NOISE STUDY
TECHNICAL MEMORANDUM

Northeast Connector Expressway – Phase 1
From Cyrils Drive to Nova Road (CR 532)
Project Development and Environment Study

Central Florida Expressway Authority

CENTRAL FLORIDA EXPRESSWAY AUTHORITY

CFX Project No.: 599-228
Contract No.: 001546

August 2021

1.0 Introduction

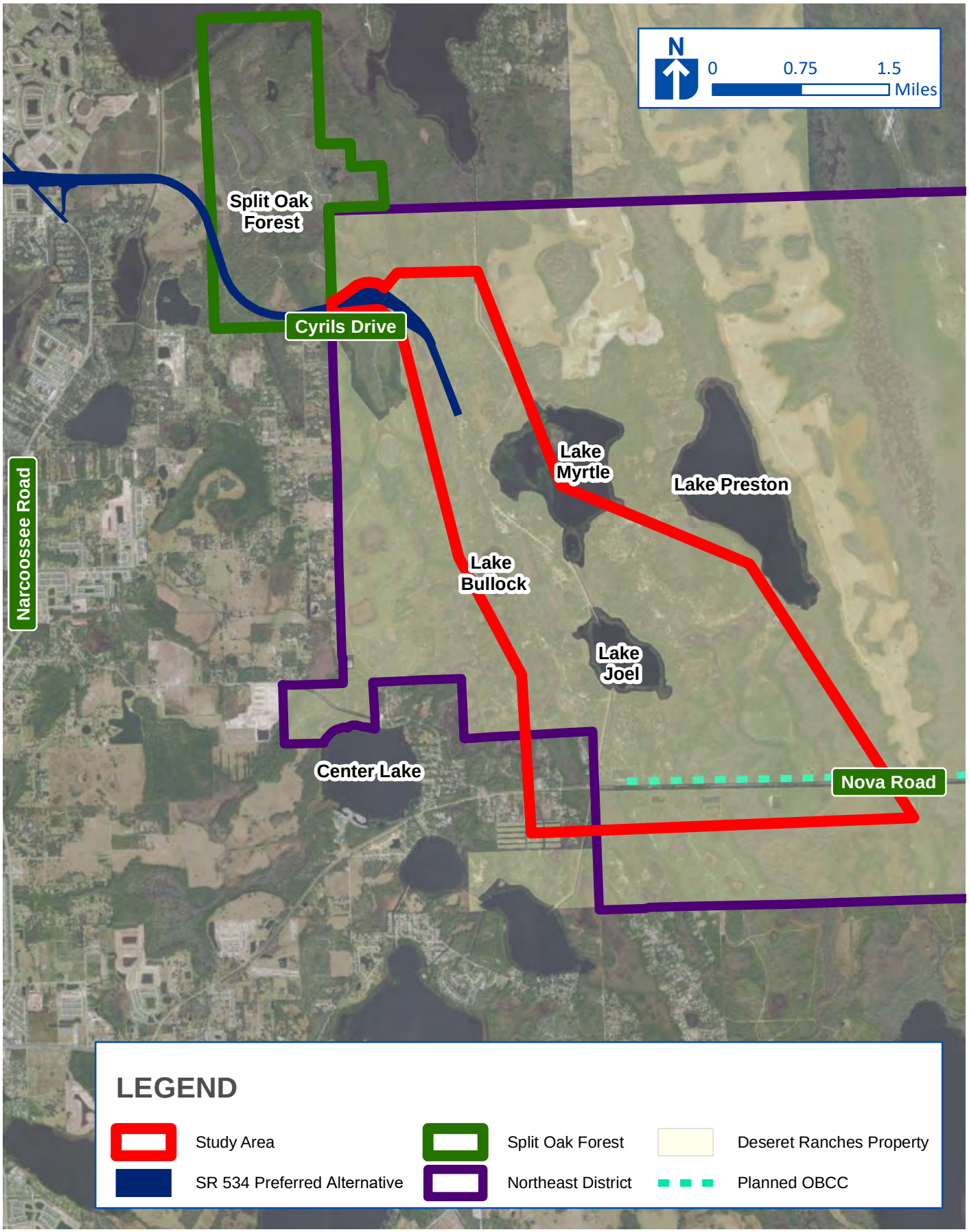
The Central Florida Expressway Authority (CFX) is conducting a Project Development and Environment (PD&E) Study for a new expressway between Cyrils Drive and Nova Road in Osceola County. The study area begins at the terminus of the planned Osceola Parkway Extension (SR 534) near Cyrils Drive and extends to Nova Road, a distance of approximately 4.3 miles. **Figure 1.0.1** shows the Northeast Connector Expressway – Phase 1 (hereafter referred to as Northeast Connector) study area.

To determine if the Florida Department of Transportation (FDOT) noise policy and procedures (i.e., Chapter 18, "Highway Traffic Noise" of the PD&E Manual July 2020) apply to this project, a review of the proposed improvements was performed. The project consists of the construction of an expressway on a new location; therefore, it is a Type I project as listed in Figure 18-2 Type 1 Project Matrix (see Attachment 4) Part 2, Chapter 18 of the FDOT PD&E Manual. All the proposed roadway improvements are consistent with the activities listed in Figure 18-2 Type 1 Project Matrix in the "Type I Project Activities (Noise Study Required)" column which require a noise assessment and consideration of noise abatement if necessary. Therefore, as part of the Northeast Connector project a traffic noise study was performed.

The primary objectives of this noise study were to:

- Document the methodology used to conduct the noise assessment;
- Describe the existing site conditions including noise sensitive land uses within the project study area;
- Assess the potential impacts to noise sensitive sites within the project corridor; and
- Evaluate abatement measures for noise sensitive sites that approach or exceed the FDOT and Federal Highway Administration (FHWA) Noise Abatement Criteria (NAC) with the Build Alternative.

Secondary objectives of this noise study include the consideration of construction noise and vibration impacts as well as the development of noise contours, which can be used in the future by Osceola County to identify compatible land uses. The methods and results of the noise study performed for the Northeast Connector PD&E Study are summarized in this technical memorandum. The information within this technical memorandum is also intended to provide the technical support for findings presented in the Preliminary Engineering Report (PER) and the Project Environmental Impact Report (PEIR).



CENTRAL FLORIDA EXPRESSWAY AUTHORITY

Northeast Connector Expressway - Phase 1 PD&E Study from Cyrils Drive to Nova Road

