SR 33
Project Development and Environment Study
Noise Study Report

From Old Combee Road to North of Tomkow Road
Polk County, Florida

Financial Project ID No: 430185-1-22-01

Florida Department of Transportation
District One

April 29, 2014

EXECUTIVE SUMMARY

The Florida Department of Transportation (FDOT), District One, is conducting a Project Development and Environment (PD&E) Study for the proposed widening of State Road (SR) 33 in Polk County. The limits of the project are from Old Combee Road to north of Tomkow Road. The recommended action would widen SR 33 from a two-lane undivided roadway to a four-lane divided roadway. Reconstruction of the SR 33 interchange with Interstate 4 (I-4) is also proposed. The interchange improvements would replace the I-4 bridges over SR 33 and reconstruct the segment of I-4 approaching the interchange.

The traffic noise analysis was performed following FDOT procedures that comply with Title 23 Code of Federal Regulations (CFR), Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. The evaluation used methodologies established by the FDOT that are documented in the PD&E Manual, Part 2, Chapter 17 (May 2011). The prediction of existing and future traffic noise levels with and without the roadway improvements was performed using the Federal Highway Administration's (FHWA's) Traffic Noise Model (TNM Version 2.5).

A total of 63 noise-sensitive sites were evaluated. The sites were comprised of 62 residences (located within the Grey Moss Manor subdivision, Lake Deeson Village Mobile Home Park, Deeson Manor subdivision, Landings Apartments, Spanish Oaks subdivision, Cambry subdivision, Snow Wood subdivision, and residences east of I-4) and a pool at the Landings Apartments.

The results of the analysis indicate that existing (2012) exterior traffic noise levels range from 47.6 to 62.6 dB(A), levels that do not approach, meet, or exceed the Noise Abatement Criteria (NAC). With the exception of one receptor for which the predicted level approaches the NAC, future (2036) noise levels without the proposed improvements (No-Build) also do not approach, meet, or exceed the NAC. In the future (2036) with the improvements (Build) traffic noise levels are predicted to approach, meet, or exceed the NAC at 37 receptors. Notably, when compared to the existing condition, traffic noise levels are not predicted to increase more than 10 dB(A) above existing conditions at any of the evaluated sites. As such, the project would not substantially increase traffic noise (i.e., increase traffic noise 15 dB(A) or more).

Noise abatement measures were considered for the 37 impacted receptors (36 residences and the pool). The measures were traffic management, alternative roadway alignments, and noise barriers. The results of the evaluation indicate that although feasible, traffic management and an alternative roadway alignment(s) are not reasonable methods of reducing predicted traffic noise impacts at the impacted receptors. The results of the analysis performed to evaluate noise barriers indicates that barriers would meet minimum noise reduction requirements and reduce traffic noise at least 5 dB(A) at 32 of the 37 impacted

receptors at a cost below the reasonable limit. The benefited residences are at the following two locations:

- Barrier 1: Residences located within the Grey Moss Subdivision and Lake Deeson Village Mobile Home Park from West of Wood Circle W. to Lake Luther Road (Sites 2-20, 26-27)
- Barrier 4: Residences located within the Cambry and Snow Wood Subdivisions (Sites 47-57)

Statement of Likelihood

The FDOT is committed to the construction of noise barriers at the locations above contingent upon the following:

- Detailed noise analysis during the final design process supports the need for, and the feasibility and reasonableness of, providing the barriers as abatement;
- The detailed analysis demonstrates that the cost of the noise barriers will not exceed the cost reasonable limit;
- The residents/property owners benefitted by the noise barriers desire that a noise barrier be constructed; and
- All safety and engineering conflicts or issues related to construction of the noise barriers are resolved.

Land uses adjacent SR 33 are identified on the FDOT listing of noise- and vibration-sensitive sites (e.g., residential use). Construction of the proposed roadway improvements is not expected to have any significant noise or vibration impact. If sensitive land uses develop adjacent to the roadway prior to construction, increased potential for noise or vibration impacts could result. It is anticipated that the application of the ***FDOT Standard Specifications for Road and Bridge Construction*** will minimize or eliminate potential construction noise and vibration impacts. However, should unanticipated noise or vibration issues arise during the construction process, the Project Engineer, in coordination with the District Noise Specialist and the Contractor, will investigate additional methods of controlling these impacts.

Land uses such as residences, auditoriums, hotels/motels, libraries, recreational areas, and parks are considered incompatible with highway noise levels that exceed the NAC. To reduce the possibility of additional traffic noise-related impacts, noise level contours were developed for the future improved roadway facility. These noise contours delineate the extent of the predicted traffic noise impact area from the improved roadway's edge-of-travel lane for activity categories of land use. Local officials will be provided a copy of the Final Noise Study Report to promote compatibility between any future land development in the project area.

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1.1 Description of the Proposed Action

The Florida Department of Transportation (FDOT), District One, is conducting a Project Development and Environment (PD&E) Study for the proposed widening of State Road (SR) 33 in Polk County. The limits of this project are from Old Combee Road to north of Tomkow Road, a distance of approximately 4.3 miles. The location of the project is shown on **Figure 1-1**.

The recommended action would widen SR 33 from a two-lane undivided roadway to a four-lane divided roadway. Reconstruction of the SR 33 interchange with Interstate 4 (I-4) is also proposed. The interchange improvements would replace the I-4 bridges over SR 33 and reconstruct the segment of I-4 approaching the interchange.

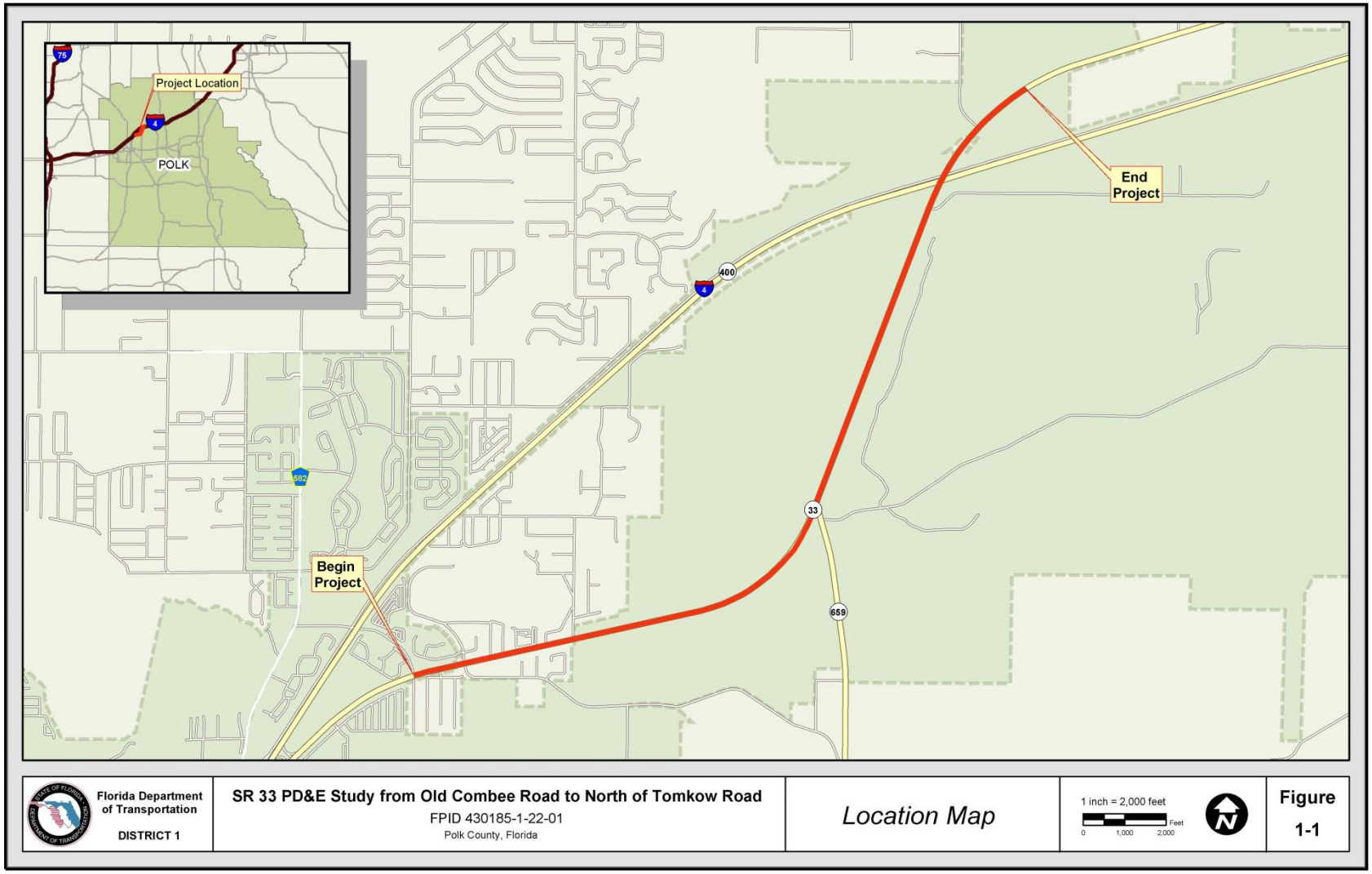
1.2 Project Purpose and Need

1.2.1 System Linkage

SR 33 serves as a primary north-south connection between Lakeland and I-4. The project would improve the functional viability of SR 33 as a local and regional travel alternative to I-4. SR 33 provides connectivity to University Boulevard which serves the planned Williams Development of Regional Impact (DRI), Polk Commerce Center DRI and the future University of South Florida/Polytechnic campus. University Boulevard and SR 33 will serve as the most direct link between these new residential and commercial centers and north and central Lakeland.

1.2.2 Capacity/Transportation Demand

This project provides increased capacity along SR 33 to meet the project future travel demand. Forecasted traffic has been completed as part of the SR 33 PD&E Study. According to the *Design Traffic Technical Memorandum (AIM Engineering, November 2013)*, in the design year of 2036, the existing two-lane SR 33 is projected to operate at a Level of Service (LOS) E or F without improvements. Additionally, many of the unsignalized intersections, including the I-4 on and off ramps, are expected to operate at unacceptable levels of service without improvements to SR 33.


Project Location
POLK
End Project
Begin Project
400
33
659
582
Florida Department of Transportation
DISTRICT 1
SR 33 PD&E Study from Old Combee Road to North of Tomkow Road
FPID 430185-1-22-01
Polk County, Florida
Location Map
1 inch = 2,000 feet
0
1,000
2,000
Feet
Figure 1-1

1.2.3 Roadway Deficiencies

As part of the project, improvements to the SR 33 interchange with I-4 are also proposed. Currently, I-4 crosses over SR 33 with two parallel bridges (three lanes each bridge). There are deficiencies with the existing interchange. First, the existing vertical clearance over SR 33 does not meet the minimum required 16.5 feet of clearance (the clearance is as low as 14.9 feet). Maintaining this substandard vertical clearance would require the approval of a design exception which would not be approved by the Federal Highway Administration (FHWA). Second, the pier footings have less than the minimum required depth of cover of three feet (cover depths are as shallow as 1.892 feet). The horizontal clearance between the center pier and the intermediate piers will not accommodate the future four lane roadway. Finally, the existing k-values (i.e., the rate of vertical curvature) for the crest and sag vertical curves on I-4 approaching SR 33 are appropriate for 55 mph and 60 mph design speeds, but not for the 70 mph design speed required for I-4.

1.3 Planning Consistency

Table 1-1 summarizes the project planning consistency with the FDOT State Transportation Improvement Plan (STIP) and the Polk County Transportation Planning Organization's (TPO) Transportation Improvement Program (TIP). A summary of the plans that were evaluated for consistency follows the table.

Table 1-1
STIP/TIP Consistency

Phase	Currently Approved TIP	Currently Approved STIP	TIP / STIP	TIP/STIP Fiscal Year	Comments
PE (Final Design)	Y	Y	$7,350,000	2014	Project can be found on page 287 of the FDOT "Current STIP" document and on page 13-2 of the Polk TPO FY 2013/14-2017/18 TIP.
R/W	N	N	$0	N/A	All phases of SR 33 from Old Combee Road to Tomkow Road are included in the Cost Affordable Plan of the Polk TPO's 2035 Mobility Vision Plan.
Construction	N	N	$0	N/A	All phases of SR 33 from Old Combee Road to Tomkow Road are included in the Cost Affordable Plan of the Polk TPO's 2035 Mobility Vision Plan.

FDOT

- The project is included in the FDOT STIP on page 287 of the Current STIP document.

Polk County Transportation Planning Organization (TPO)

- The widening of SR 33 from two to four lanes from Old Combee Road/Deeson Point Drive to Tomkow Road is included in the Cost Affordable section of Polk County TPO's 2035 Mobility Vision Plan.
- The project is included in the Polk TPO's FY 2013/14 – 2017/18 TIP on page 13-2.

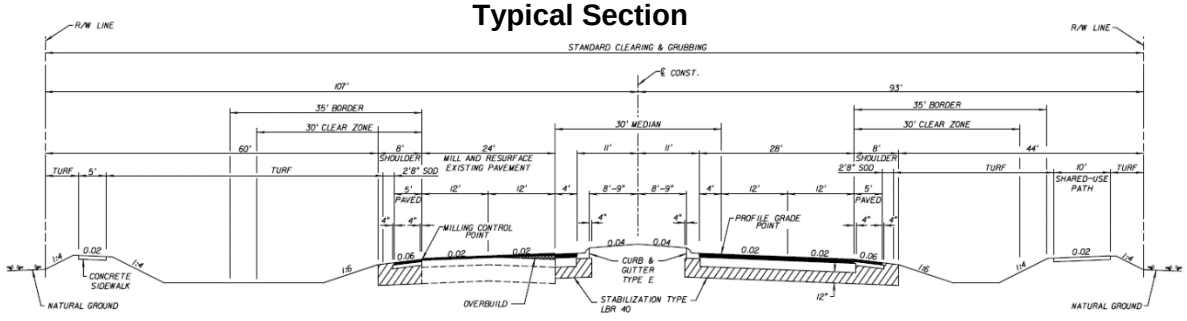
City of Lakeland

- The project is included in the Capital Improvements Plan and Transportation Element of the City of Lakeland's 2020 Comprehensive Plan.
- A 12-foot-wide multi-use pathway along the south side of SR 33 between SR 659 (Combee Road) and University Boulevard is included in the City of Lakeland's Citywide Pathways Plan.

