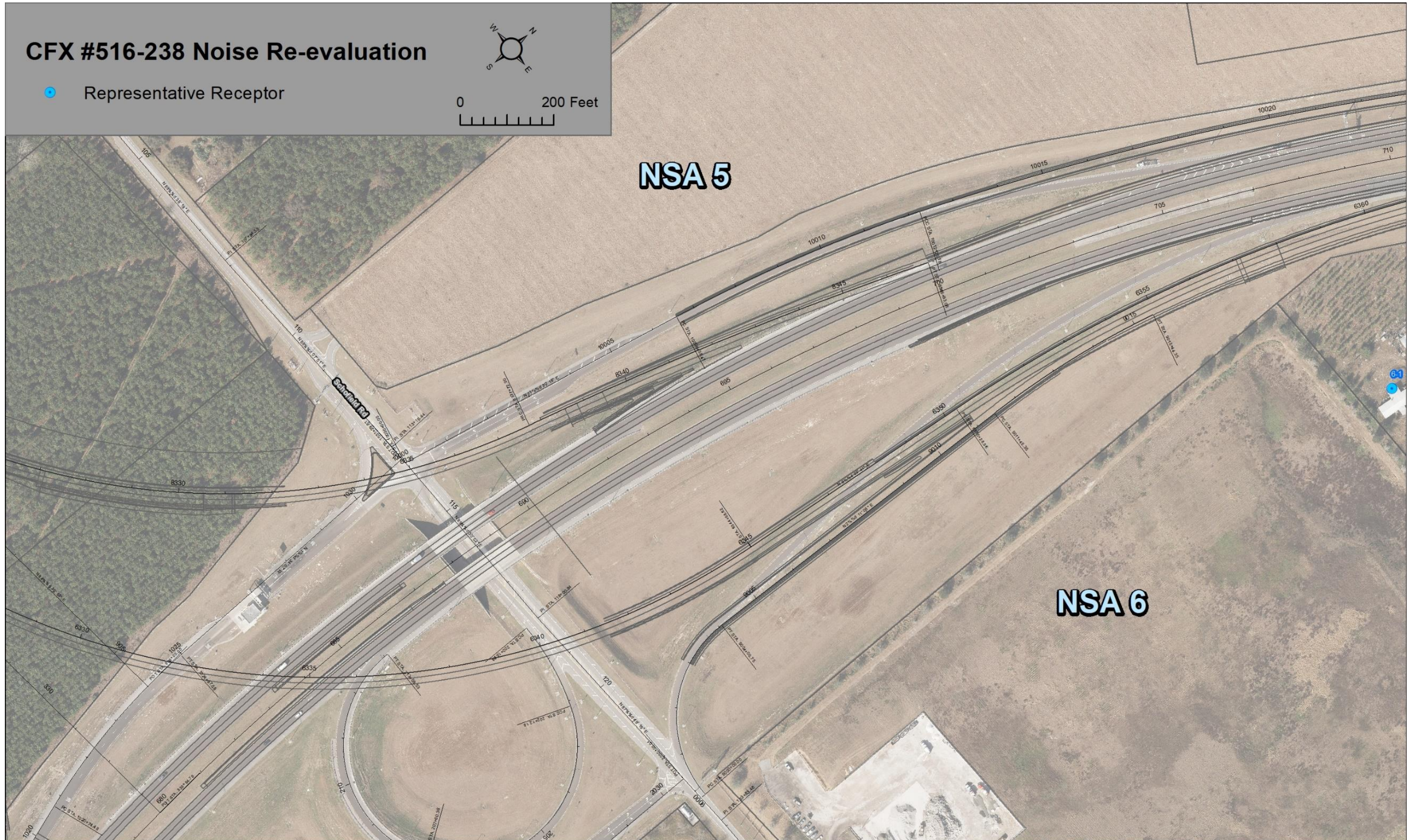


CFX #516-238 Noise Re-evaluation

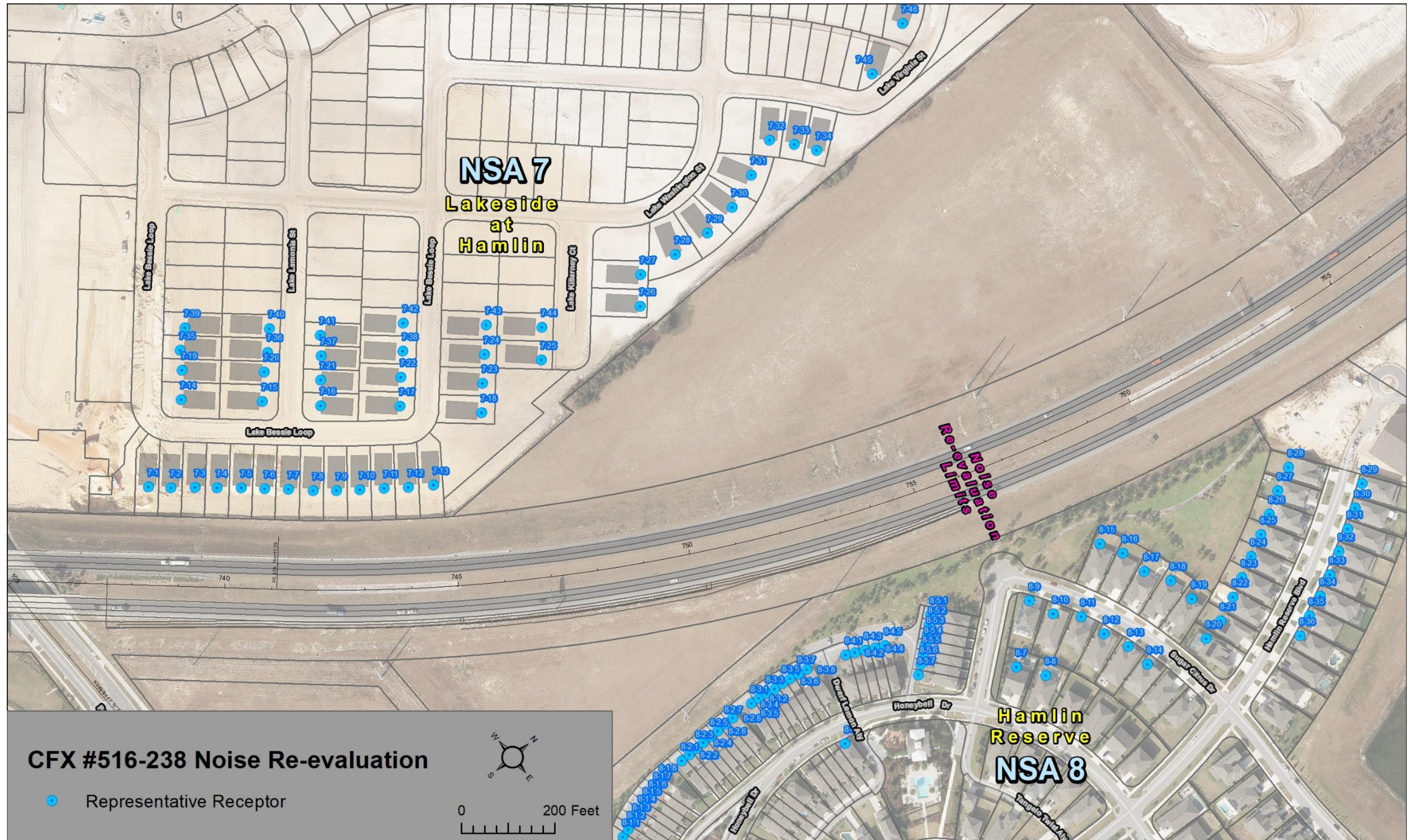
● Representative Receptor