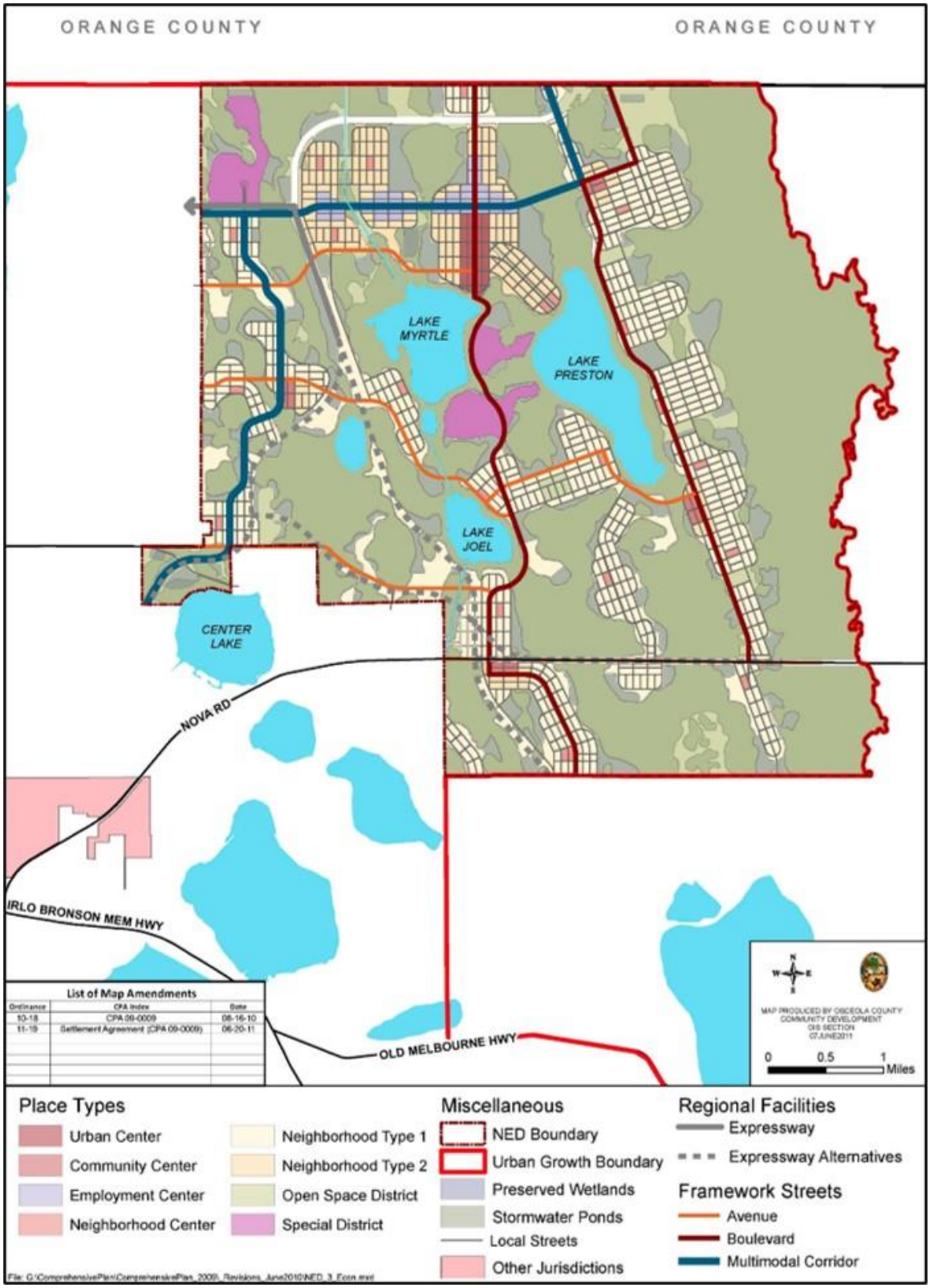
Figure 1.0.1: Project Study Area

1.1 Project Description

The Northeast Connector will link the planned SR 534, which is based on an approved PD&E Study, with the planned Osceola/Brevard County Connectors (OBCC), which is currently in the planning phase. These connections will promote regional connectivity, provide for transit opportunities, and enhance mobility in Osceola County. The link between the planned SR 534 and the OBCC will also provide a seamless limited access, high-speed connection from the Orlando International Airport (OIA) to I-95 in Brevard County. In the interim, before the OBCC is constructed, the Northeast Connector Expressway will extend the limited access connection from Cyrils Drive to Nova Road, a major county road. This connection will be vital to providing a limited access, north-south facility within the Northeast District, a large master-planned development in northeast Osceola County. The Northeast District Conceptual Master Plan includes planned local roadways and expressways which would result in future intersections and interchanges within the study area as shown on **Figure 1.1.1**.

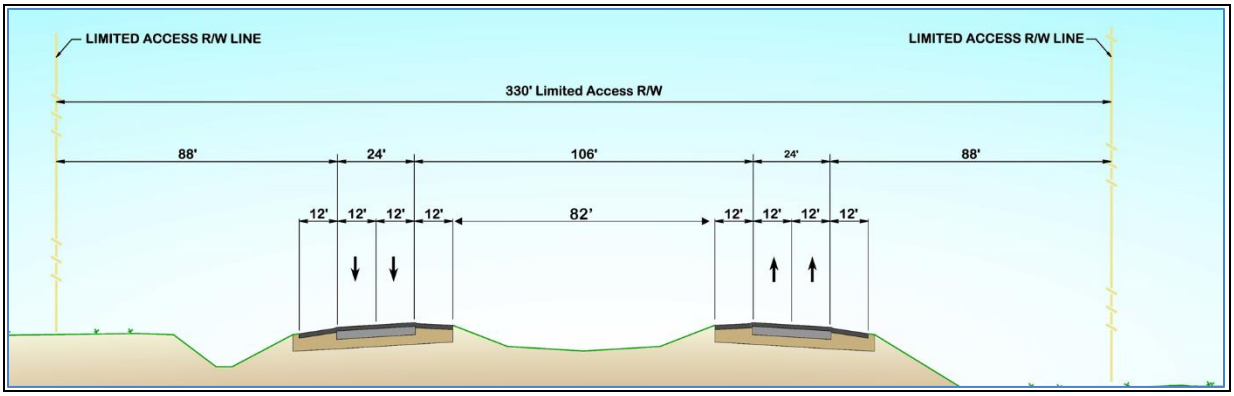
One typical section is considered for the length of the project. The proposed initial typical section features two 12-foot travel lanes in each direction flanked by 12-foot paved inside and outside shoulders. The proposed median width is 82 feet wide, which can accommodate future widening. The ultimate typical section features an eight-lane section and two potential multi-use lanes with a concrete median barrier wall. The proposed typical section requires 330 feet of limited access right-of-way, which includes a border width of 88 feet on both sides of the Northeast Connector as shown on **Figure 1.1.2.**

Figure 1.1.1 Northeast District Conceptual Master Plan



Source: Northeast District Element, August 2010

Figure 1.1.2: Proposed Typical Section



The alternatives for the project are split into two geographic areas:

- Jack Brack Road: Cyrils Drive to south of Jack Brack Road; and
- Nova Road Connection: south of Jack Brack Road to Nova Road.