1.4 Typical Section Alternatives

The proposed roadway typical section for this project (**Figure 1-2**) is a suburban typical section that would provide two 12-foot travel lanes in each direction separated by a 30-foot median. The proposed improvements also include a four-foot inside paved shoulder and a five-foot outside paved shoulder in each direction. An open drainage system will collect stormwater runoff and convey it to off-site ponds and/or linear ponds. A 10-foot-wide multi-use path is proposed along the south side of the road between SR 659 (Combee Road) and University Boulevard. A five-foot sidewalk is planned along the north side of the road throughout the project limits and along the south side of the road from University Boulevard to north of Tomkow Road. This typical section can be constructed within the existing 200 feet of right-of-way. The design speed for this typical section is 55 miles per hour (mph).

Figure 1-2
Typical Section



2.0 Methodology

2.1 Evaluation Process

The traffic noise analysis for the SR 33 project was prepared in accordance with Title 23 CFR Part 772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. Methodologies established by FDOT and documented in the PD&E Manual, Part 2, Chapter 17 (May 2011) were also used. The potential feasibility and reasonableness of providing noise barriers as an abatement measure for impacted non-residential land uses (e.g., active sports areas and parks) was determined following procedures in FDOT's publication, A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations.

The predicted noise levels presented in this report are expressed in dB(A). This scale most closely approximates the response characteristics of the human ear to traffic noise. All noise levels are reported as equivalent levels (Leq(h)), which is the hourly equivalent steady-state sound level that contains the same acoustic energy as a time-varying sound level over a period of one hour.

2.2 Noise Model

The prediction of existing and future traffic noise levels with and without the roadway improvements was performed using the FHWA's computer model for highway traffic noise prediction and analysis – TNM Version 2.5. The TNM propagates sound energy, in one-third octave bands, between highways and nearby receptors taking the intervening ground's acoustical characteristics/topography and rows of buildings into account.

2.3 Traffic Data

Noise levels are low when traffic volumes are low (LOS A or B) or when traffic is so congested that movement is slow (LOS D, E, or F). Generally, the maximum hourly noise level occurs between these two conditions; therefore, traffic volumes used in the SR 33 analysis reflect either the design LOS C volumes or the demand volumes (if forecast demand levels meet the LOS A or B criteria), whichever were less. The Existing (2012), Future No-Build (2036), and Future Build Year (2036) traffic data used in the analysis are presented in **Table 2-1**. As noted in Table 2-1, the posted speed limits were used in the analysis. Additional documentation related to the traffic data is provided in **Appendix B** of this NSR.

Table 2-1
Traffic Data for Noise Analysis

Segment	Scenario	Total Peak Hour Peak Directional Volume		Peak Directional Volume by Vehicle Type					Off-Peak Directional Volume by Vehicle Type					Posted Speed (mph)
		LOS C	Demand	Cars	MT	HT	Buses	MC	Cars	MT	HT	Buses	MC	
Old Combee Rd to Lake Luther Rd[1]	Existing	840	***409***	385	7	13	1	3	308	6	11	1	3	45
	No-Build	***840***	1,720	790	15	27	1	7	790	15	27	1	7	45
	Build	1,910	***1,720***	1,620	30	55	1	14	1,305	24	44	1	11	50
Lake Luther Rd to N Combee Rd (SR 659)[1]	Existing	880	***294***	277	5	9	1	2	222	4	8	1	2	55
	No-Build	***880***	1,471	829	15	28	1	7	829	15	28	1	7	55
	Build	1,910	***1,471***	1,385	26	47	1	12	1,115	21	38	1	9	50
N Combee Rd (SR 659) to University Blvd[2]	Existing	880	***496***	457	12	22	1	4	367	10	18	1	3	60
	No-Build	***880***	1,690	810	22	40	1	7	810	22	40	1	7	60
	Build	1,910	***1,690***	1,557	42	76	1	14	1,255	33	61	1	11	50
University Blvd to EB I-4 On/Off-Ramps[2]	Existing	880	***524***	482	13	24	1	4	388	10	19	1	3	60
	No-Build	***880***	1,471	810	22	40	1	7	810	22	40	1	7	60
	Build	1,910	***1,471***	1,356	36	66	1	12	1,092	29	53	1	9	50
EB I-4 On/Off-Ramps to WB I-4 On/Off-Ramps[2]	Existing	880	***588***	542	14	26	1	5	436	12	21	1	4	60
	No-Build	***880***	1,361	810	22	40	1	7	810	22	40	1	7	60
	Build	1,910	***1,361***	1,255	33	61	1	11	1,010	27	49	1	9	50
WB I-4 On/Off-Ramps to Tomkow Rd[2]	Existing	880	***618***	569	15	28	1	5	459	12	22	1	4	60
	No-Build	***880***	1,127	810	22	40	1	7	810	22	40	1	7	60
	Build	1,910	***1,127***	1,038	28	51	1	9	836	22	41	1	7	50

[1] Medium Trucks (MT) = 1.75%, Heavy Truck (HT) = 3.21%, Buses = 0.04%, Motorcycles = 0.8%
[2] Medium Trucks (MT) = 2.46%, Heavy Truck (HT) = 4.5%, Buses = 0.04%, Motorcycles = 0.8%
Note: The total peak hour peak direction traffic data used in the analysis is denoted by bold and italic text.
Source: AIM Engineering, 2013.

3.0 Traffic Noise Analysis

3.1 Noise Sensitive Sites

Noise-sensitive sites, and the receptors (i.e., locations for predicted traffic noise levels) at these sites, are properties and locations where frequent human use occurs. To evaluate traffic noise at these sites/receptors, the FHWA established Noise Abatement Criteria (NAC). As shown in **Table 3-1**, the criteria vary according to the properties' activity category. For comparative purposes, typical noise levels for common indoor and outdoor activities are provided in **Table 3-2**.

The location of the receptor at each noise-sensitive site is illustrated on the project aerials provided in **Appendix A**. The residences were evaluated as Activity Category "B" and the pool (a recreational area) was evaluated as Activity Category "C". For both categories, noise abatement measures were considered if future traffic noise with the proposed improvements was predicted to be 66 dB(A) or more or levels were predicted to increase 15 dB(A) or more with the improvements when compared to existing levels.

3.2 Measured Noise Levels

As previously stated, existing and future noise levels with and without the proposed improvements were modeled using the TNM. To verify the accuracy of the predictions, the computer model was validated using measured noise levels adjacent to the project corridor. Traffic data including motor vehicle volumes, vehicle mix, vehicle speeds, and meteorological conditions were recorded during each measurement period.

The field measurements were conducted in accordance with the FHWA's *Measurement of Highway-Related Noise*. The measurements were obtained using a Larson Davis Model 831, Type II integrating sound level meter (SLM). The SLM was calibrated before and after the measurement periods with a Larson Davis CAL200 calibrator.

The recorded traffic data were used as input for the TNM to determine if, given the topography and actual site conditions of the area, the computer model could "re-create" the measured levels with the existing roadway. Following FDOT guidelines, a noise prediction model is considered within the accepted level of accuracy if the measured and predicted noise levels are within a tolerance standard of three dB(A).

Table 3-3 presents the field measurements and the validation results. As shown, the ability of the model to predict noise levels within the FDOT limits of plus or minus three dB(A) for the project was confirmed. Documentation in support of the validation is provided in **Appendix C** of this NSR.

Table 3-1
FHWA/FDOT Noise Abatement Criteria
[Leq(h) Expressed in dB(A)]

Activity Category	Description of Activity Category	Activity Leq(h)[1]	
		FHWA	FDOT
A	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.	57 (Exterior)	56 (Exterior)
B[2]	Residential	67 (Exterior)	66 (Exterior)
C[2]	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.	67 (Exterior)	66 (Exterior)
D	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.	52 (Interior)	51 (Interior)
E[2]	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.	72 (Exterior)	71 (Exterior)
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.	--	--

Sources: Table 1 of 23 CFR Part 772 and Table 17.1 of Chapter 17 of the FDOT's PD&E Manual (dated 5-24-11).
[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.

Note: Noise abatement considerations are also warranted when a substantial noise increase is predicted to occur (i.e., when the predicted future traffic noise level with an improvement project is equal to or greater than 15 dB(A) when compared to the existing traffic noise level.

Table 3-2
Typical Noise Levels

Common Outdoor Activities	Noise Level dB(A)	Common Indoor Activities
	110	Rock band
Jet flyover at 1,000 feet		
	100	
Gas lawnmower at 3 feet		
	90	
Diesel truck at 50 feet at 50 mph		Food blender at 3 feet
	80	Garbage disposal at 3 feet
Noisy urban area daytime		
Gas lawnmower at 100 feet	**70**	Vacuum cleaner at 10 feet
Commercial area		Normal speech at 3 feet
Heavy traffic at 300 feet	**60**	
		Large business office
Quiet urban daytime	**50**	Dishwasher in next room
Quiet urban nighttime	**40**	Theater, large conference room (background)
Quiet suburban nighttime		
	30	Library
Quiet rural nighttime		Bedroom at night, concert hall (background)
	20	
		Broadcast/recording studio
	10	
	0	

Source: California Dept. of Transportation Technical Noise Supplement, Nov. 2009, Page 2-21.

Table 3-3
Validation Data

Location	Measurement Period	Modeled	Measured	Difference
SR 33 at Sunset Way (Northwest corner)	1	61.3	61.7	-0.4
	2	60.1	59.4	0.7
	3	62.0	60.9	1.1
SR 33 at Spanish Oaks (Southwest corner)	1	56.8	57.0	-0.2
	2	57.4	58.4	-1.0
	3	57.5	55.1	2.4

3.3 Results of the Noise Analysis

Table 3-4 presents the results of the traffic noise analysis for the proposed improvements. As shown, existing (2012) exterior traffic noise levels are predicted to range from 47.6 to 62.6 dB(A). These results indicate that existing traffic noise levels do not approach, meet, or exceed the NAC.

With the exception of one receptor for which the predicted level is 66.0 dB(A), future (2036) noise levels without the proposed improvements (No-Build) also do not approach, meet, or exceed the NAC.

In the future (2036) with the improvements (Build) traffic noise levels are predicted to approach, meet, or exceed the NAC at 37 receptors. Notably, when compared to the existing condition, traffic noise levels are not predicted to increase more than 10 dB(A) above existing conditions at any of the evaluated sites. As such, the project would not substantially increase traffic noise (i.e., increase traffic noise 15 dB(A) or more).

Noise abatement measures were evaluated for the following 37 noise sensitive sites that are predicted to experience future traffic noise levels that would approach, meet, or exceed the NAC with the proposed improvements:

- Sites 2-20 and 26-27 - Residences located within the Grey Moss Subdivision and Lake Deeson Village Mobile Home Park;
- Site 31 - The swimming pool at the Landings Apartments;
- Sites 32b, 33b, 34b, and 35b - Residences at the Landings Apartments; and
- Sites 47-57 - Residences located within the Cambry and Snow Wood subdivisions.

The results of the abatement evaluation are provided in the following section of this NSR.

Table 3-4
Predicted Traffic Noise Levels

Receptor Id	Description	Activity Category	FDOT NAC	Existing (2012)	No-Build (2036)	Build (2036)	Increase over Existing	Approaches, Meets or Exceeds the NAC ?
Residences at the Grey Moss Subdivision - West of Wood Circle W. to East of Wood Circle E. - (Southbound SR 33 between Stations 1270 and 1277)								
1	Residential	B	66	55.1	58.7	64.8	10	--
2	Residential	B	66	58.2	61.8	68.4	10	Yes
3	Residential	B	66	59.5	63.1	68.6	9	Yes
4	Residential	B	66	59.6	63.2	68.5	9	Yes
Residences at Lake Deeson Village MH Park - (Southbound SR 33 between Stations 1277 and 1285)								
5	Residential	B	66	61.6	65.1	70.2	9	Yes
6	Residential	B	66	61.3	64.8	69.9	9	Yes
7	Residential	B	66	61.8	65.3	69.8	8	Yes
8	Residential	B	66	60.1	63.6	68.4	8	Yes
9	Residential	B	66	58.4	62.0	66.6	8	Yes
10	Residential	B	66	59.4	63.0	67.5	8	Yes
11	Residential	B	66	60.3	63.9	68.1	8	Yes
12	Residential	B	66	59.6	63.2	67.2	8	Yes
13	Residential	B	66	59.6	63.2	67.3	8	Yes
14	Residential	B	66	61.0	64.6	68.2	7	Yes
15	Residential	B	66	61.9	65.6	68.8	7	Yes
16	Residential	B	66	61.8	65.5	68.6	7	Yes
17	Residential	B	66	61.7	65.3	68.5	7	Yes
18	Residential	B	66	61.6	65.2	68.3	7	Yes
19	Residential	B	66	60.6	64.2	67.6	7	Yes
20	Residential	B	66	62.4	66.0	69.2	7	Yes
21	Residential	B	66	57.2	60.9	64.2	7	--
22	Residential	B	66	53.6	57.4	60.1	7	--
23	Residential	B	66	55.6	59.4	62.0	6	--
24	Residential	B	66	55.2	58.8	63.6	8	--
25	Residential	B	66	56.9	60.5	65.6	9	--
Residences between Sunset Way to Lake Luther Road - (Southbound SR 33 between Stations 1285 and 1293)								
26	Residential	B	66	62.1	65.9	68.1	6	Yes
27	Residential	B	66	60.6	65.0	66.3	6	Yes
Residences East of I-4 - (Northbound SR 33 between Stations 1489 and 1495)								
28	Residential	B	66	62.6	64.7	64.0	1	--
29	Residential	B	66	59.2	61.3	60.5	1	--
30	Residential	B	66	62.2	64.4	62.9	1	--
Residences and Pool Area at The Landings Apartments - (Northbound SR 33 between Stations 1308 and 1317)								
31	MF - Pool	C	66	56.5	61.7	66.0	10	Yes
32	Residential	B	66	55.5	60.6	65.8	10	--
32b	Residential - 2nd story	B	66	60.1	65.1	68.1	8	Yes
33	Residential	B	66	56.0	61.2	65.8	10	--
33b	Residential - 2nd story	B	66	60.1	65.1	68.1	8	Yes
34	Residential	B	66	55.9	61.1	65.7	10	--

Receptor Id	Description	Activity Category	FDOT NAC	Existing (2012)	No-Build (2036)	Build (2036)	Increase over Existing	Approaches, Meets or Exceeds the NAC ?
34b	Residential - 2nd story	B	66	60.0	65.1	68.0	8	Yes
35	Residential	B	66	55.4	60.5	65.7	10	--
35b	Residential - 2nd story	B	66	59.9	65.0	68.0	8	Yes
36	Residential	B	66	47.6	52.8	56.5	9	--
Residences at the Spanish Oaks Subdivision - (Northbound SR 33 between Stations 1292 and 1304)								
37	Residential	B	66	54.7	59.8	64.0	9	--
38	Residential	B	66	54.8	60.0	64.2	9	--
39	Residential	B	66	54.8	59.9	64.0	9	--
40	Residential	B	66	55.0	60.2	64.3	9	--
41	Residential	B	66	55.2	60.4	64.3	9	--
42	Residential	B	66	55.1	60.2	64.0	9	--
43	Residential	B	66	53.3	58.4	61.2	8	--
44	Residential	B	66	56.1	61.1	65.1	9	--
45	Residential	B	66	56.9	61.6	65.9	9	--
Residences at the Cambry Subdivision - (Northbound SR 33 between Stations 1285 and 1292)								
46	Residential	B	66	55.3	58.9	64.0	8	--
47	Residential	B	66	58.7	62.1	67.7	9	Yes
48	Residential	B	66	59.9	63.3	68.9	9	Yes
49	Residential	B	66	58.4	61.7	67.3	9	Yes
50	Residential	B	66	60.5	63.8	69.7	9	Yes
51	Residential	B	66	58.3	61.6	67.3	9	Yes
52	Residential	B	66	58.2	61.6	67.4	9	Yes
53	Residential	B	66	60.8	64.0	70.1	9	Yes
Residences at the Snow Wood Subdivision - (Northbound SR 33 between Stations 1277 and 1285)								
54	Residential	B	66	59.1	62.9	68.6	9	Yes
55	Residential	B	66	60.1	63.8	69.7	10	Yes
56	Residential	B	66	56.7	60.3	66.0	9	Yes
57	Residential	B	66	58.1	61.8	67.7	10	Yes
58	Residential	B	66	56.1	59.8	64.8	9	--
59	Residential	B	66	52.1	55.8	60.7	9	--

Notes: Receptor locations are illustrated on the project aerials in Appendix A of this report.
Each residential receptor represents one residence.