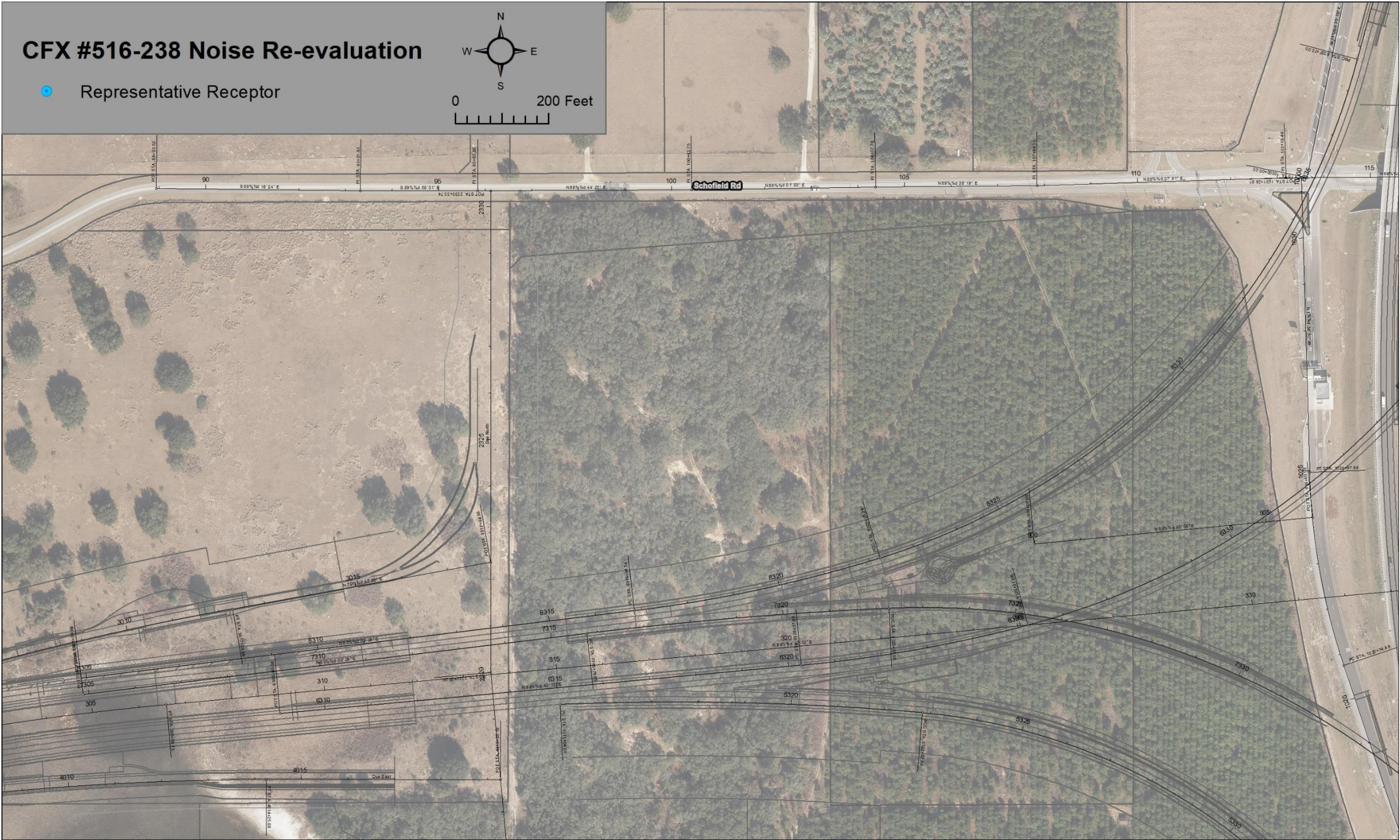


0 200 Feet



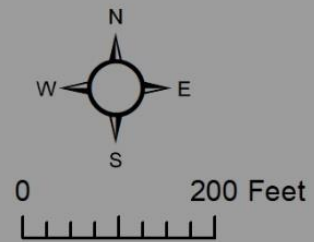






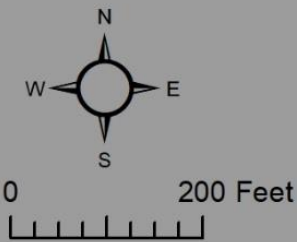
CFX #516-238 Noise Re-evaluation

● Representative Receptor



CFX #516-238 Noise Re-evaluation

● Representative Receptor





Appendix D:

Noise Barrier Maps [CFX #516-238]