Jack Brack Road Alternatives

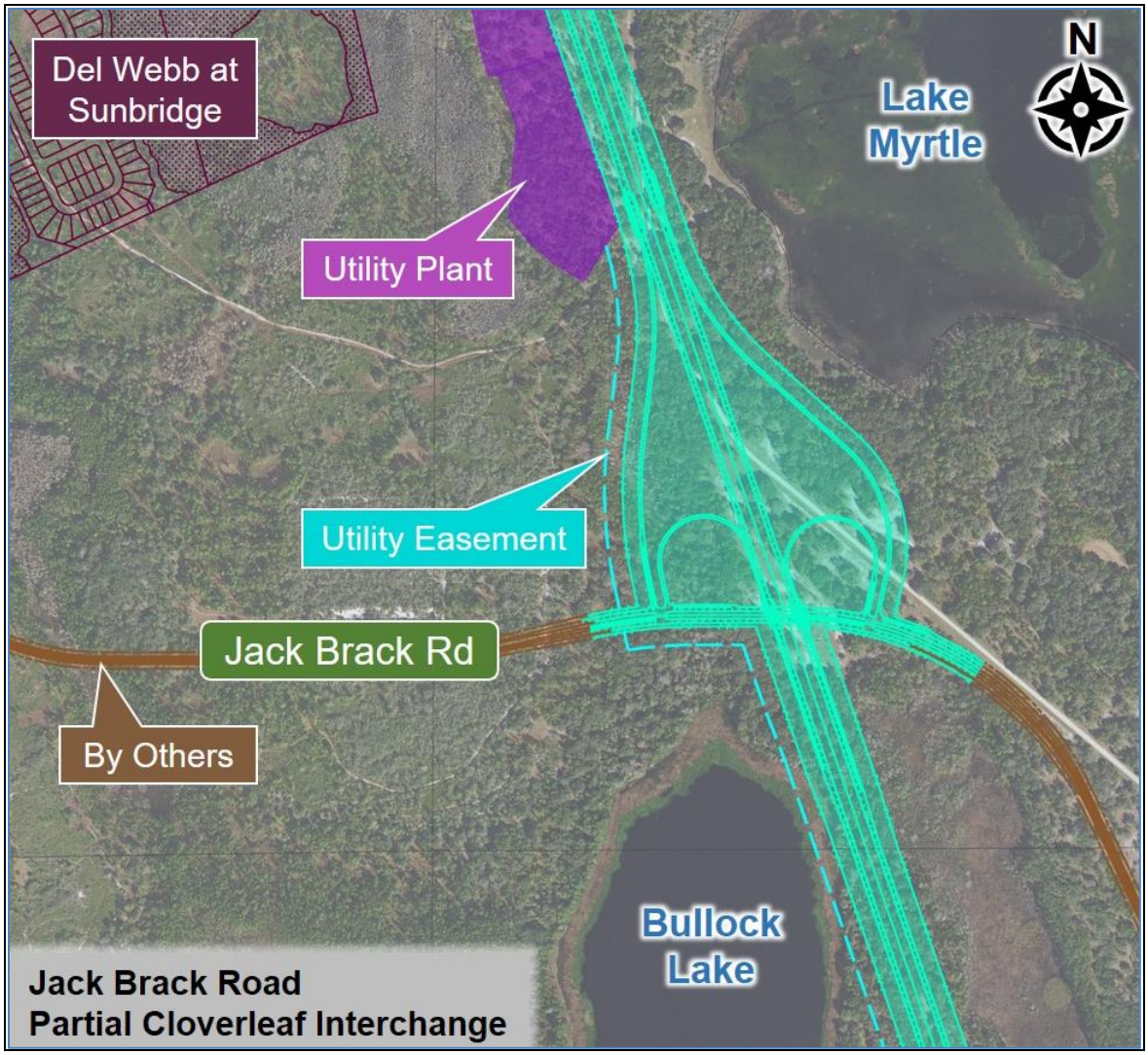
The Cyrils Drive to south of Jack Brack Road segment features one mainline alignment with three interchange alternatives at Jack Brack Road. The three interchange alignments are identified as follows:

- Partial Cloverleaf Interchange
- Diamond Interchange; and
- Tighter Diamond Interchange.

The mainline alignment extends south from the proposed SR 534 preferred alternative. The alignment is located between the Del Webb community to the west and the planned Sunbridge neighborhoods to the east. Continuing further south, the alignment stays just east of the Tavistock utility site, currently under construction. The mainline alignment then squeezes between Lake Myrtle and Bullock Lake, staying close to the east side of Bullock Lake.

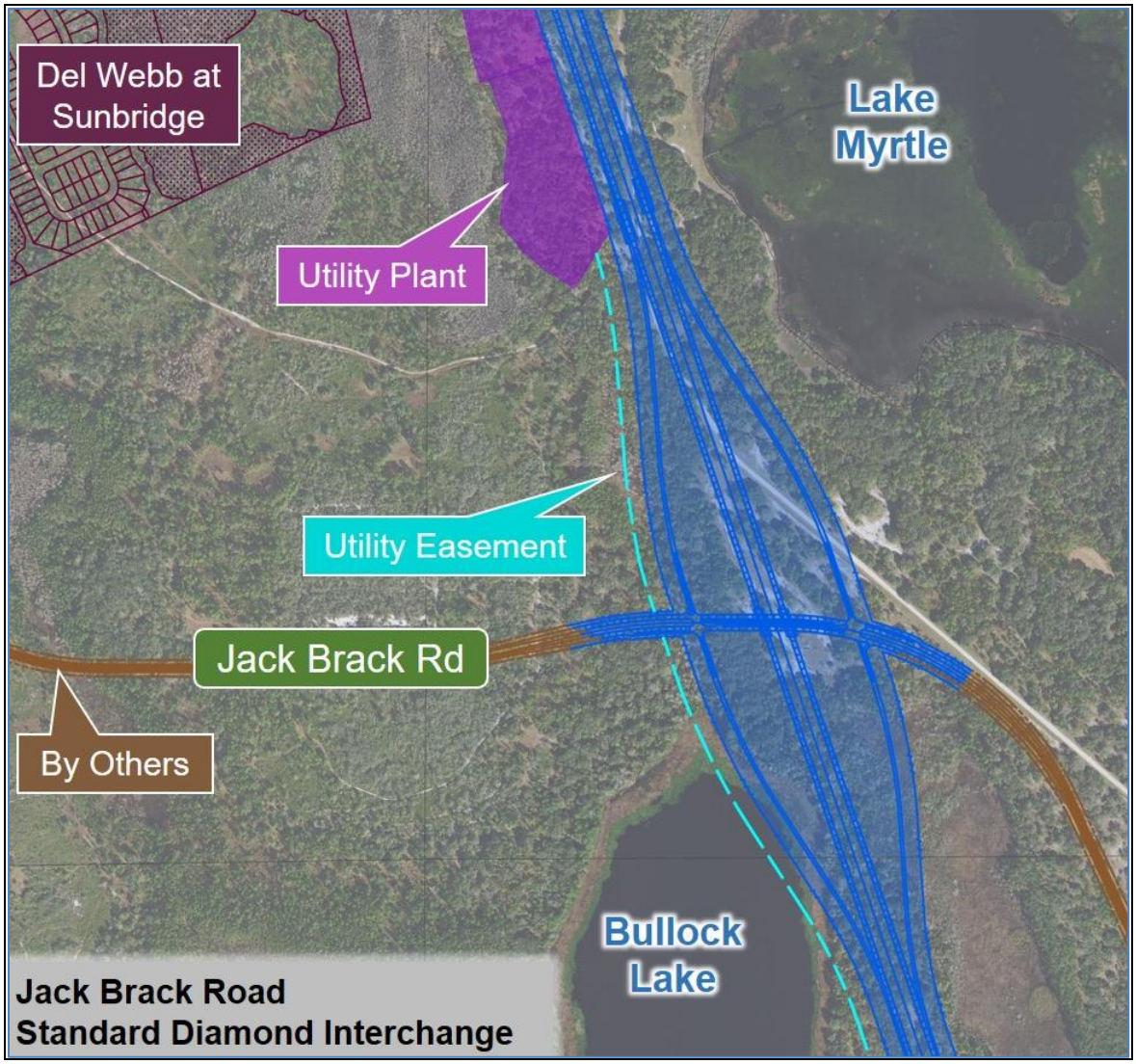
The Partial Cloverleaf Interchange, shown on **Figure 1.1.3** is located at the proposed extension of Jack Brack Road. The Partial Cloverleaf Interchange is located on the northern side of Jack Brack Road in order to avoid impacts to Bullock Lake and the associated wetlands. The southbound lanes will have an exit ramp and entrance loop ramp on the west side of the expressway while the northbound lanes will have an entrance ramp and exit loop ramp on the east side. Easy access to and from the expressway will be present for eastbound and westbound traffic on Jack Brack Road.