4.0 Evaluation of Abatement Alternatives

The traffic noise impact abatement measures considered for SR 33 were traffic management, alternative roadway alignment and noise barriers. The following discusses the feasibility (e.g., amount of noise reduction, engineering considerations, etc.) and cost reasonableness of these measures.

4.1 Traffic Management

Traffic management measures that limit motor vehicle speeds, reduce traffic volumes or prohibit truck traffic can be effective noise mitigation measures. However, these measures also negate a project's ability to accommodate forecast traffic volumes. For example, if the posted speed were reduced, the capacity of the roadway to handle the forecast motor vehicle demand would also be reduced. Therefore, reducing traffic speeds and/or the traffic volumes or fleet is inconsistent with the goal of improving the ability of the roadway to handle the forecast volumes. As such, traffic management measures were not considered a reasonable noise mitigation measure for the SR 33 project.

4.2 Alternative Roadway Alignment

The proposed improvements will follow the same alignment as the existing roadway and would not require any additional right-of-way (ROW) within the project corridor. Because noise sensitive sites are located on both sides of the roadway, shifting the alignment one way or the other would also shift the noise closer to some of the sites.

4.3 Noise Barriers

Noise barriers have the potential to reduce traffic noise levels by blocking the sound path between the motor vehicles on the roadway (the source) and the noise-sensitive sites adjacent to the roadway. However, in order to effectively reduce traffic noise, a noise barrier must be relatively long, continuous (without intermittent openings), and sufficiently tall. FDOT procedures require that a noise barrier provide at least the following noise reduction requirements at a cost below the reasonable limit:

- *Minimum Noise Reduction Requirements* - A barrier must provide at least a five dB(A) reduction in traffic noise for at least one impacted noise-sensitive receptor and also provide at least a seven dB(A) reduction (i.e., the FDOT's noise reduction design goal) for at least one additional impacted receptor.

- *Cost Effective Limit* – At a cost of $30 per square foot, a barrier should not cost more than $42,000 per benefited noise-sensitive receptor (a benefited receptor is a receptor that receives at least a five dB(A) reduction in noise from a mitigation measure). For

special land uses, such as the pool area at the Landings Apartments, the cost of a barrier should not be more than $995,935 per person-hour per square foot (dollars/person-hr/ft2).

After considering the amount of reduction that may be provided and the cost effectiveness of a noise barrier, additional factors are also considered. These factors address both the feasibility and reasonableness of a barrier as an abatement measure and include factors that relate to design and construction (i.e., given site-specific details, can a barrier actually be constructed), safety, access to and from adjacent properties, ROW requirements, maintenance, and impacts on utilities and drainage. The viewpoint of the impacted property owners, and renters if applicable, who may, or may not, desire a noise barrier is also a factor that is considered when evaluating noise barriers as an abatement measure.

The TNM was used to evaluate the ability of a noise barrier(s) to reduce traffic noise levels for the impacted noise sensitive sites adjacent to SR 33. The barriers were evaluated at heights from eight to 22 feet (in two-foot increments) and due to the project's limited amount of ROW and with the exception of a small area near the Lake Deeson Mobile Home Park, located on the ROW line.

The following provides the results of the noise barrier evaluation and discusses the potential amount of noise reduction and the cost effectiveness of providing barriers as an abatement measure for the impacted residences.

Barrier 1: Residences located within the Grey Moss Subdivision and Lake Deeson Village Mobile Home Park (Sites 2-20, 26-27)

Barrier 1 was considered for the 21 residences located in the area west of Wood Circle West to Lake Luther Road including the residences within the Lake Deeson Village Mobile Home Park. The predicted traffic noise levels at these properties with the improvements ranges from 66.3 to 70.2 dB(A). Several factors were considered in the evaluation of a noise barrier for these properties including:

- The cross streets that intersect SR 33 would not allow a continuous length of barrier,
- Some properties have direct access to/from SR 33 and the need for this access would not allow a continuous length of barrier (i.e., a barrier could not be constructed such that it was continuous from cross street to cross street), and
- The ROW is very limited with only one to two feet between the ROW and the proposed sidewalk.

Due to the limited ROW, a barrier was evaluated on the FDOT ROW line. The barrier was also evaluated in four segments to accommodate access to/from the properties and cross-streets. The length of the barrier was optimized using the TNM in an attempt to determine if at least the minimum noise reduction requirements (i.e., a minimum reduction of 5 dB(A) for at least one impacted property and a minimum reduction of 7 dB(A) for at least one additional impacted property) could be achieved.

The results of the evaluation are provided in **Table 4-1**. As shown, regardless of the height of the barrier, at least 15 of the impacted residences would benefit from a reduction in traffic noise of at least 5 dB(A), the noise reduction design goal of 7 dB(A) would be achieved at one or more of the benefitted receptors, and the cost per benefited residence would be below the FDOT's cost reasonable limit. Because Barrier 1 is predicted to provide the minimum required noise reduction at a cost below the cost reasonable limit, the barrier was evaluated further. The results of the evaluation are provided in **Table 4-2**.

Table 4-1
Barrier 1 – Residences Within the Grey Moss Subdivision and Lake Deeson Village Mobile Home Park

Barrier Height/ Length (ft)	Number of Impacted Receptors and Insertion Loss (dB(A))			Number of Benefited Receptors			Total Estimated Cost	Cost Per Benefited Receptor	Cost Reasonable Yes/No
	5	6	7 or >	Impacted	Other*	Total			
8 / 1,149	6	2	7	15	1	16	$275,760	$17,235	Yes
10 / 1,339	8	2	10	20	2	22	$401,700	$18,259	Yes
12 / 1,241	6	2	13	21	3	24	$446,760	$18,615	Yes
14 / 1,225	5	2	14	21	3	24	$514,500	$21,438	Yes
16 / 1,205	6	1	14	21	3	24	$578,400	$24,100	Yes
18 / 1,205	6	1	14	21	3	24	$650,700	$27,113	Yes
20 / 1,195	6	1	14	21	3	24	$717,000	$29,875	Yes
22 / 1,195	6	1	16	21	3	24	$788,700	$32,863	Yes

* Other = Receptors determined to be unaffected by the project (traffic noise levels less than 66 dB(A)) but benefited by the noise barrier.

Barrier 2: The Landings Apartments Swimming Pool (Site 31)

Barrier 2 was evaluated for the community swimming pool (Site 31) at the Landings Apartments. The predicted traffic noise level at this location with the proposed improvements is 66.0 dB(A). As previously stated, the FDOT's "special land use" analysis methodologies were used to determine if a noise barrier could be considered a potential abatement measure for this property.

Due to the limited ROW, a barrier was evaluated on the FDOT ROW line at heights between eight and 22 feet in two-foot increments. Due to the distance of the pool from the roadway, the noise reduction design goal of 7 dB(A) could not be achieved at any of the evaluated barrier heights. Therefore, the barrier is not considered a reasonable noise abatement measure.

Table 4-2
Additional Considerations – Barrier 1

Evaluation Criteria	Comment
1. Amount of noise reduction	Traffic noise from SR 33 would reduce a minimum of 5 dB(A) at all 21 affected receptors at barrier heights from 12 to 22 feet.
2. Safety	It is not anticipated that there will be any safety issues at this location. This item will be reviewed in greater detail during the design phase of the project.
3. Community desires	The desires of the property owners and renters (if applicable) will be solicited during the design phase of the project.
4. Accessibility	Accessibility constraints to residences are anticipated at this location and should be evaluated further during the design phase of this project.
5. Land use stability	The use of this property is not expected to change in the near future.
6. Local controls	Polk County's Land Development Code (*Section 720 Landscaping and Buffering*) identifies noise as a factor to consider when reviewing proposed general development plans. Additional information on these policies is provided in Appendix D.
7. Views of local officials with jurisdiction	The views of local officials will be solicited during the design phase as part of the ongoing public involvement process.
8. Constructability	It is anticipated that the barrier could be constructed using routine construction methods. This will be reviewed in greater detail during the design phase of the project.
9. Maintainability	There may be constraints for maintenance purposes due to limited ROW. This item will be reviewed in greater detail during the design phase of the project.
10. Aesthetics	The aesthetics of the noise barrier will be determined by the District in consultation with the property owners/renters during the design phase of the project.
11. ROW needs including access rights, easements for construction and/or maintenance, and additional land	Due to a limited ROW width, the noise barrier would need to be located on or very close to the ROW line.
12. Cost	The cost per benefited site does not exceed the reasonable limit at any of the evaluated heights.
13. Utilities	The noise barrier may conflict with above-ground power poles. Potential conflicts will be reviewed in greater detail during the design phase of the project.
14. Drainage	It is not anticipated that the barrier would impede/restrict drainage in the area. This should be reviewed in greater detail during the design phase of the project.
15. Special land use considerations	None.
16. Other environmental considerations	None.

Barrier 3: Residences at the Landings Apartments (Sites 32b, 33b, 34b, and 35b)

Barrier 3 was considered for the four residences (second floor residences) located in the Landings Apartments that are predicted to be impacted with the proposed SR 33 improvements. The predicted traffic noise levels at these properties ranges from 66.0 to 68.1 dB(A).

Due to the limited ROW, a barrier was evaluated on the FDOT ROW line. The length of the barrier was optimized using the TNM to meet at least the minimum noise reduction requirements. Because the residences are located on the second floor and the outdoor use is located some distance from the roadway, the noise reduction design goal of 7 dB(A) could not be achieved at any of the evaluated barrier heights. Therefore, the barrier is not considered a reasonable noise abatement measure.

Barrier 4: Residences located within the Cambry and Snow Wood Subdivisions (Sites 47-57)

Barrier 4 was evaluated for the 11 residences located within the Cambry and Snow Wood subdivisions. The predicted traffic noise levels with the proposed improvements at these properties ranges from 66.0 to 70.1 dB(A).

Due to the limited ROW, a barrier was evaluated on the FDOT ROW line. The length of the barrier was optimized using the TNM in an attempt to meet the minimum noise reduction requirements (i.e., a minimum reduction of 5 dB(A) for at least one impacted property and a minimum reduction of 7 dB(A) for at least one additional impacted property).

The results of the evaluation are provided in **Table 4-3**. As shown, at barrier heights of 8 to 14 feet, at least 9 of the impacted residences would benefit from a reduction in traffic noise of 5 dB(A) or more. At these same heights, the noise reduction design goal of 7 dB(A) would be achieved at four or more of the properties and the cost of the barrier would be below the FDOT's cost reasonable limit. Because Barrier 4 is predicted to provide the minimum noise reduction requirements at a cost below the cost effective limit, the barrier was evaluated further. The results of the evaluation are provided in **Table 4-4**.

Table 4-3
Barrier 4 - Residences Within the Cambry and Snow Wood Subdivisions

Barrier Height/ Length (ft)	Number of Impacted Receptors and Insertion Loss (dB(A))			Number of Benefited Receptors			Total Estimated Cost	Cost Per Benefited Receptor	Cost Reasonable Yes/No
	5	6	7 or >	Impacted	Other*	Total			
8 / 1,081	5	0	4	9	0	9	$259,440	$28,827	Yes
10 / 1,151	2	0	8	10	0	10	$345,300	$34,530	Yes
12 / 1,345	1	0	10	11	2	13	$484,200	$37,246	Yes
14 / 1,285	1	0	10	11	2	13	$539,700	$41,515	Yes
16 / 1,195	1	0	10	11	2	13	$573,600	$44,123	No
18 / 1,195	2	0	9	11	1	12	$645,300	$49,638	No
20 / 1,185	2	0	9	11	1	12	$711,000	$54,692	No
22 / 1,185	2	0	9	11	1	12	$782,100	$60,162	No

* Other = Receptors determined to be unaffected by the project (traffic noise levels less than 66 dB(A)) but benefited by the noise barrier.

Table 4-4
Additional Considerations - Barrier 4

Evaluation Criteria	Comment
1. Amount of noise reduction	Traffic noise from SR 33 would be reduced a minimum of 5 dB(A) at up to 11 of the impacted receptors at barrier heights ranging from of 8 to 14 feet.
2. Safety	It is not anticipated that there will be any safety issues at this location. This item will be reviewed in greater detail during the design phase of the project.
3. Community desires	The desires of the property owners and renters (if applicable) will be solicited during the design phase of the project.
4. Accessibility	It is not anticipated that there will be any accessibility constraints at this location.
5. Land use stability	The use of this property is not expected to change in the near future.
6. Local controls	Polk County's Land Development Code (*Section 720 Landscaping and Buffering*) identifies noise as a factor to consider when reviewing proposed general development plans. Additional information on these policies is provided in Appendix D.
7. Views of local officials with jurisdiction	The views of local officials will be solicited during the design phase as part of the ongoing public involvement process.
8. Constructability	It is anticipated that the barrier could be constructed using routine construction methods. This will be reviewed in greater detail during the design phase of the project.
9. Maintainability	There may be constraints for maintenance purposes due to limited ROW. This item will be reviewed in greater detail during the design phase of the project.
10. Aesthetics	The aesthetics of the noise barrier will be determined by the District in consultation with the property owners/renters during the design phase of the project.
11. ROW needs including access rights, easements for construction and/or maintenance, and additional land	Due to a limited ROW width, the noise barrier would need to be located on or as close to the right-of-way line as possible.
12. Cost	The cost of a barrier would be cost reasonable at heights of 8 to 14 feet.
13. Utilities	The noise barrier may conflict with above-ground power poles. Potential conflicts will be reviewed during the design phase of the project.
14. Drainage	It is not anticipated that the barrier would impede/restrict drainage in the area. This should be reviewed in greater detail during the design phase of the project.
15. Special land use considerations	None.
16. Other environmental considerations	None.