Figure 1.1.3: Jack Brack Road Partial Cloverleaf Interchange



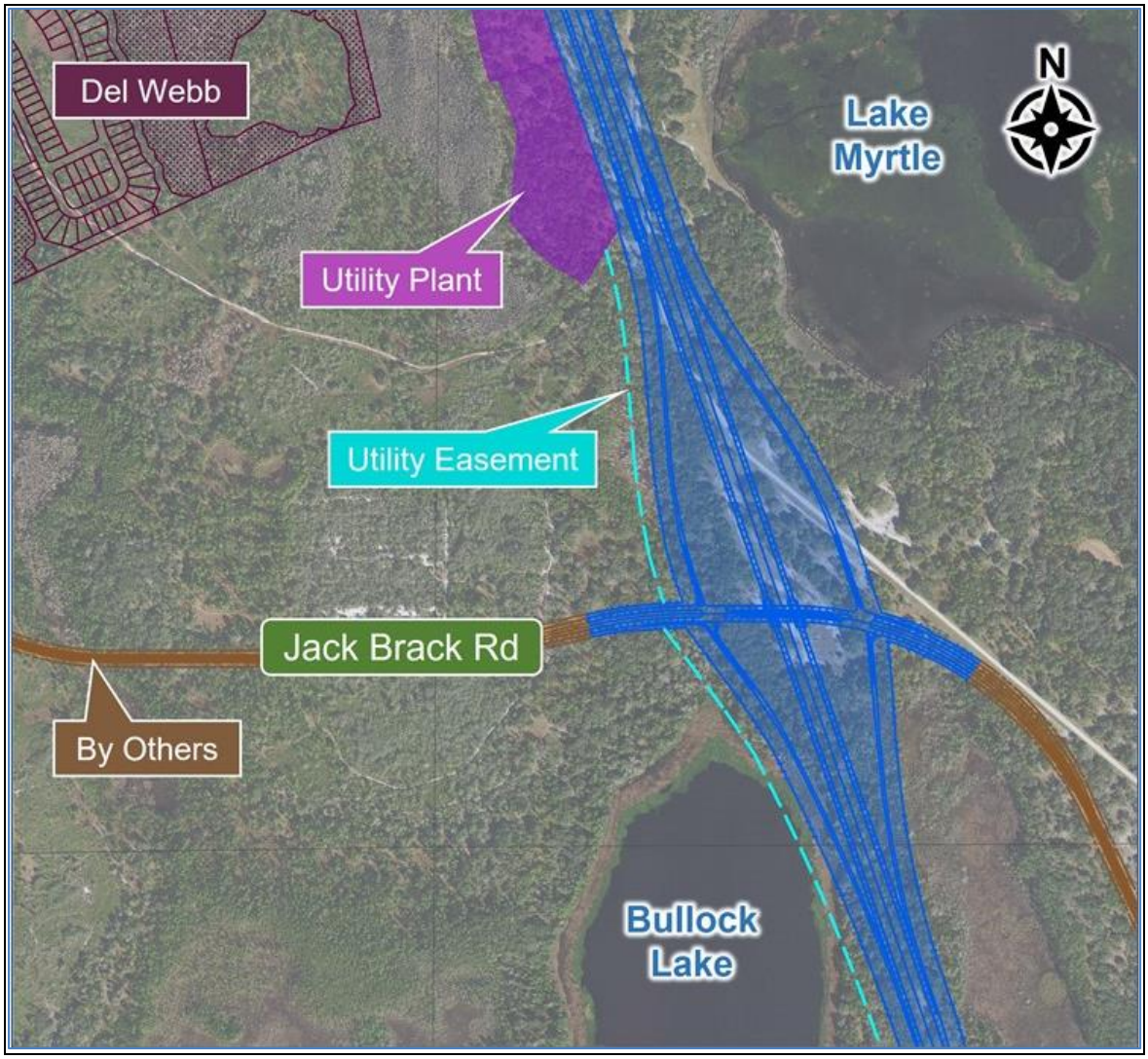
The Diamond Interchange as shown on **Figure 1.1.4** has exit ramps in the southeast and northwest quadrants of the interchange that will allow for traffic exiting the expressway to continue east or west along Jack Brack Road. There are also entrance ramps in the northeast and southwest corners of the interchange that will allow for traffic traveling in the eastbound or westbound direction to enter the expressway in either direction.

Figure 1.1.4: Jack Brack Road Standard Diamond Interchange



The Tighter Diamond Interchange is identical to the Diamond Interchange as shown in **Figure 1.1.5** except for the configuration of the two ramps located south of Jack Brack Road. To accommodate the planned Orlando Utility Commission transmission line, the ramp in the southwest quadrant of the interchange needed to be tightened to allow space for transmission poles to be placed west of the limited access right-of-way, but east of Lake Bullock. The southeast quadrant ramp was similarly tightened to minimize wetland impacts.

Figure 1.1.5: Jack Brack Road Tighter Diamond Interchange



Nova Road Connection Alternatives

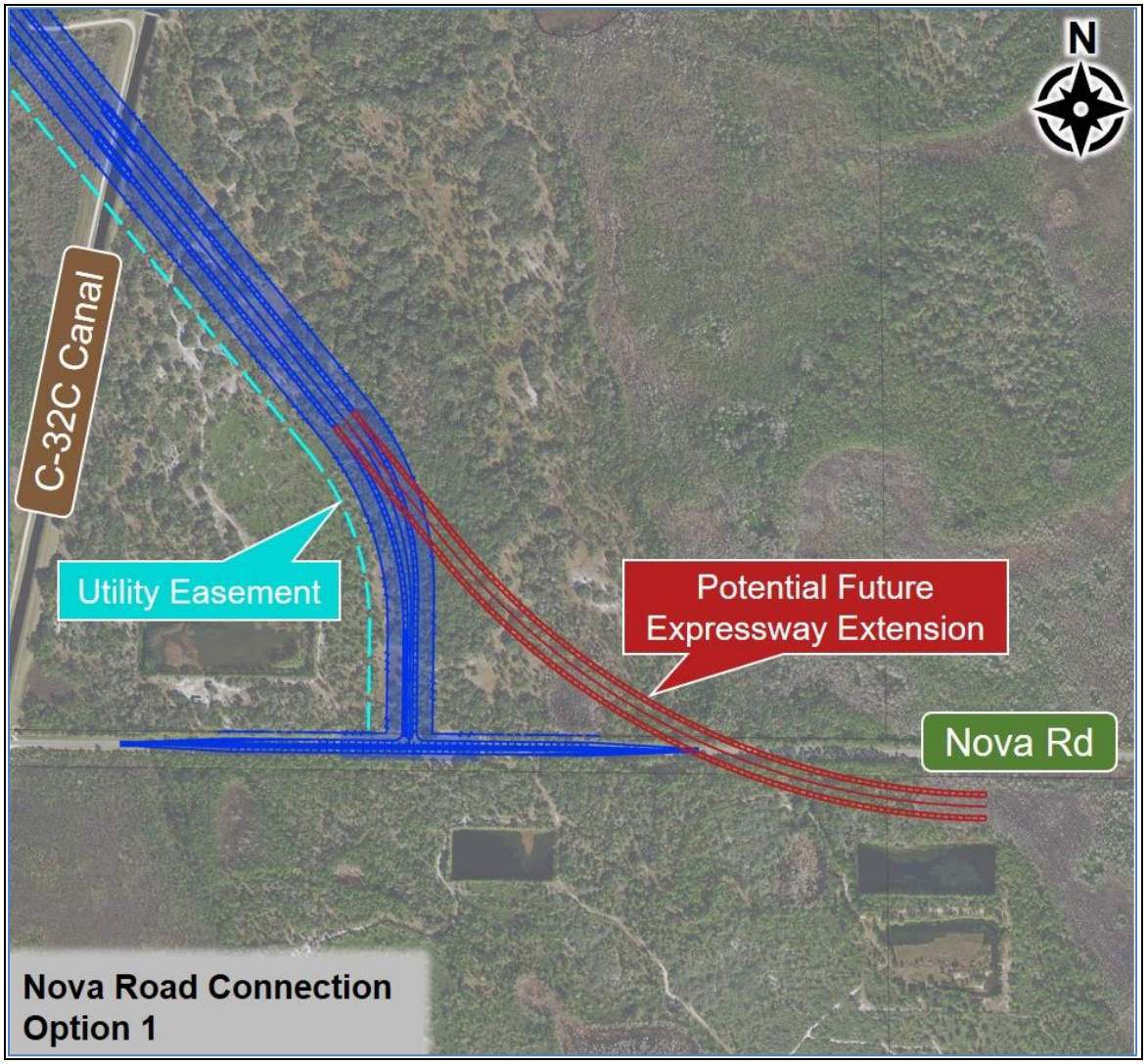
The south of Jack Brack Road to Nova Road segment features two mainline alignments with connections to Nova Road in different locations. The two alternatives in this segment are identified as follows:

- Nova Road Connection – Option 1; and
- Nova Road Connection – Option 2.

South of the proposed Jack Brack extension, the mainline alignment diverges between the two alternatives. Nova Road Connection – Option 1, as shown on **Figure 1.1.6** continues a southeasterly tangent, crosses the C-32C canal, and continues that tangent until it terminates at Nova Road. Just north of Nova Road, the alignment bends to provide a 90-

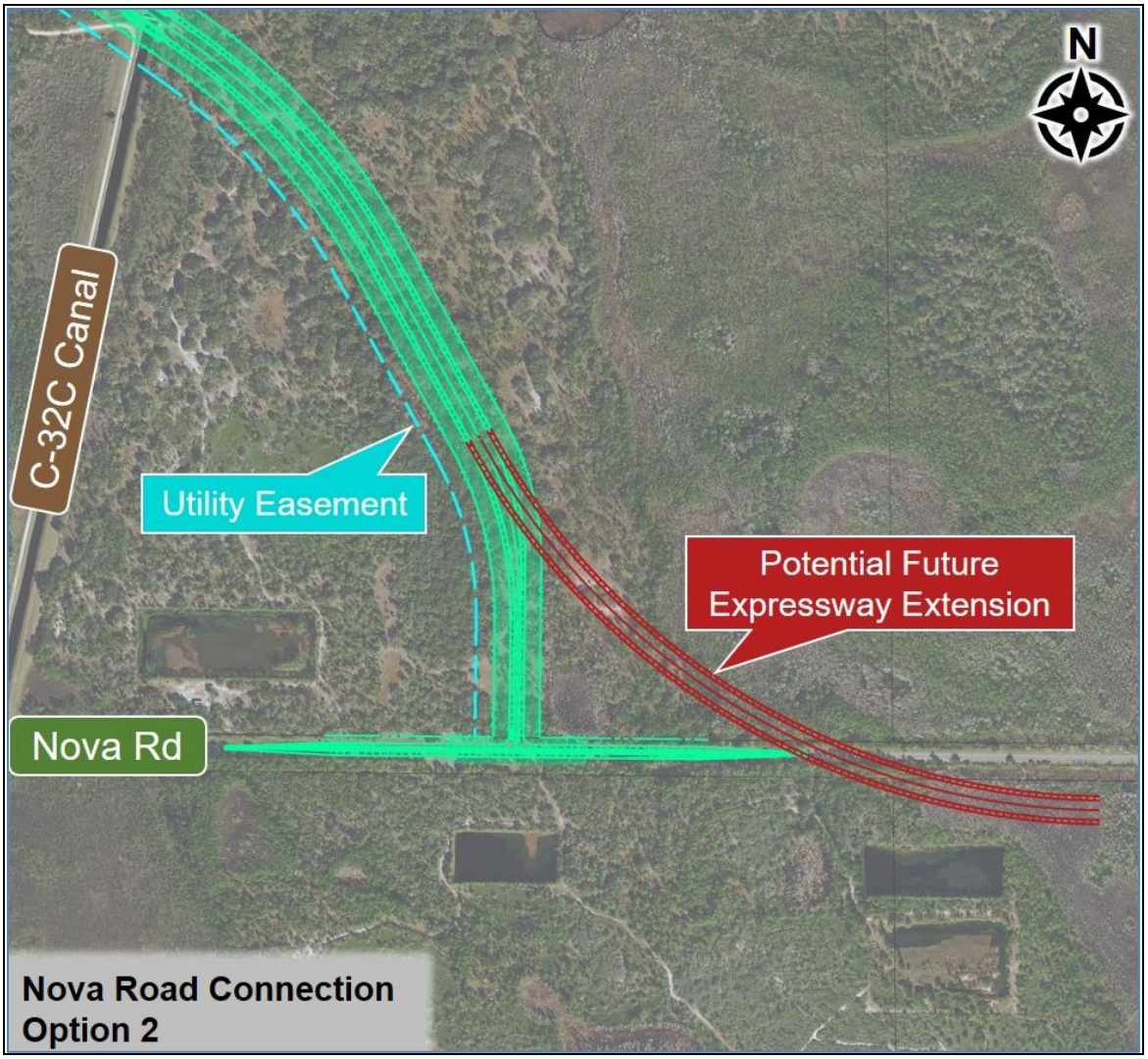
degree T-intersection at Nova Road. At this time, the expressway would end at Nova Road, but a future easterly extension of the expressway is possible if the OBCC project moves forward at this location.

Figure 1.1.6: Nova Road Connection Option 1



Nova Road Connection – Option 2 as shown on **Figure 1.1.7** is similar to Option 1; however, the alignment differs slightly. Option 2 introduces a reverse curve in the alignment to shift the alignment closer to Lake Joel. The crossing of the C-32C canal is less skewed than in Option 1. This reverse curve also shifts the T-intersection at Nova Road further to the east. Similar to Option 1, the alignment terminates at Nova Road with a 90-degree T-intersection. At this time, the expressway would end at Nova Road, but a future easterly extension of the expressway is possible if the OBCC project moves forward at this location.