5.0 Conclusions

As previously stated, future traffic noise levels with the proposed improvements are predicted to approach, meet, or exceed the NAC at 37 noise sensitive sites. These sites are predicted to experience future traffic noise levels with the proposed improvements to SR 33 that would range from 66.0 to 70.2 dB(A).

The results of the evaluation indicate that construction of noise barriers is a potentially reasonable and feasible noise abatement method to reduce the predicted traffic noise levels for up to 32 of the 37 impacted sites at the following locations:

- Barrier 1: Residences located within the Grey Moss Subdivision and Lake Deeson Village Mobile Home Park from West of Wood Circle W. to Lake Luther Road (Sites 2-20, 26-27)
- Barrier 4: Residences located within the Cambry and Snow Wood Subdivisions (Sites 47-57)

5.1 Statement of Likelihood

The FDOT is committed to the construction noise barriers at the locations above, contingent upon the following:

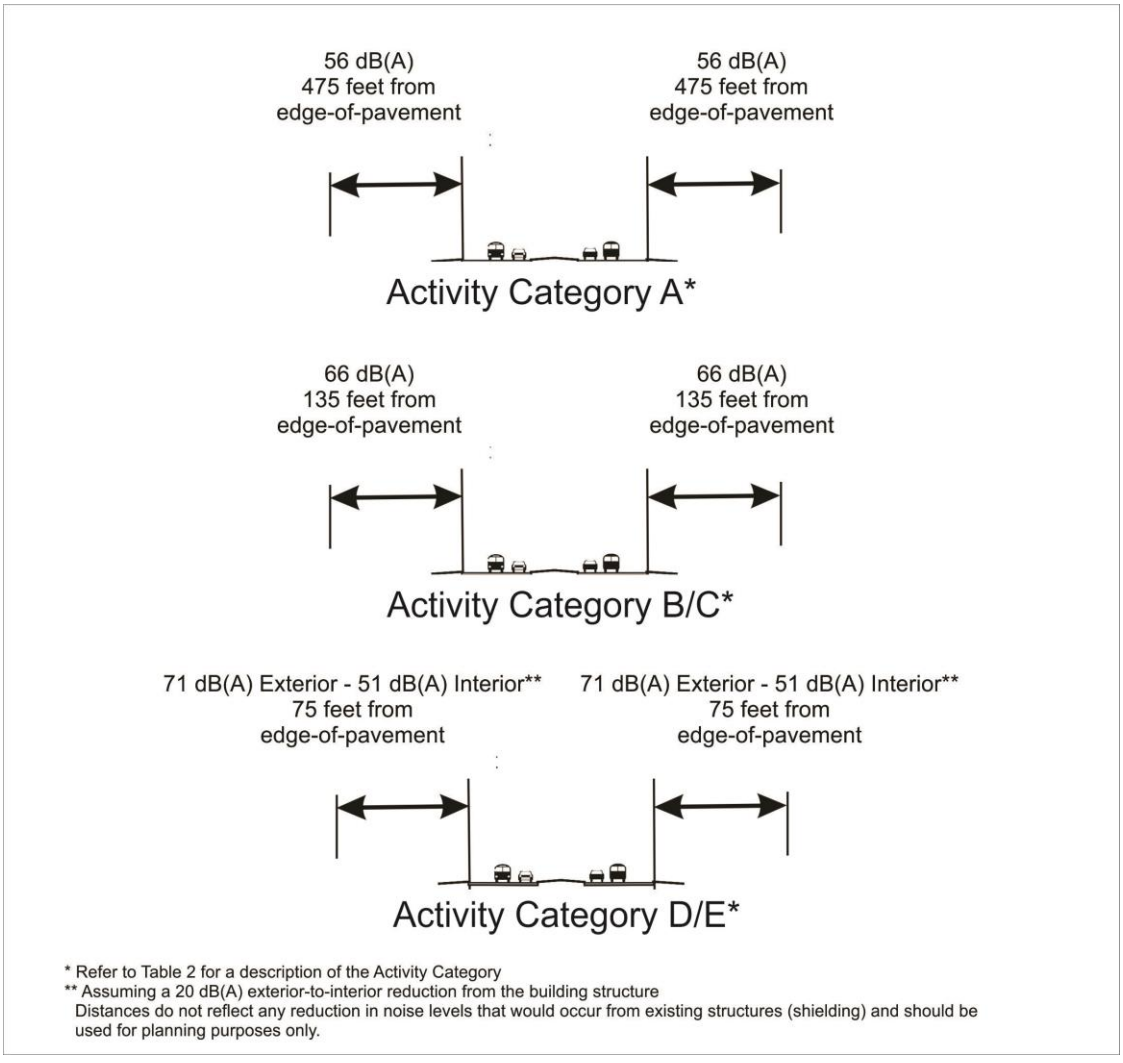
- Detailed noise analysis during the final design process supports the need for, and the feasibility and reasonableness of providing the barriers as abatement;
- The detailed analysis demonstrates that the cost of the noise barrier will not exceed the cost effective limit;
- The residents/property owners benefitted by the noise barrier desire that a noise barrier be constructed; and
- All safety and engineering conflicts or issues related to construction of a noise barrier are resolved.

6.0 Noise Contours

Land uses such as residences and recreational areas are considered incompatible with highway noise levels that approach or exceed the NAC. To reduce the possibility of additional traffic noise-related impacts, noise level contours were developed for the future improved roadway facility. These noise contours, shown in Figure 5-1, delineate the extent of the predicted traffic noise impact area from the improved roadway's edge-of-travel lane for each of the land use Activity Categories (Table 3-1).

Local officials will be provided a copy of the Final NSR to promote compatibility between any future land developments in this area.

Figure 5-1
Noise Contours



7.0 Construction Noise and Vibration

Land uses adjacent SR 33 are identified on the FDOT listing of noise- and vibration-sensitive sites (e.g., residential use). Construction of the proposed roadway improvements is not expected to have any significant noise or vibration impact. If sensitive land uses develop adjacent to the roadway prior to construction, increased potential for noise or vibration impacts could result. It is anticipated that the application of the ***FDOT Standard Specifications for Road and Bridge Construction*** will minimize or eliminate potential construction noise and vibration impacts. However, should unanticipated noise or vibration issues arise during the construction process, the Project Engineer, in coordination with the District Noise Specialist and the Contractor, will investigate additional methods of controlling these impacts."

8.0 References

Polk County, FL. Land Development Code. Chapter 7 – Site Development Standards. http://www.polk-county.net/subpage.aspx?menu_id=226&id=492

Federal Highway Administration. U.S. Department of Transportation. July 13, 2010. Title 23 CFR, Part 772. Procedures for Abatement of Highway Traffic Noise and Construction Noise.

Federal Highway Administration. February 2004. Traffic Noise Model, Version 2.5.

Federal Highway Administration. December 2011. Highway Traffic Noise: Analysis and Abatement Guidance.

Federal Highway Administration. May 1996. Measurement of Highway-Related Noise. FHWA-PD-96-046.

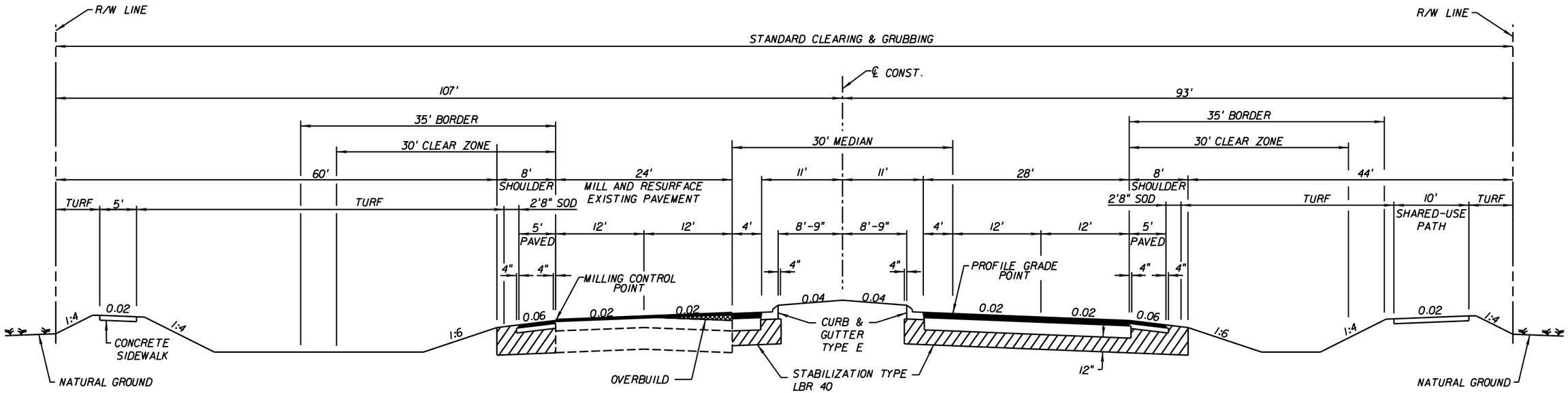
Florida Department of Transportation. May 24, 2011. Project Development and Environment Manual, Part 2, Chapter 17 – Noise.

Florida Department of Transportation. January 1, 2012. Plans Preparation Manual, Volume 1, Chapter 32 – Sound Barriers.

Florida Department of Transportation. July 22, 2009. A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations.

APPENDIX A – PROJECT AERIALS

Note: See Plan Sheets 2-5 and 17 for the location of noise sensitive sites.



TYPICAL #2
HIGH SPEED SUBURBAN
55 MPH

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SUBURBAN SAVE PAVEMENT
55 MPH DESIGN SPEED

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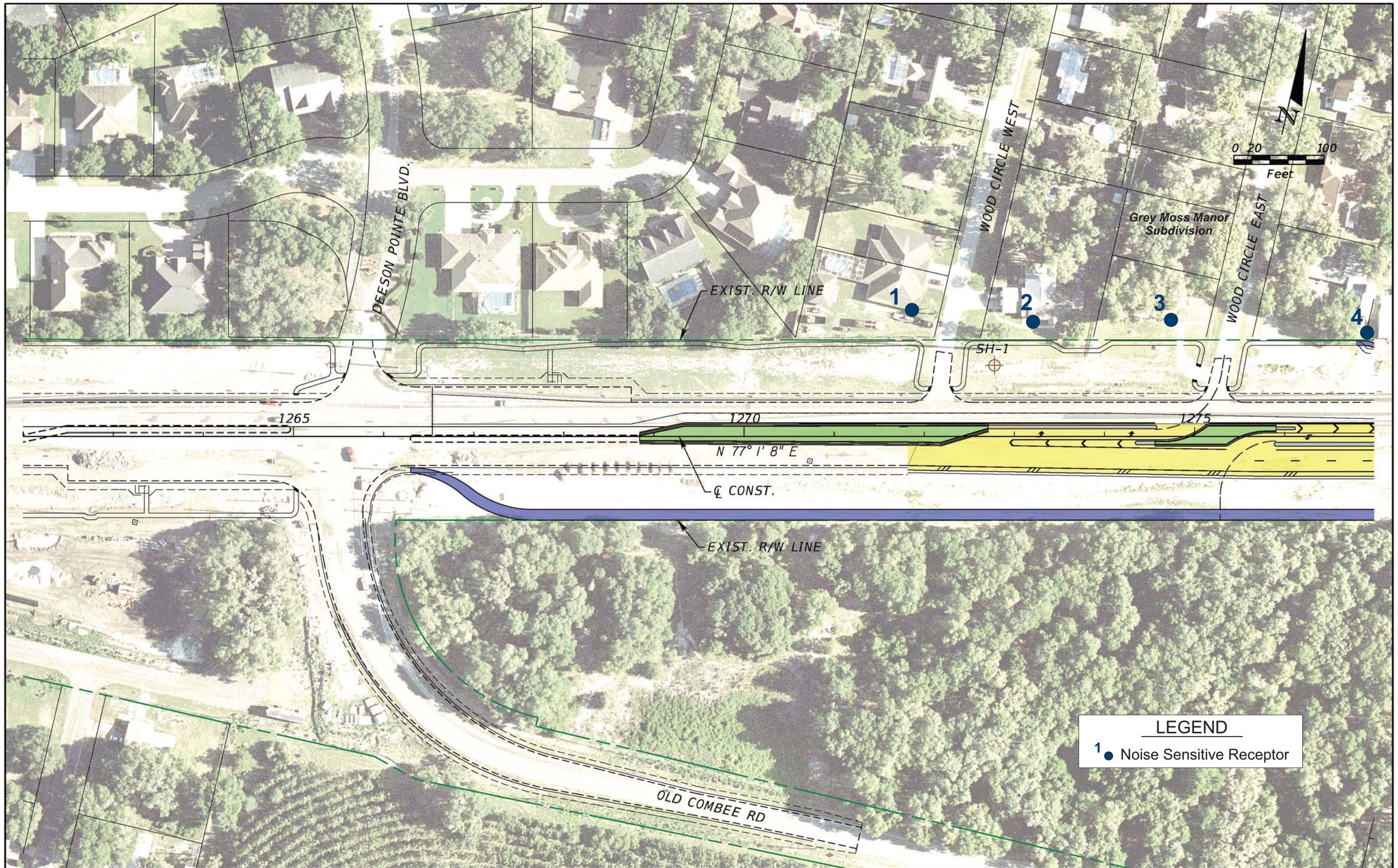

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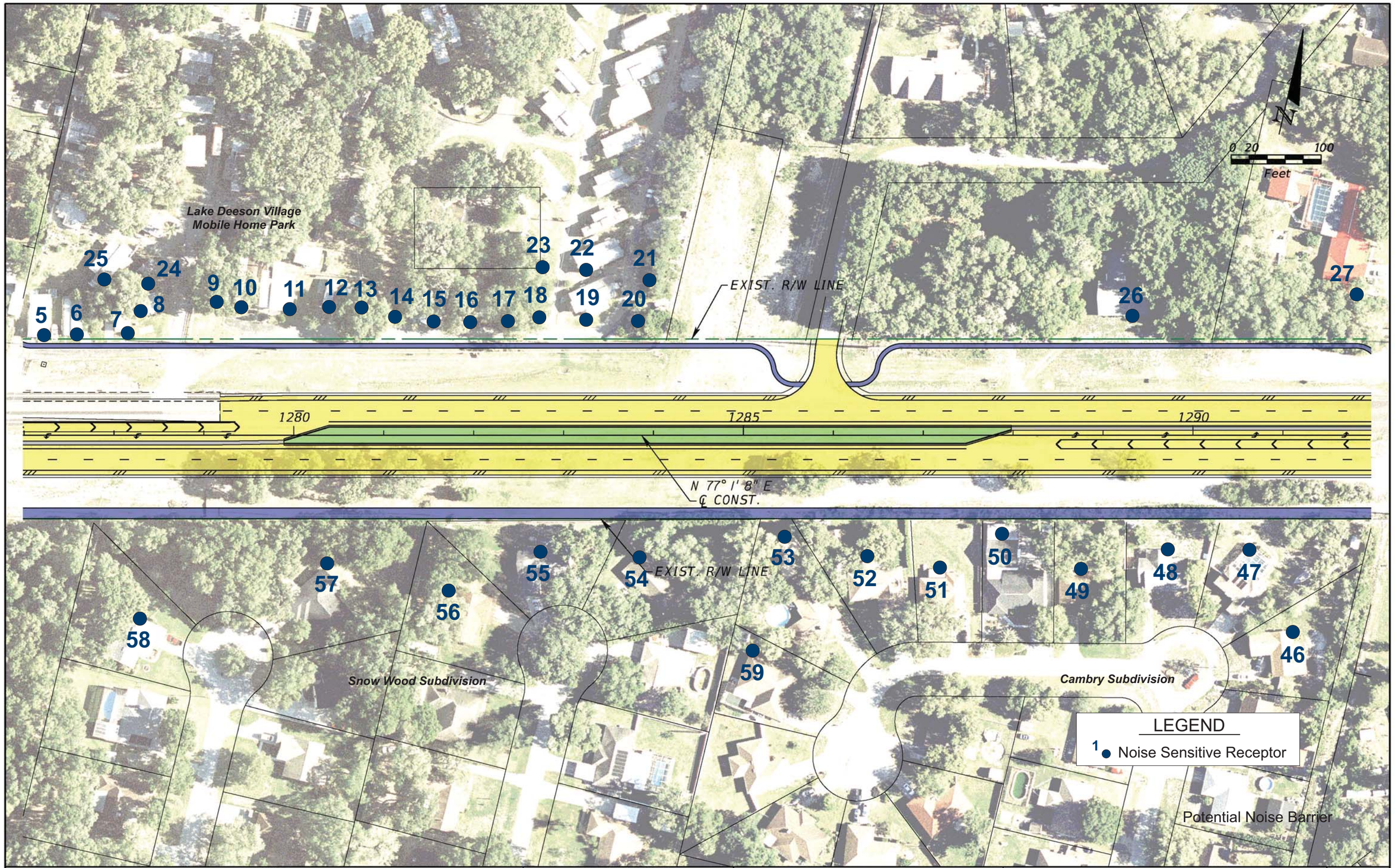

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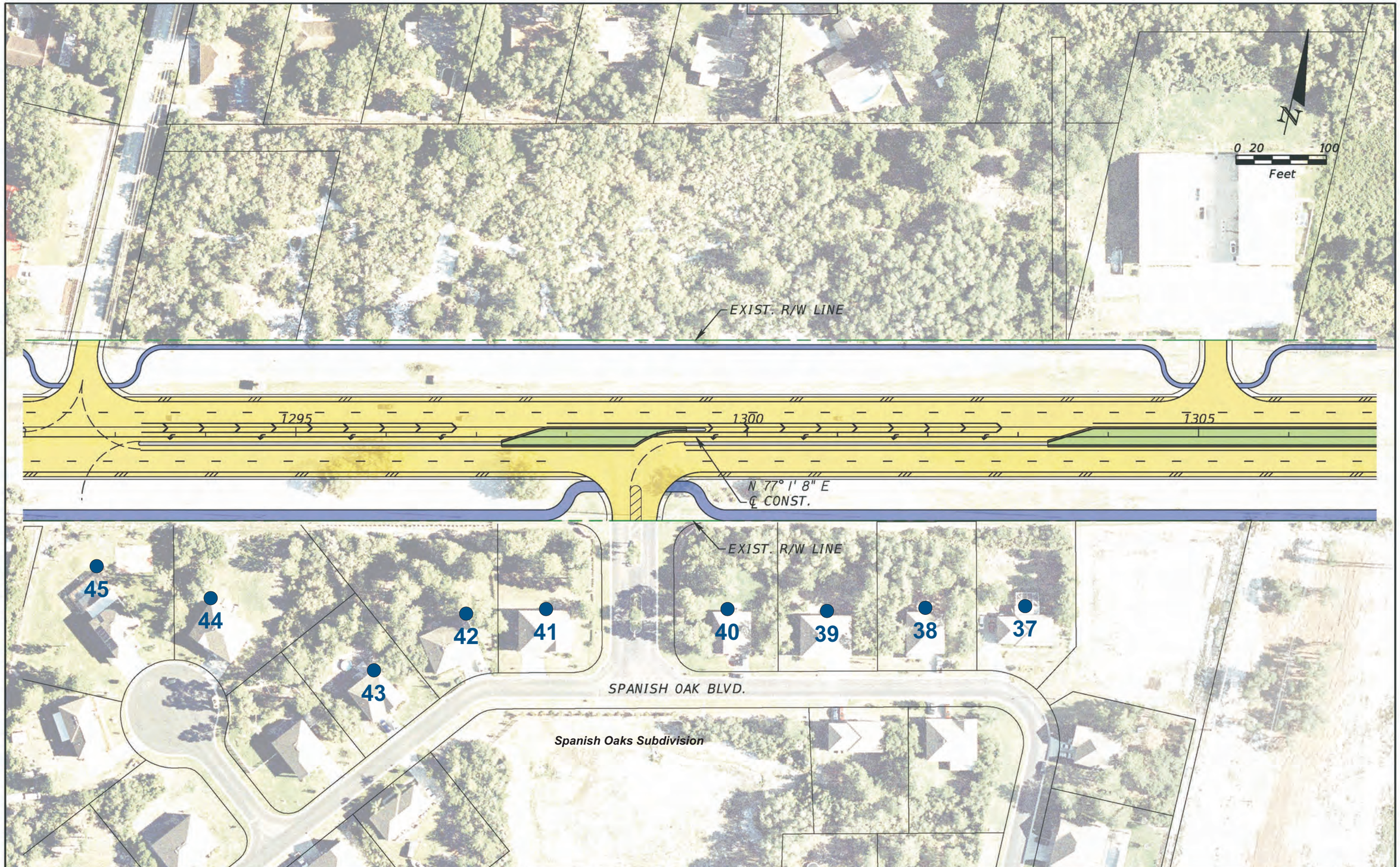

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N

0 20 100
Feet

EXIST. R/W LINE

1310

1315

1320

N 77° 1' 8" E

℄ CONST.

EXIST. R/W LINE

35 34 33 32

35b 34b 33b 32b

36

31

The Landings Apartments

LONG LAKE CIR.

LEGEND

1 ● Noise Sensitive Receptor

Potential Noise Barrier

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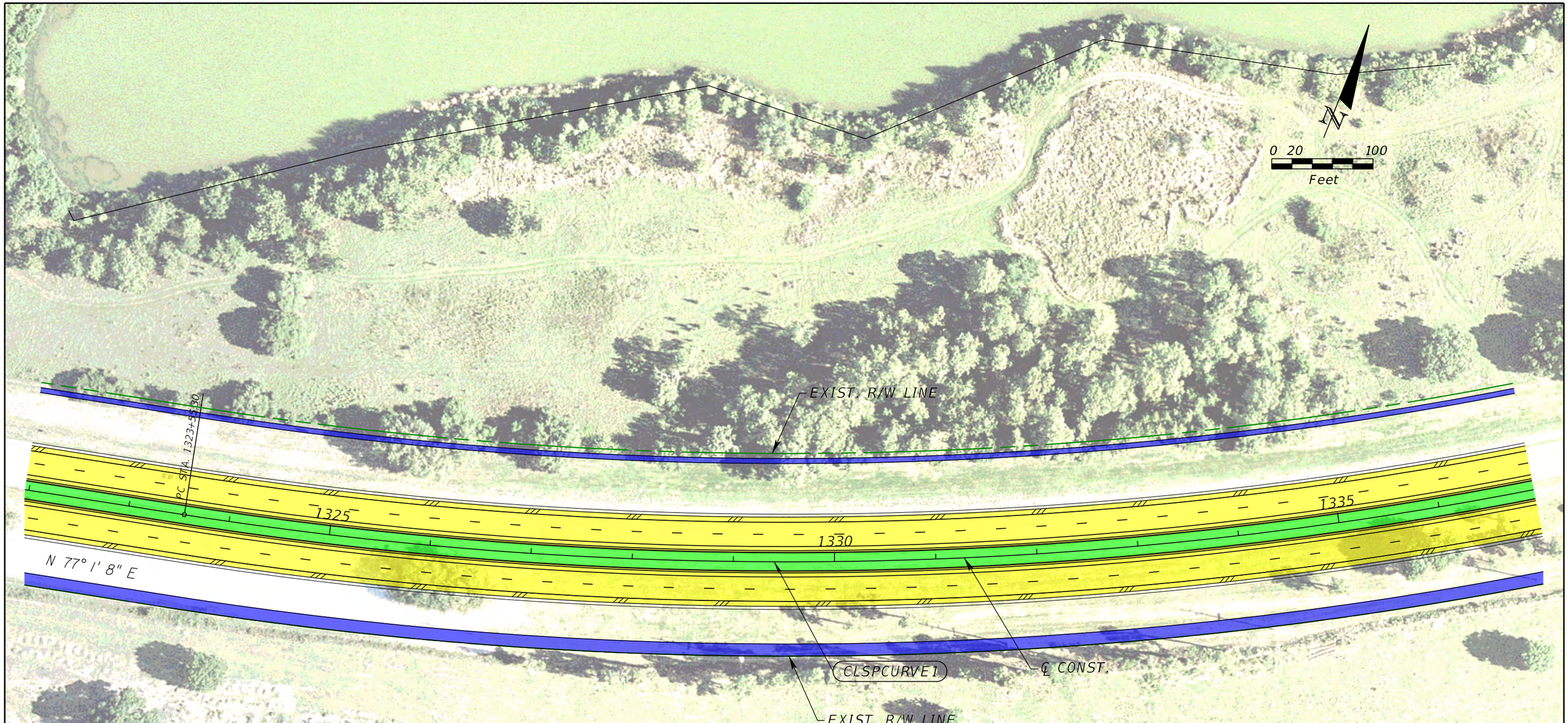

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PC STA. = 1323+55.30
PT STA. = 1361+47.96
e = 0.037

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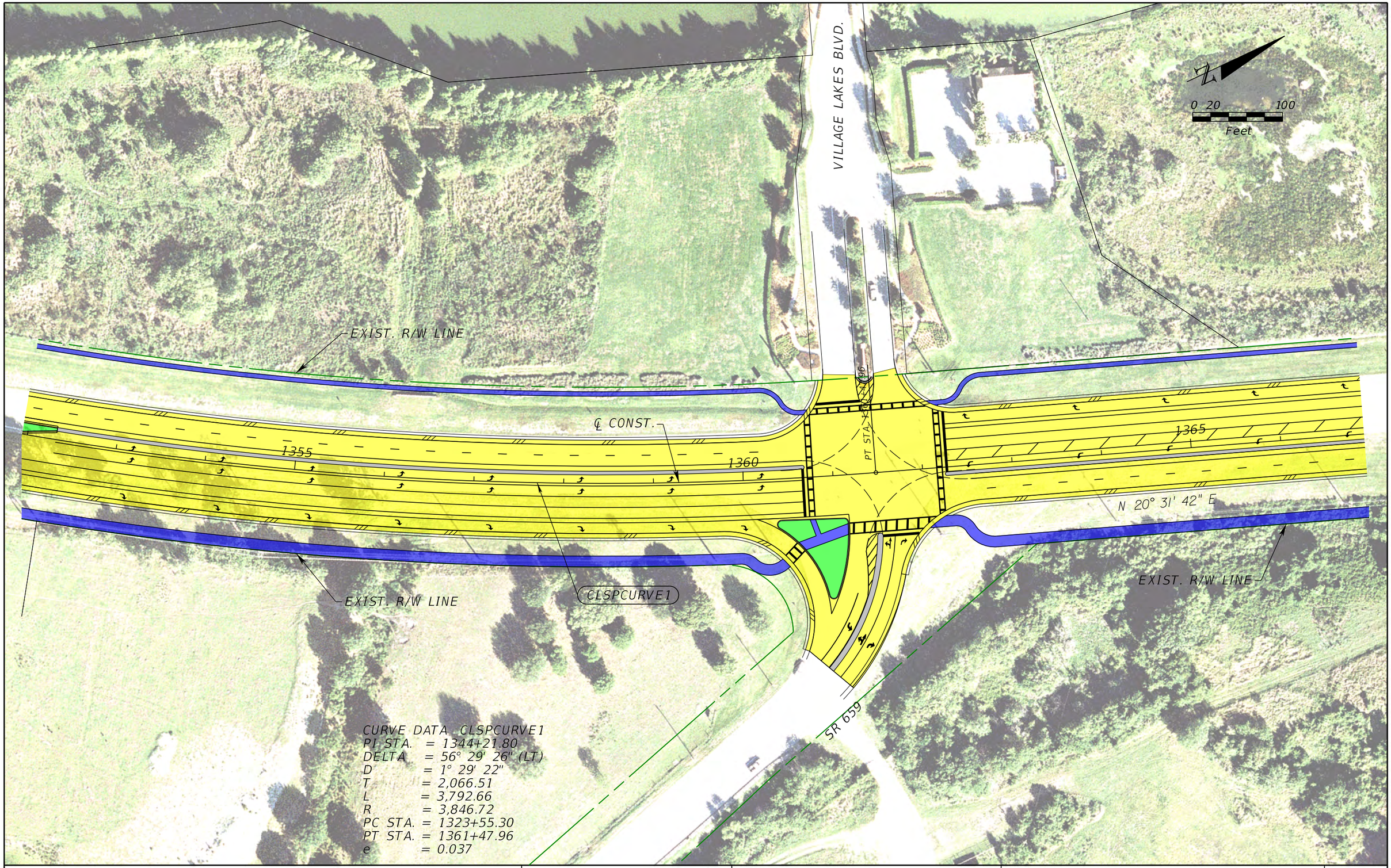