Figure 1.1.7: Nova Road Connection Option 2



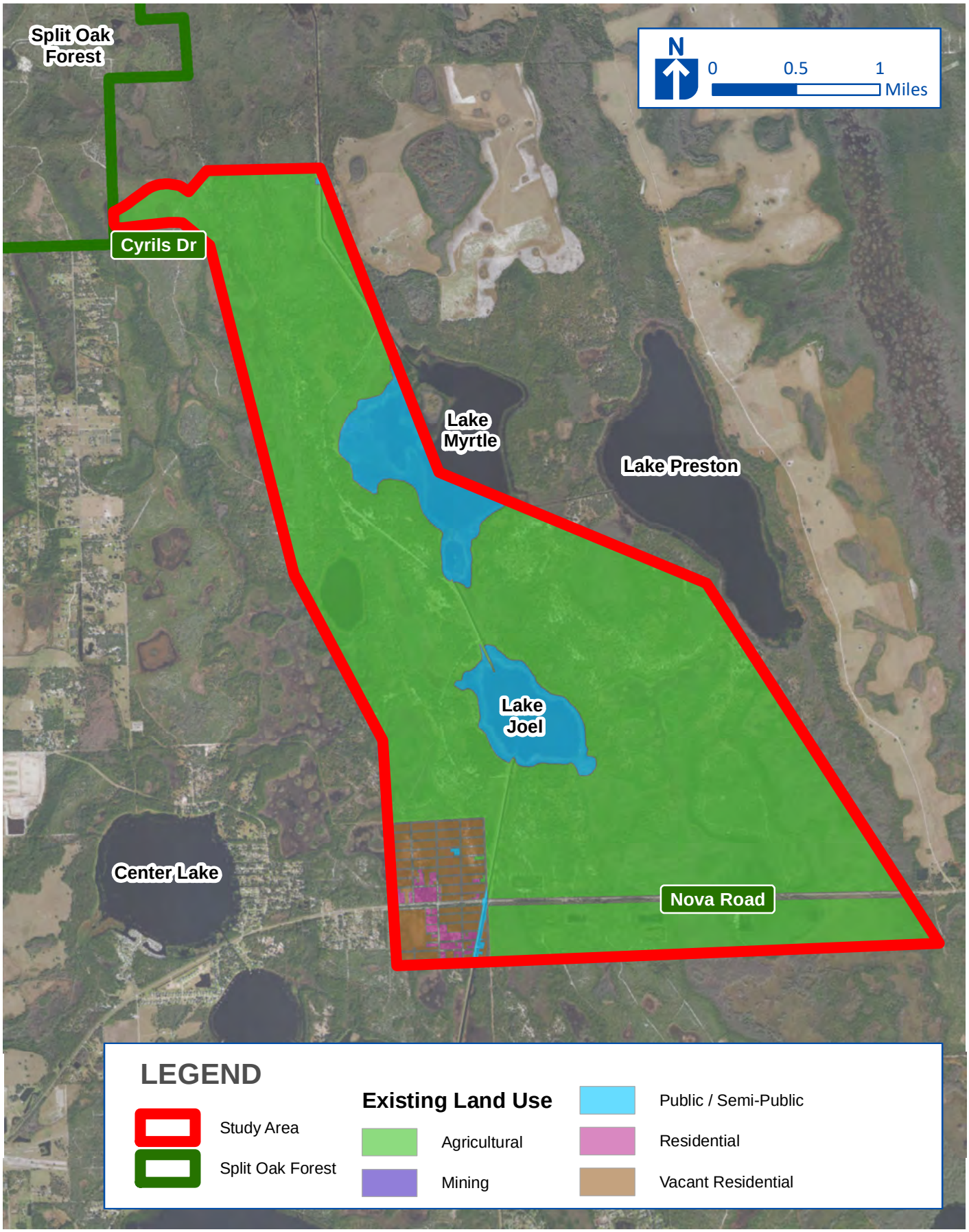
1.2 Existing and Future Land Uses

The existing land in the corridor is primarily agricultural as shown on **Figure 1.2.1**. According to the Osceola County property appraiser 2019 data, 99% of the land in the study area is agricultural, 0.6% is public/semi-public (waterbodies), approximately 0.2% is residential and vacant residential. Forty structures/buildings are located within the study area. The majority of those are located in the southwest quadrant of the study area, near Nova Road. The closest residential structure is located approximately 1,000 feet from the end of the Nova Road proposed improvements.

The Osceola County 2040 Future Land Use Map indicates the study area will be converted entirely to mixed use development, as shown on **Figure 1.2.2**. This is consistent with the approved Northeast District Conceptual Master Plan. Therefore, this project is not

anticipated to change or effect land use patterns. The land use within the study area is changing based on the approved Northeast District Conceptual Master Plan.

As shown on **Figure 1.1.1** multiple developments are planned for the future. A permit search was undertaken in April 2021 and updated in June 2021 to ensure that there are no active building permits along the corridor. Currently, there are subdivision plans for the Sunbridge Community, at the northern terminus of the project. However, there are no active building permits for any residential structures within the study area.

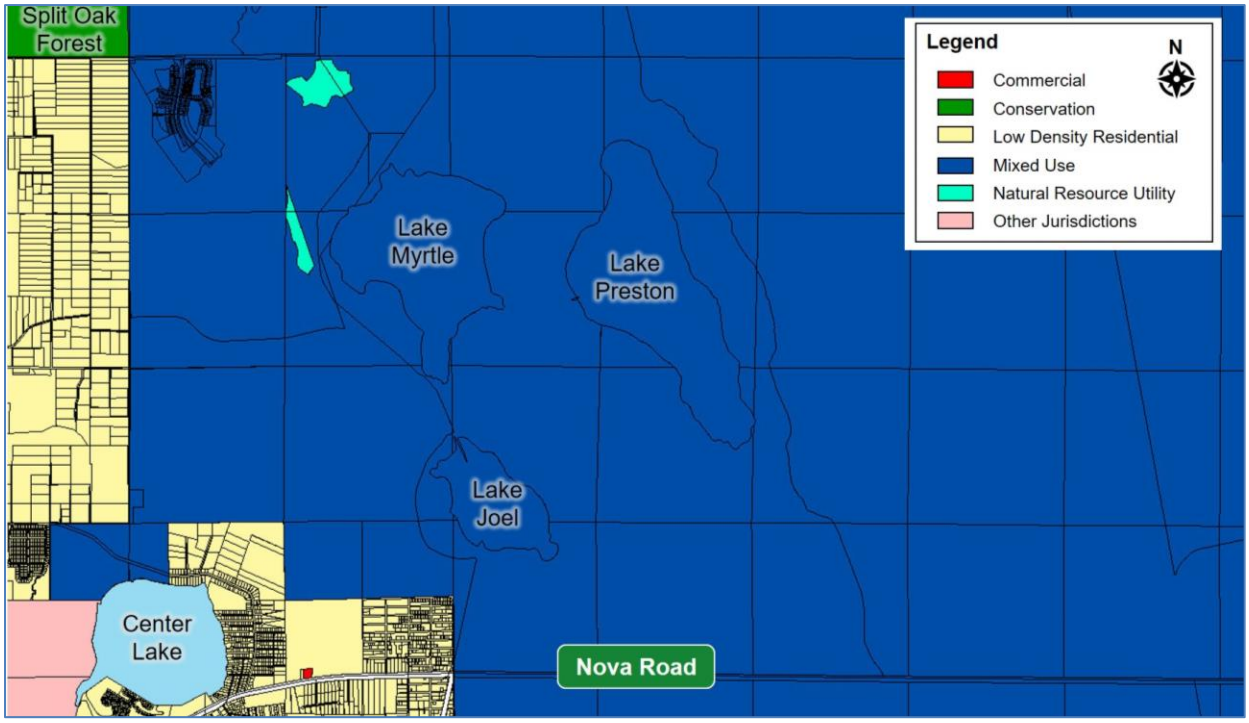


CENTRAL FLORIDA EXPRESSWAY AUTHORITY

Northeast Connector Expressway - Phase 1 PD&E Study from Cyrils Drive to Nova Road

Figure 1.2.1: Existing Land Use

Figure 1.2.2: Future Land Use



Source: Osceola County Interactive Maps: https://maps.osceola.org/gisweb/WebPages/Map/FundyViewer.aspx

2.0 Methodology

This traffic noise study was conducted based on the methodology described in the FDOT's PD&E Manual, Part 2, Chapter 18, *Highway Traffic Noise* (July 1, 2020), the FDOT's *Traffic Noise Modeling and Analysis Practitioners Handbook* (December 31, 2018), and in accordance with Title 23 of the Code of Federal Regulations, Part 772 (23 CFR 772), *Procedures for Abatement of Highway Traffic Noise and Construction Noise* (July 13, 2010).

A review of the project corridor was undertaken to determine the presence of noise sensitive land uses potentially impacted by the Northeast Connector and if consideration of noise abatement measures such as noise barriers are warranted. In addition, noise contours were developed to determine future noise compatible land uses within the contours. The noise contours are provided to assist local officials and private developers in promoting compatible land development and highways. The noise contours were developed in accordance with 23 CFR 772, FHWA Traffic Noise Model (TNM) Version 2.5 (February 2004).

The following sections describe the noise metrics, traffic data, and noise abatement criteria used in this study.

2.1 Noise Metrics

Noise levels documented in this report represent the hourly equivalent sound level [Leq(h)]. Leq(h) is the steady-state sound level, which contains the same amount of acoustic energy as the actual time-varying sound level over a one-hour period. Leq(h) is measured in A-weighted decibels [dB(A)], which closely approximate the human frequency response. Sound levels of typical noise sources and environments are provided in **Table 2.1.1** as a frame of reference.