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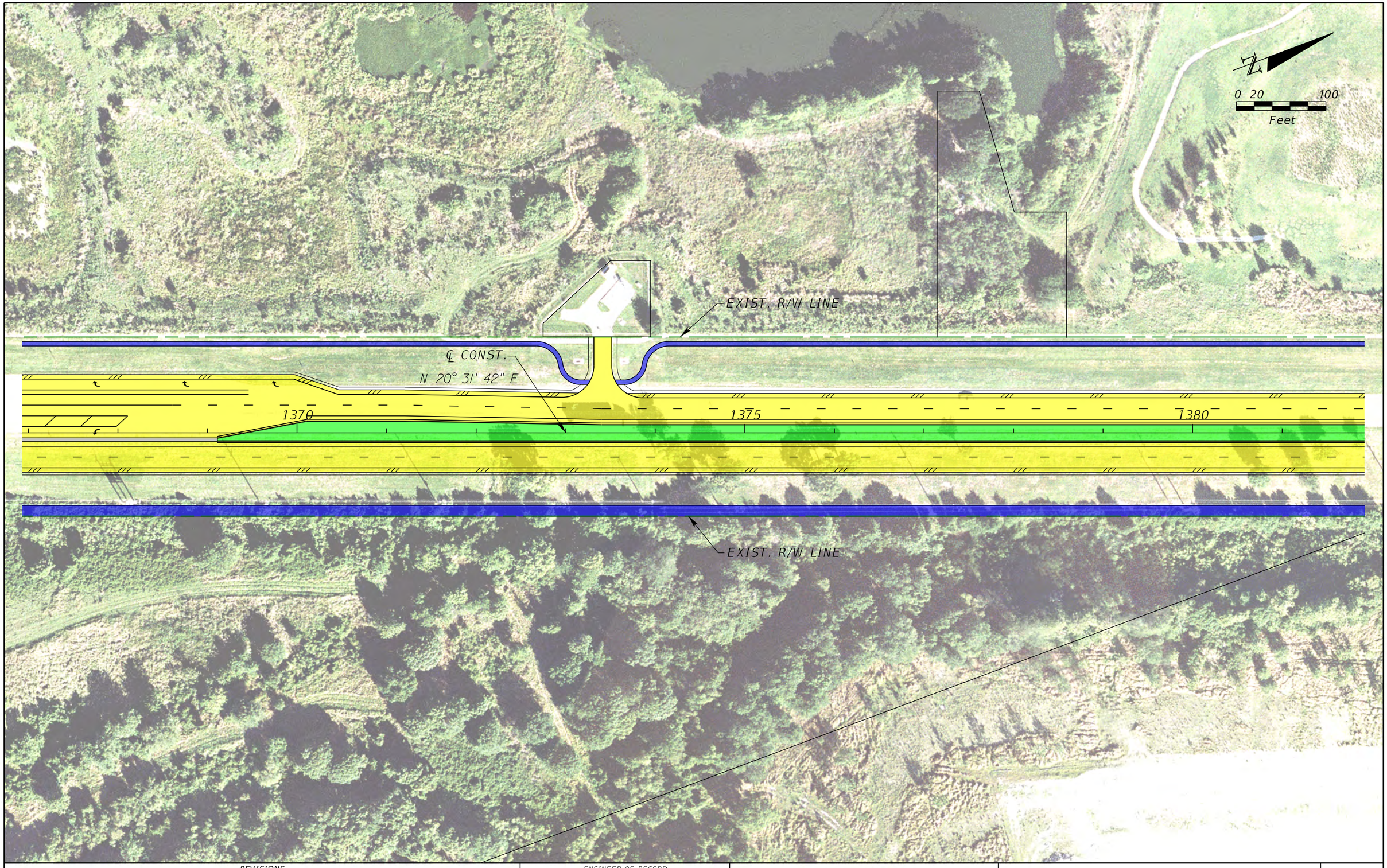

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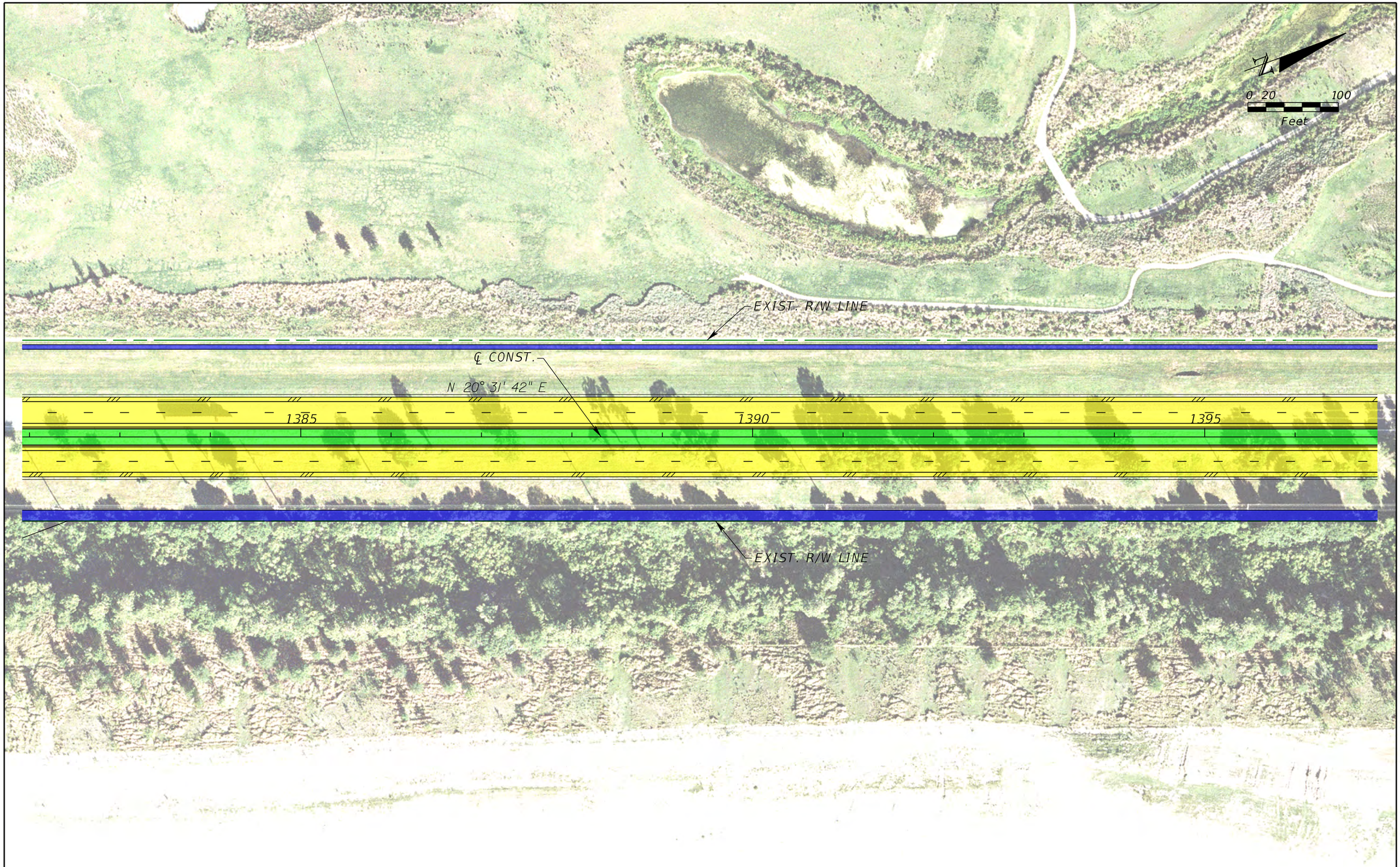

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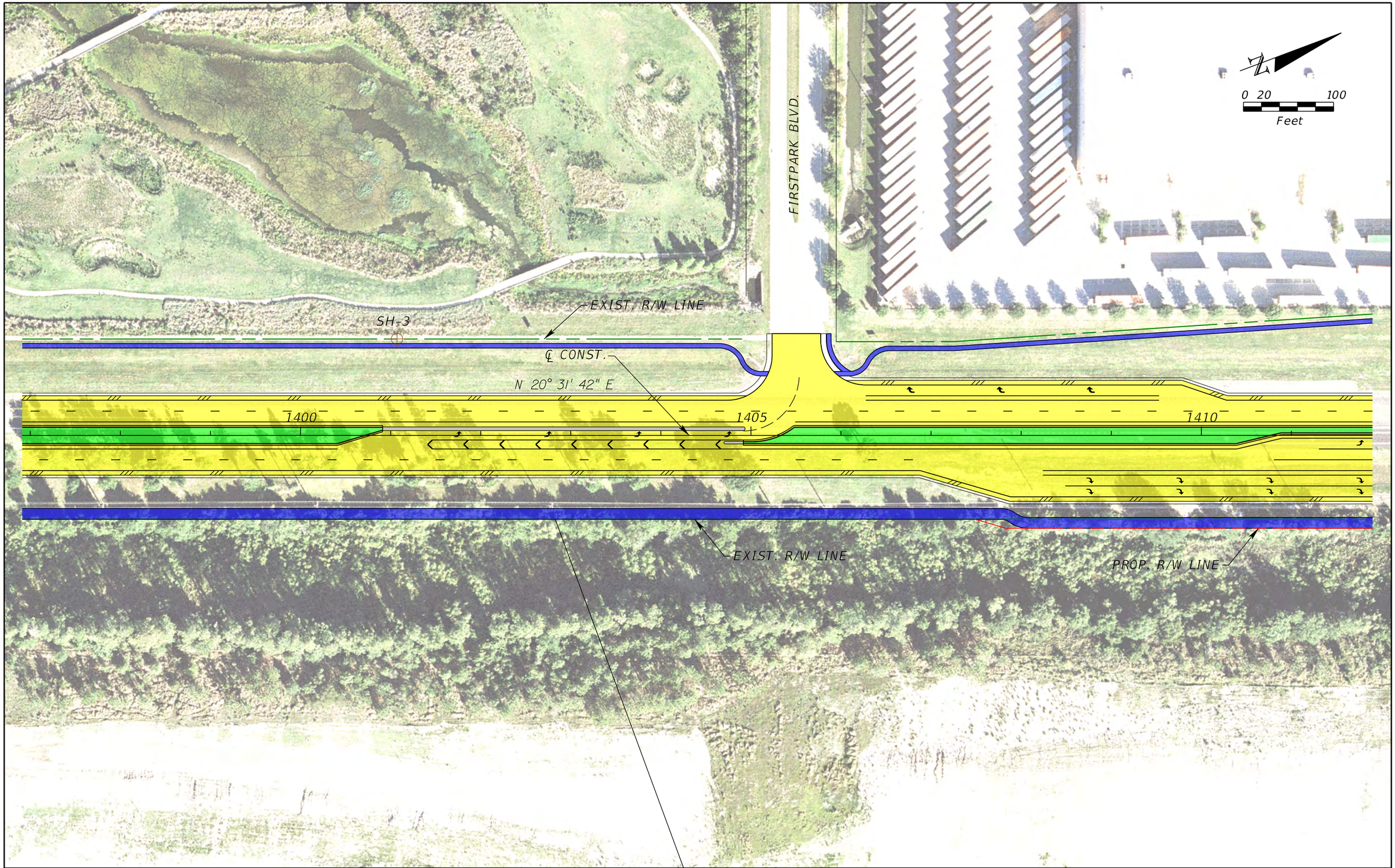
SAVE PAVT. ALTERNATIVE

SHEET NO. 10



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
Mark D. Hales, PE
PE No. 62430
Inwood Consulting Engineers, Inc.
Certificate of Authorization No. 7074
3000 Dovera Drive, Suite 200, Oviedo, Florida 32765
P 407.971.8850

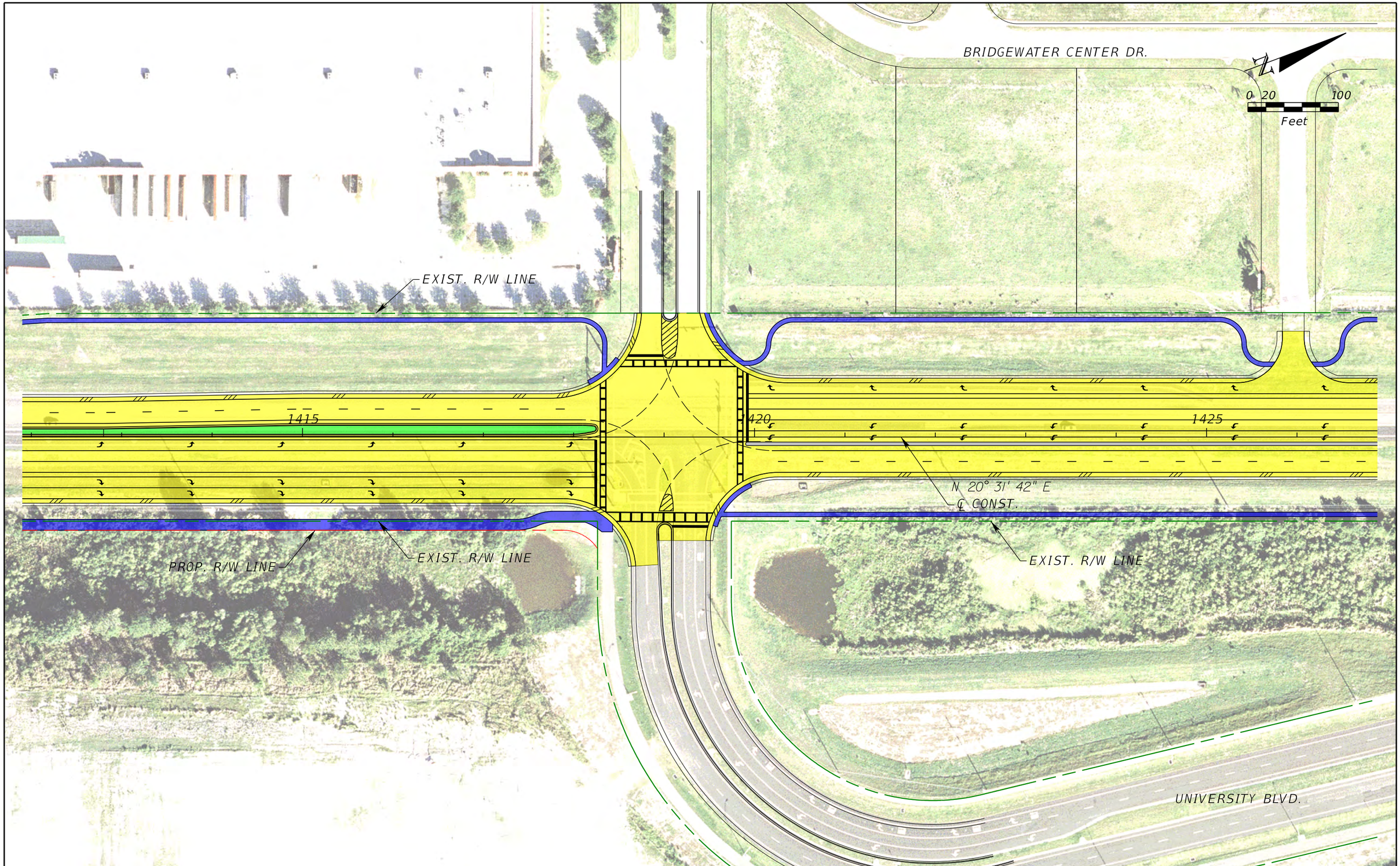
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 11

jpatel 11/19/2013 4:09:28 PM F:\Projects\DT1-017-01\roadway\Plan_SavePavement\plan10b.dgn



REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			PLAN SAVE PAVT. ALTERNATIVE	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	Mark D. Hales, PE PE No. 62430 Inwood Consulting Engineers, Inc. Certificate of Authorization No. 7074 3000 Dovera Drive, Suite 200, Oviedo, Florida 32765 P 407.971.8850	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		12
					SR 33	POLK	430185-1-22-01		

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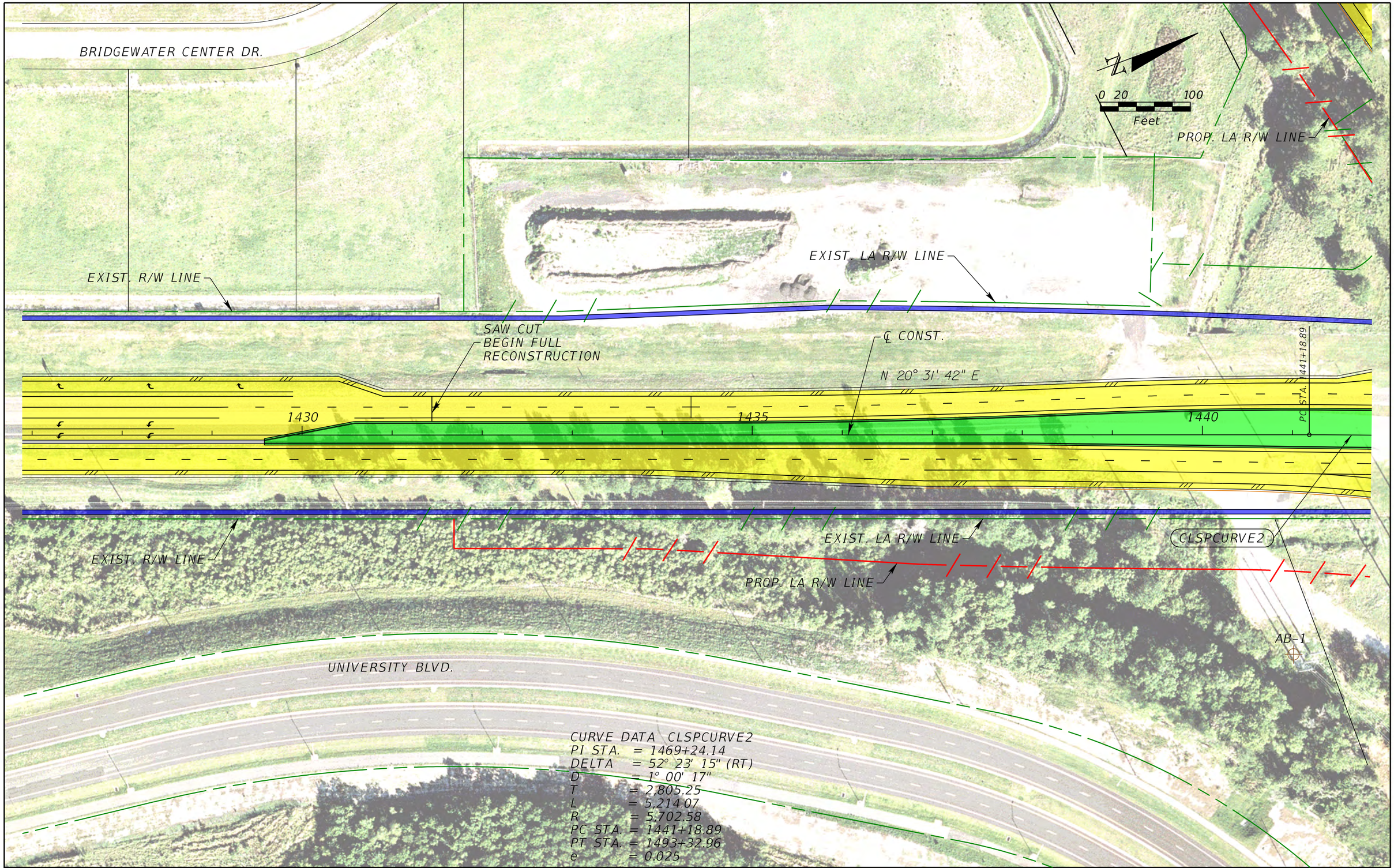

CURVE DATA CLSPCURVE2
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D = 1° 00' 17"
T = 2,805.25
L = 5,214.07
R = 5,702.58
PC STA. = 1441+18.89
PT STA. = 1493+32.96
e = 0.025

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
Mark D. Hales, PE
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 13

EXIST. LA R/W LINE

PROP. LA R/W LINE

0 20 100

Feet

I-4

AB-2

AB-4

AB-6

1445

SH-4

1450

1455

SH 5

CLSPCURVE2

℄ CONST.

AB-5

EXIST. LA R/W LINE

AB-3

I-4

CURVE DATA CLSPCURVE2
PI STA. = 1469+24.14
DELTA = 52° 23' 15" (RT)
D = 1° 00' 17"
T = 2,805.25
L = 5,214.07
R = 5,702.58
PC STA. = 1441+18.89
PT STA. = 1493+32.96
e = 0.025

EXIST. LA R/W LINE

PROP. LA R/W LINE

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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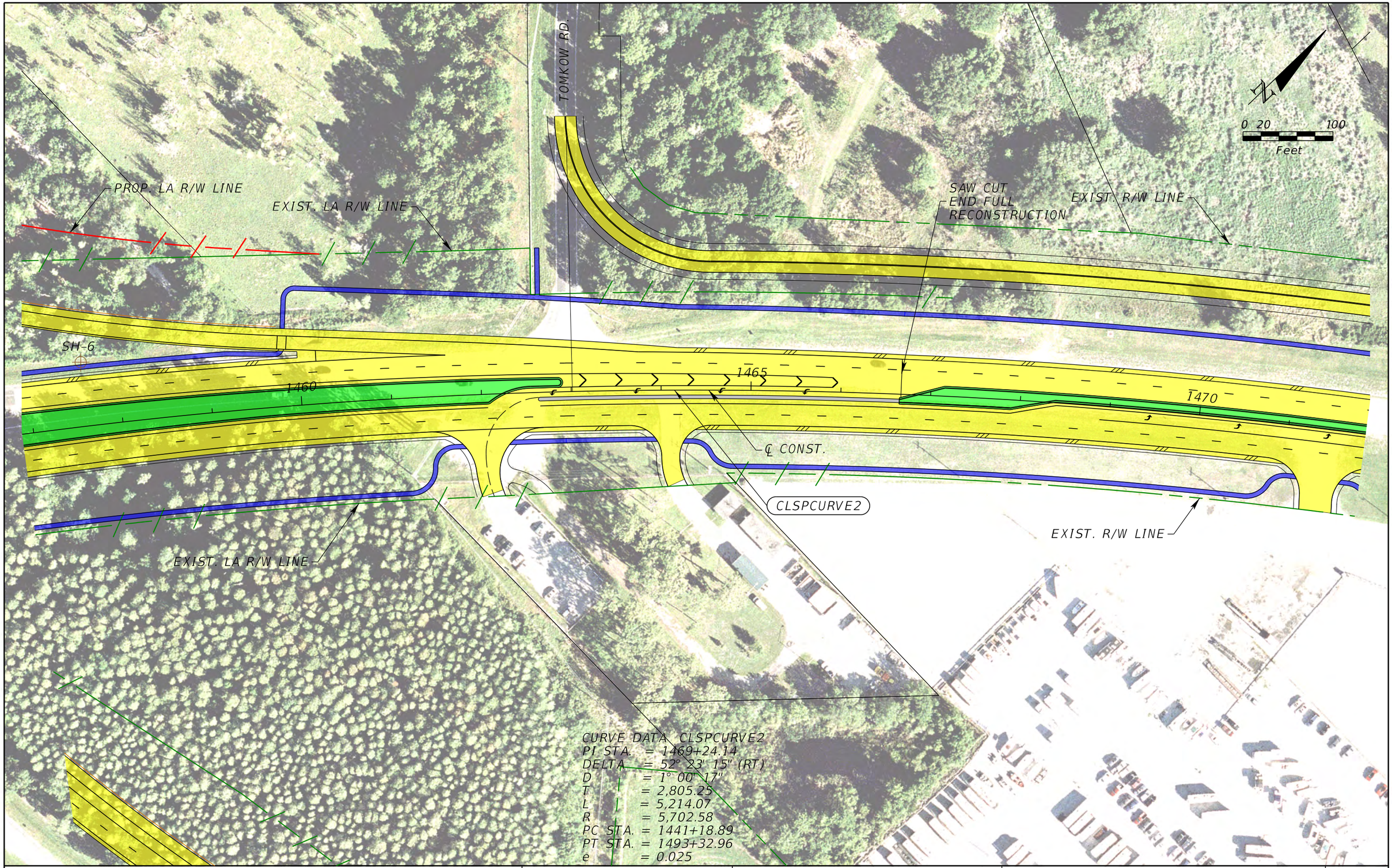
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 14



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
Mark D. Hales, PE
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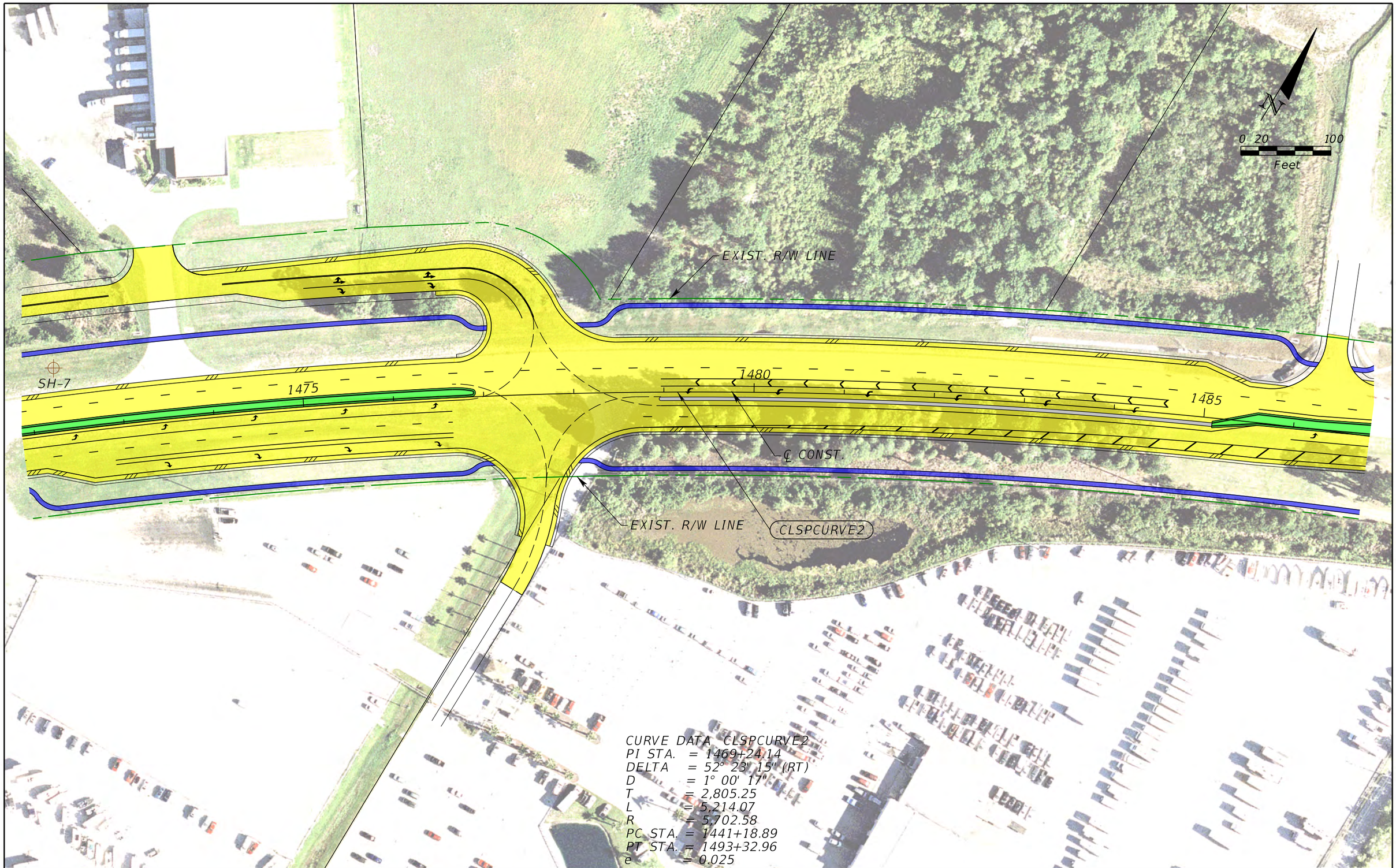
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 15