Table 2.1.1: Sound Levels of Typical Noise Sources and Environment

COMMON OUTDOOR ACTIVITIES	NOISE LEVEL dB(A)	COMMON INDOOR ACTIVITIES
	---110---	Rock Band
Jet Fly-over at 1000 ft		
	---100---	
Gas Lawn Mower at 3 ft		
	---90---	
Diesel Truck at 50 ft, at 50 mph		Food Blender at 1 m (3 ft)
	---80---	Garbage Disposal at 1 m (3 ft)
Noise Urban Area (Daytime)		
Gas Lawn Mower at 100 ft	---70---	Vacuum Cleaner at 10 ft
Commercial Area		Normal Speech at 3 ft
Heavy Traffic at 300 ft	---60---	
		Large Business Office
Quiet Urban Daytime	---50---	Dishwasher Next Room
Quiet Urban Nighttime	---40---	Theater, Large Conference Room
Quiet Suburban Nighttime		(Background)
	---30---	Library
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (Background)
	---20---	
	---10---	
Lowest Threshold of Human Hearing	---0---	
		Lowest Threshold of Human Hearing

Source: California Dept. of Transportation Technical Noise Supplement, Oct. 1998, Page 18.

2.2 Traffic Data

Part 2 Chapter 18 of the PD&E Manual, requires the "Maximum peak-hourly traffic representing Level of Service (LOS) "C" or demand traffic be used (unless analysis shows that other conditions create a "worst-case" level)". LOS C volumes were used to represent worst case conditions. LOS C volumes represent the highest traffic volume traveling at the highest average speed, which typically generates the highest noise levels at a given site. The Build Traffic is located in **Appendix A** and shows the LOS C traffic volumes for the Northeast Connector. The truck percentages used for the Northeast Connector are based on the truck percentages from the Osceola Parkway Extension (OPE / SR 534) Project. The Northeast Connector provides a continuation of SR 534 without any intervening interchanges. Therefore, the truck percentages from the SR 534 project are considered appropriate for the Northeast Connector.

2.3 Noise Abatement Criteria

The FHWA has established NAC for land use activity categories, presented in **Table 2.3.1**. Maximum noise threshold levels, or criteria levels, have been established for five of the seven activity categories. These criteria determine when an impact occurs and when consideration of noise abatement is required. Noise abatement measures must be considered when predicted noise levels approach or exceed the NAC levels or when a substantial noise increase occurs. A substantial noise increase occurs when the existing noise level is predicted to be exceeded by 15 dB(A) or more as a result of the transportation improvement project. The FDOT defines "approach" as within 1.0 dB(A) of the FHWA criteria.

Noise sensitive receptor sites include properties where frequent exterior human use occurs and where a lowered noise level would be of benefit. This includes lands where serenity and quiet are of extraordinary significance such as The Tomb of the Unknown Soldier at Arlington National Cemetery (NAC Category A); residential land use (NAC Activity Category B); a variety of nonresidential land uses not specifically covered in Category A or B including parks and recreational areas, medical facilities, schools, and places of worship (Activity Category C); and commercial and developed properties including offices, hotels, and restaurants with exterior areas of use (Activity Category E). Noise sensitive sites also include interior use areas where no exterior activities occur for facilities such as auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, recording studios, schools, and television studios (Activity Category D). Categories F and G, which include commercial and developed properties without exterior areas of use, do not have noise abatement criteria levels. Category F includes land uses such as industrial and retail facilities that are not considered noise sensitive. Category G includes undeveloped lands.

Table 2.3.1: Noise Abatement Criteria [Hourly A-Weighted Sound Level-decibels (dB(A))]

Activity Category	Activity Leq(h)[1]		Evaluation Location	Description of Activity Category
	FHWA	FDOT		
A	57	56	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	66	Exterior	Residential
C[2]	67	66	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	51	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[2]	72	71	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 a design standard for noise abatement measures.

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

Note: FDOT defines that a substantial noise increase occurs when the existing noise level is predicted to be exceeded by 15 decibels or more as a result of the transportation improvement project. When this occurs, the requirement for abatement consideration will be followed.

2.4 Noise Abatement Measures

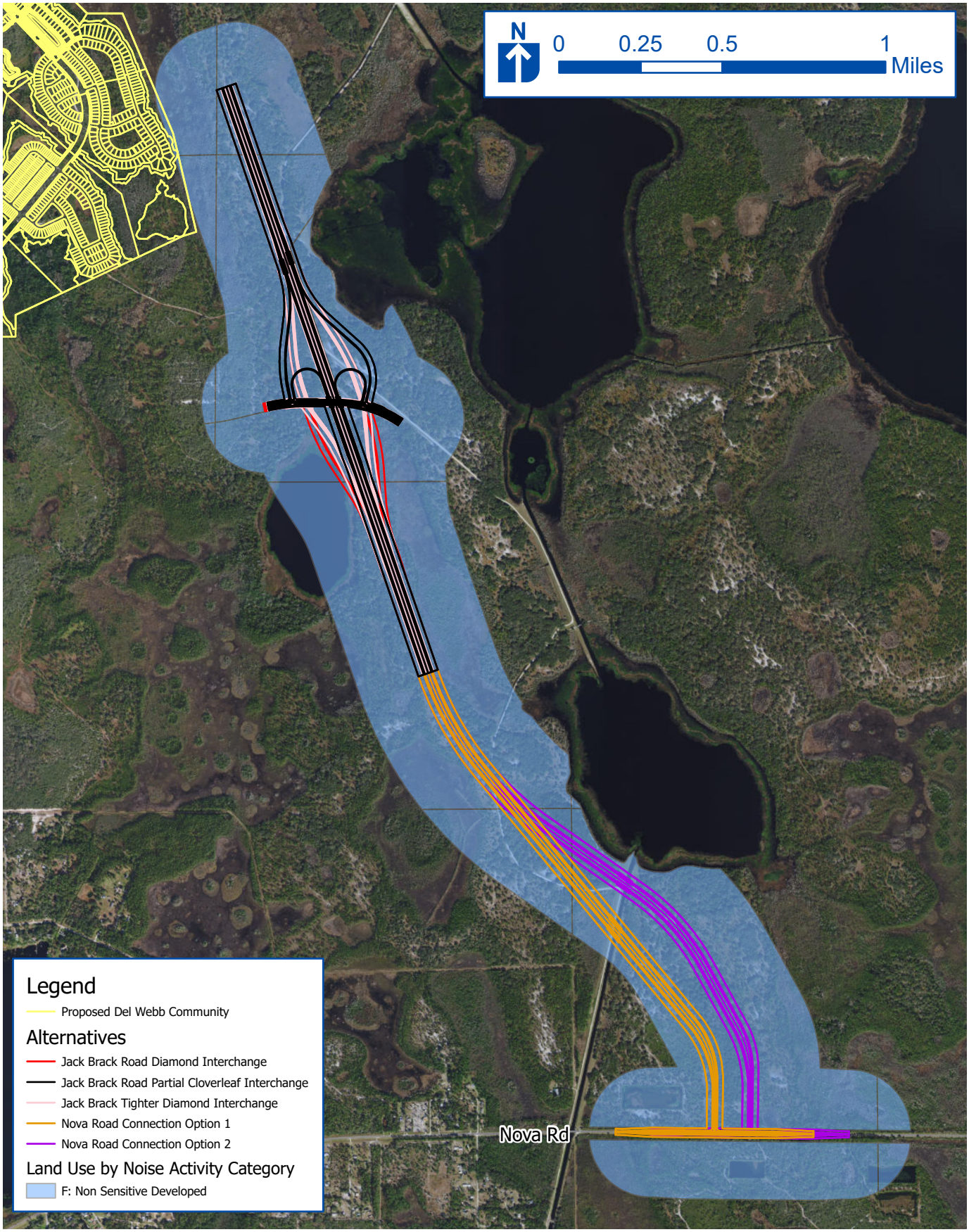
When traffic noise associated with a proposed project is predicted to approach or exceed the NAC at a noise sensitive site, noise abatement measures must be evaluated. The most common and effective noise abatement measure for projects such as this is the construction of noise barriers. Noise barriers reduce noise by blocking the sound path between a roadway and a noise sensitive area. To be effective, noise barriers must be long, continuous (i.e., no

intermittent openings), and have sufficient height to block the path between the noise source and the receptor site. The FHWA's Analysis and Abatement Guidance (January 2011) indicates the ends of the noise barriers should, in general, extend in each direction four times as far as the distance from the receptor site to the noise barrier.

Other abatement measures that should be considered include traffic management, alignment modification, and property acquisition. Traffic management measures such as traffic control devices, prohibition of certain vehicle types, time-use restriction for certain vehicle types, modified speed limits, and exclusive lane designation applied for the purpose of reducing traffic noise levels can be considered.

3.0 Traffic Noise Analysis

A review of the proposed improvements determined that this project is a Type I project as listed in Figure 18-2 Type 1 Project Matrix (see Attachment 4) Part 2, Chapter 18 of the FDOT PD&E Manual. Therefore, an assessment of potential traffic noise impacts and consideration of noise abatement was performed. A Noise Analysis Map showing the alternatives and land uses categorized by NAC is shown on **Figure 3.1.1**. In addition, a review of the existing, future land use maps (see **Figures 1.2.1** and **1.2.2**, respectively), and planned developments was performed to determine if there are noise sensitive receptors within the corridor. The review of the available land use data determined that there are no noise sensitive receptors within the project corridor that could be impacted by highway traffic noise since the study area consists of undeveloped and agricultural lands. Del Webb, while currently under construction, is approximately 1100 feet from the western boundary of the proposed corridor and was therefore not evaluated for noise impacts. In addition, as stated in **Section 1.2** (Existing and Future Land Uses) a review was performed in June 2021 of building permits issued for future developments in the area that would require noise abatement consideration. There are proposed/planned developments in the area, however, none of these developments have active residential building permits so they were not evaluated. In accordance with Chapter 18, no detailed noise modeling, impact analysis, or consideration of noise abatement measures were performed or warranted. Therefore, the project is not anticipated to result in any traffic noise impacts. To avoid incompatible land uses, noise contours were developed (see Section 4.0). It is recommended that the status of planned and active developments be confirmed and those that have obtained active residential building permits are evaluated during the design phase.



CENTRAL FLORIDA EXPRESSWAY AUTHORITY

Northeast Connector Expressway - Phase 1 PD&E Study From Cyrils Drive to Nova Road

Figure 3.1.1 Noise Analysis Map

4.0 Noise Contours

To aid in promoting land use compatibility, a copy of the Noise Study Report, which provides information that can be used to protect future land development from becoming incompatible with anticipated traffic noise levels, will be provided to Osceola County. In addition, generalized future noise contours for the properties in the immediate vicinity of the project have been developed for Noise Abatement Activity Categories A, B/C and E (i.e., highly sensitive land uses, residential and other sensitive land uses, and sensitive commercial, respectively). These contours represent the approximate distance from the edge of the nearest proposed travel lane of the Northeast Connector to the limits of the area predicted to approach [i.e., within 1 dB(A)] or exceed the NAC. The contours do not consider any shielding of noise provided by structures between the receiver and the proposed travel lanes. Within the project corridor, the distance between the proposed edge of the outside travel lane and the contour at various locations are presented in **Table 4.1**. To minimize the potential for incompatible land use, noise sensitive land uses should be located beyond this distance.

Table 4.1 Noise Contour Distances

Roadway	Speed (mph)	Distance from Proposed Nearest Travel Lane to Noise Contour (Feet)		
		56 dB(A) - Activity Category A	66 dB(A) - Activity Category B/C	71 dB(A) - Activity Category E
Northeast Connector	70	615	245	135

5.0 Construction Noise and Vibration

During construction of the project, there is the potential for noise impacts to be substantially greater than those resulting from normal traffic operations because heavy equipment is typically used to build roadways. In addition, construction activities may result in vibration impacts. Since there are no receptors within the project corridor that could be impacted, construction and vibration impacts are not expected. A reassessment of the project area for sites particularly sensitive to construction noise and/or vibration will be performed during design to ensure that impacts to such sites are minimized.

6.0 Community Coordination

Public meeting invitation letters were sent on Monday, February 22, 2021, by mail to 27 elected officials, as well as to 89 local, regional, state, and federal agency contacts. Invitation letters were also mailed to 368 property owners and tenants adjacent to the study area. The public workshop was advertised in the Orange and Osceola County editions of the Orlando Sentinel on Sunday, February 28, 2021 and Sunday, March 7, 2021. An ad was printed in the Florida Administrative Register (FAR) on Friday, February 19, 2021, and a press release was distributed to major media outlets on March 3, 2021.

The workshop began at 6:30 p.m. with a live presentation explaining the project and current alternatives under consideration, followed by a question-and-answer (Q&A) period. At 7:00 p.m., the live presentation was given a second time followed by a second round of Q&A. During the virtual workshop, project representatives were available to discuss the study, receive input, and answer questions that audience members submitted via the chat function.

A total of 29 people registered to attend the Public Information Workshop. A total of 19 attendees participated in the virtual workshop, and 13 questions and comments were received. One question was received within the 10-day comment period following the meeting. More information on the virtual workshop is provided in the Comments and Coordination Report, available under separate cover. There were no specific noise inquiries received.

7.0 References

23 CFR Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise", Federal Register, Vol. 75, No. 133, Tuesday, July 13, 2010; pages 39834-39839.

Federal Highway Administration Report FHWA-HEP-10-025, "Highway Traffic Noise: Analysis and Abatement Guidance", December 2011; 76 pages.

"FHWA Traffic Noise Model (FHWA TNM) User's Guide", January 1998 and Version 2.5 Addendum, April 2004.

Federal Highway Administration Report Number FHWA-PD-96-046, "Measurement of Highway-Related Noise", Cynthia S.Y. Lee and Gregg Fleming; May, 1996; 206 pages.

Federal Highway Administration Report FHWA-HEP-06-015, "Construction Noise Handbook". Final Report August 2006; 185 pages.

"A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations", Roger L. Wayson and John M. MacDonald, University of Central Florida; Updated July 22, 2009; 64 pp.

Florida Department of Transportation. "Highway Traffic Noise", Part 2, Chapter 18. Project Development and Environment Manual, Florida Department of Transportation, Tallahassee, July 1, 2020.

Florida Department of Transportation 2020 FDOT Design Manual (Topic 625-000-002), Chapter 264, "Noise Walls and Perimeter Walls"

Florida Department of Transportation "Standard Specifications for Road and Bridge Construction", July 2020.

Appendix A
Traffic Data for Future Build Noise Modeling

TRAFFIC DATA FOR NORTHEAST CONNECTOR NOISE STUDY
CENTRAL FLORIDA EXPRESSWAY AUTHORITY

Traffic Data for Future Build Noise Modeling

Roadway Segment		Speed Limit[1]	Number of Lanes	Percent Heavy Trucks[1]	Percent Medium Trucks[1]	Percent Buses[1]	Percent Motorcycles[1]	Cars per lane	Heavy Trucks per lane	Medium Trucks per Lane	Buses per lane	Motorcycles per lane
Northeast Connector (NB/SB)	SR 534 to Jack Brack Rd	70	2	1.00%	3.00%	0.50%	0.50%	1,471	16	47	8	8
	Jack Brack Rd to Nova Rd	70	2	1.00%	3.00%	0.50%	0.50%	1,471	16	47	8	8

* LOS "C" volumes obtained from Table 7 of FDOT's Level of Service Handbook (2020) and HCM 2000 (Volume adjustments have been applied as appropriate)

[1] Vehicle split percentages based on SR 534 Project