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
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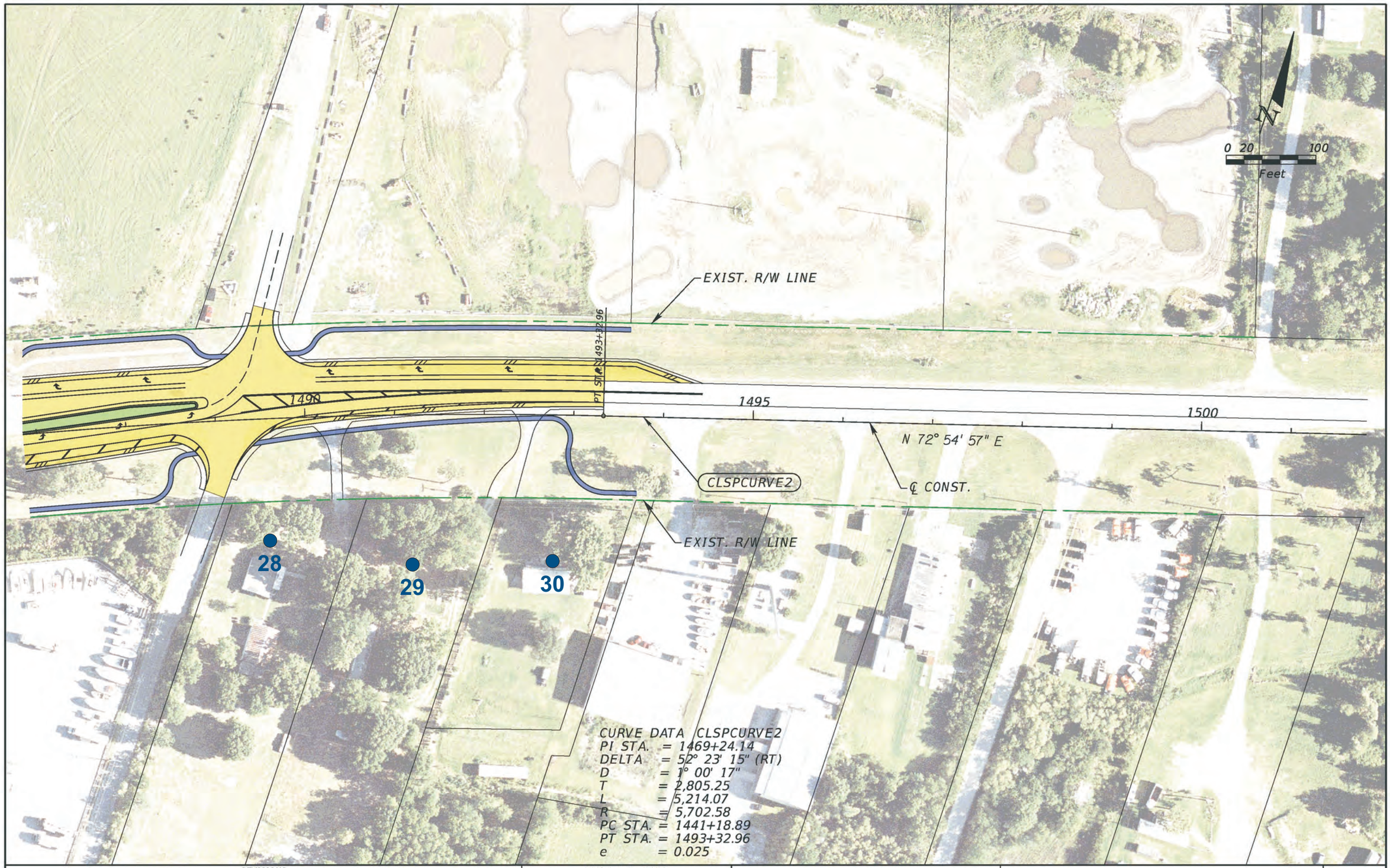
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 16



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 17

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
Mark D. Hales, PE
PE No. 62430
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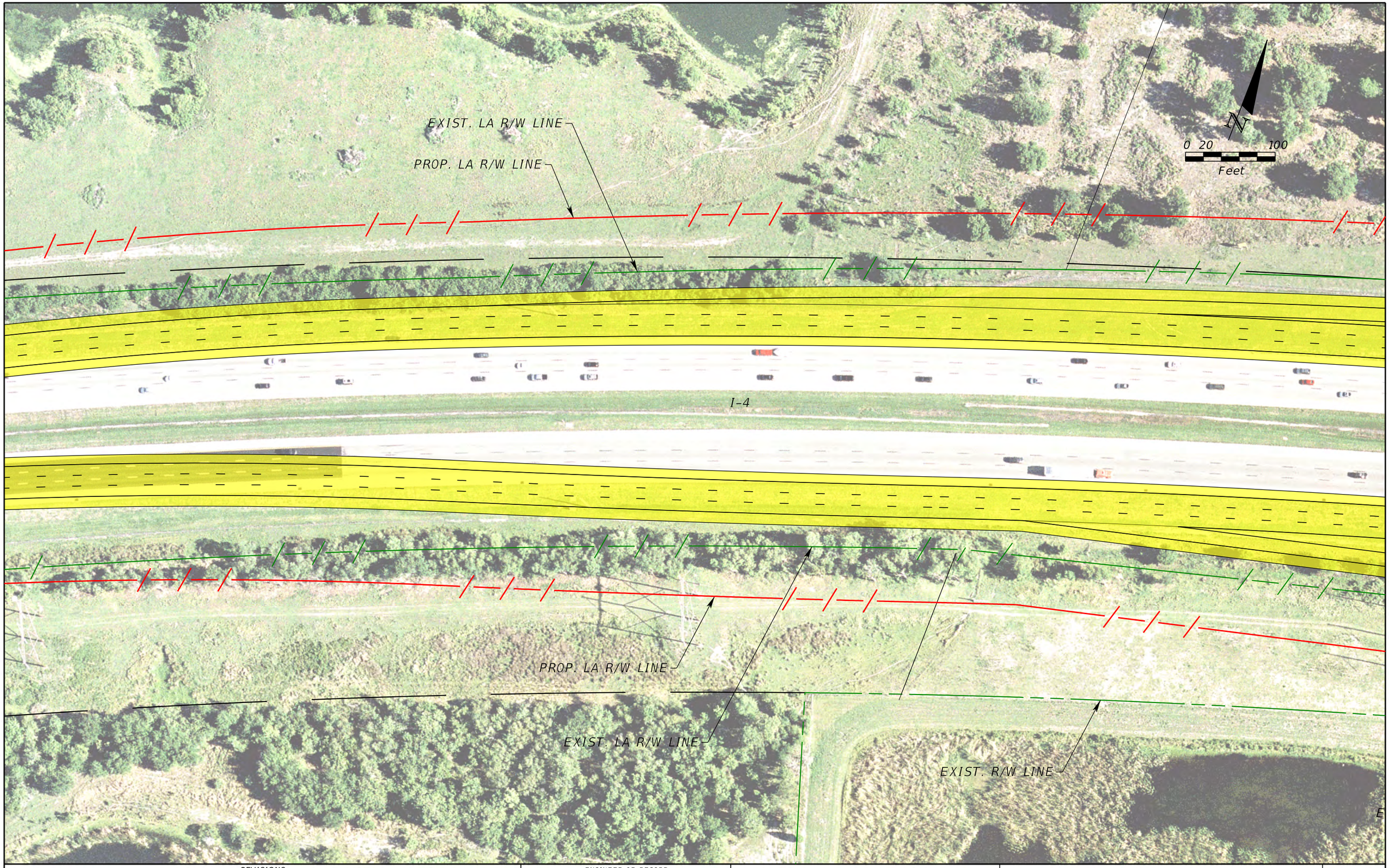
Certificate of Authorization No. 7074
3000 Dovera Drive, Suite 200, Oviedo, Florida 32765
P 407.971.8850

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 18



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
Mark D. Hales, PE
PE No. 62430
Inwood Consulting Engineers, Inc.
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3000 Dovera Drive, Suite 200, Oviedo, Florida 32765
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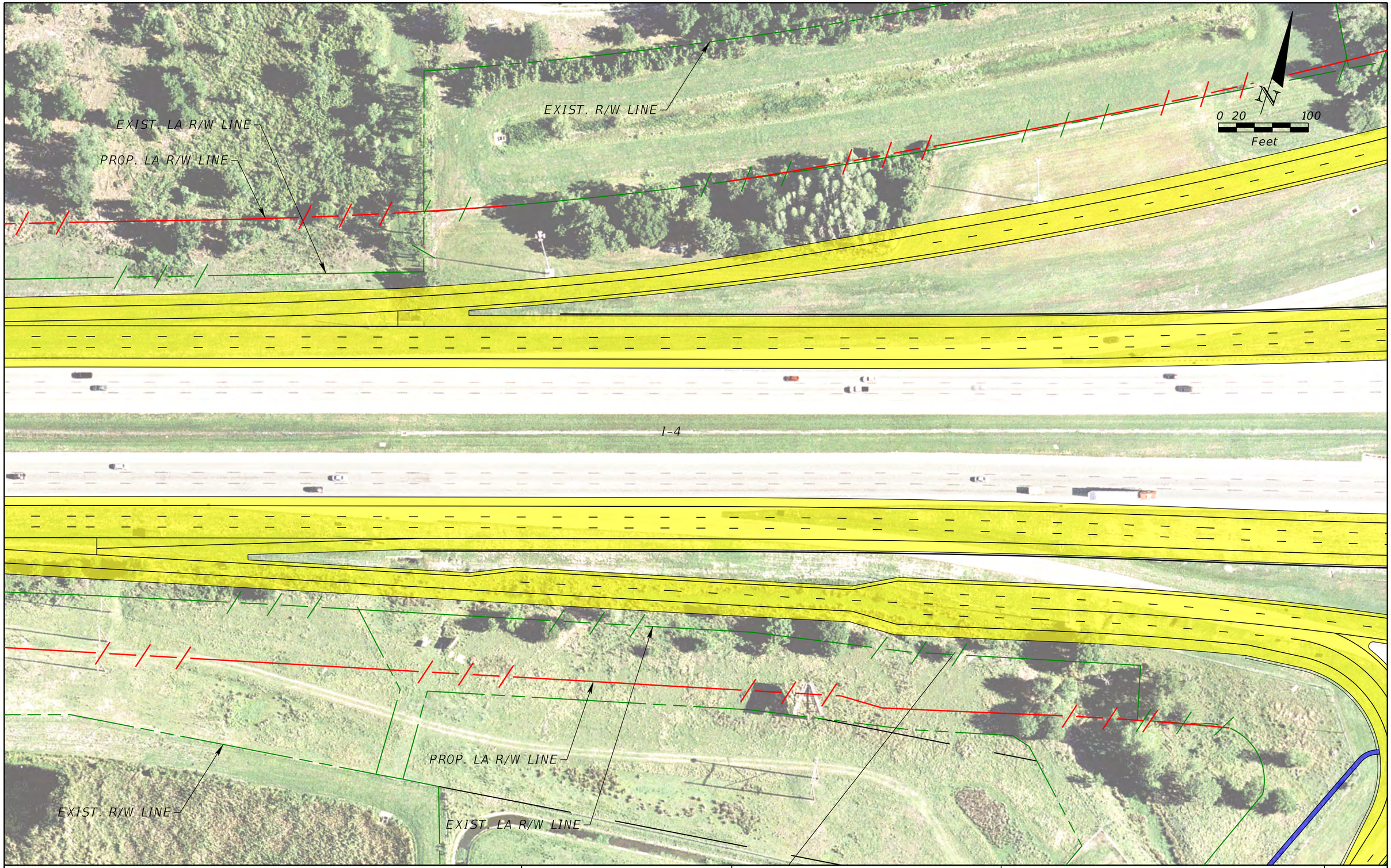
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
33	POLK	430185-1-22-01

PLAN
SAVE. PAVT. ALTERNATIVE

SHEET NO. 19



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
Mark D. Hales, PE
PE No. 62430
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Certificate of Authorization No. 7074
3000 Dovera Drive, Suite 200, Oviedo, Florida 32765
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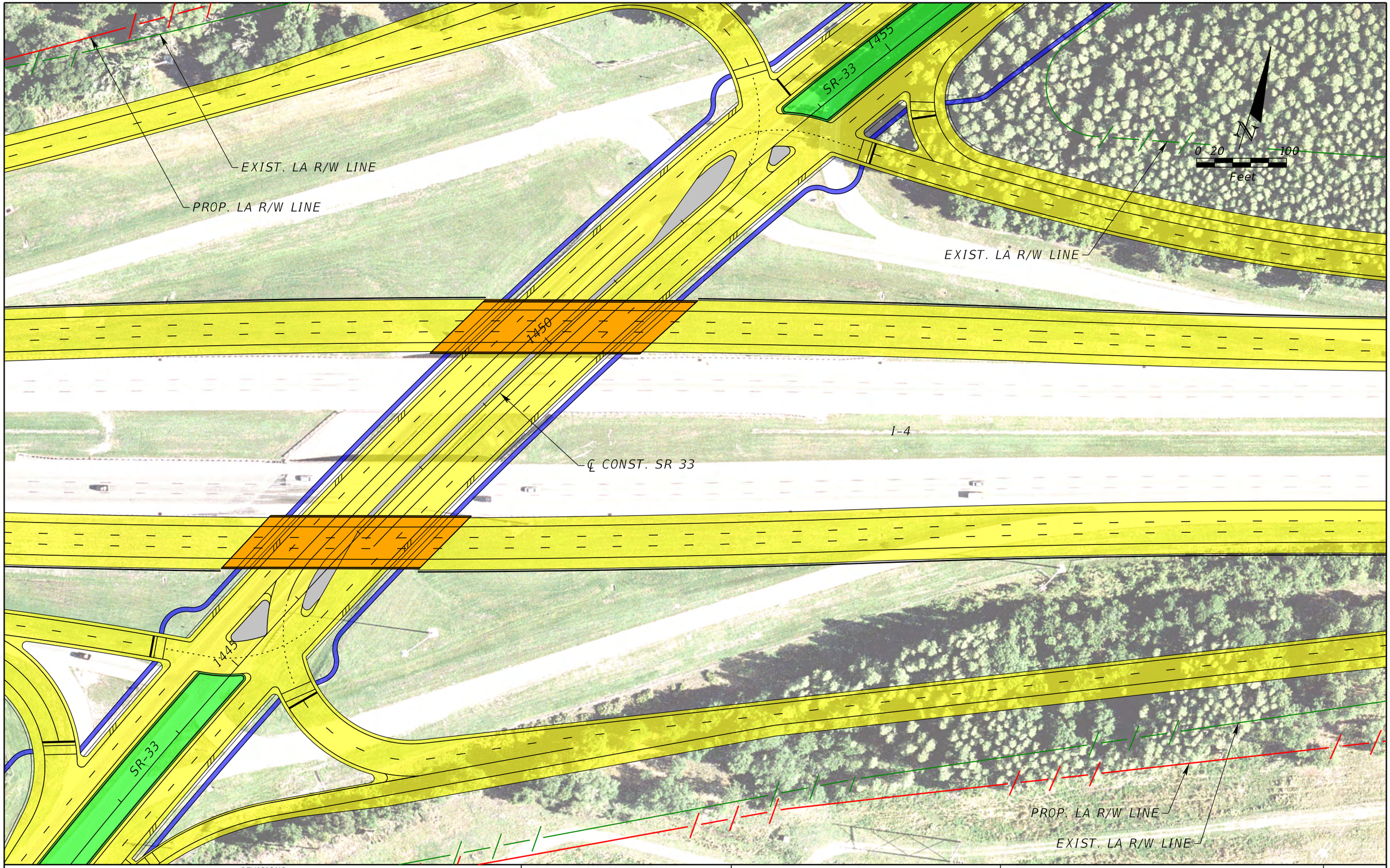
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 20



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
Mark D. Hales, PE
PE No. 62430
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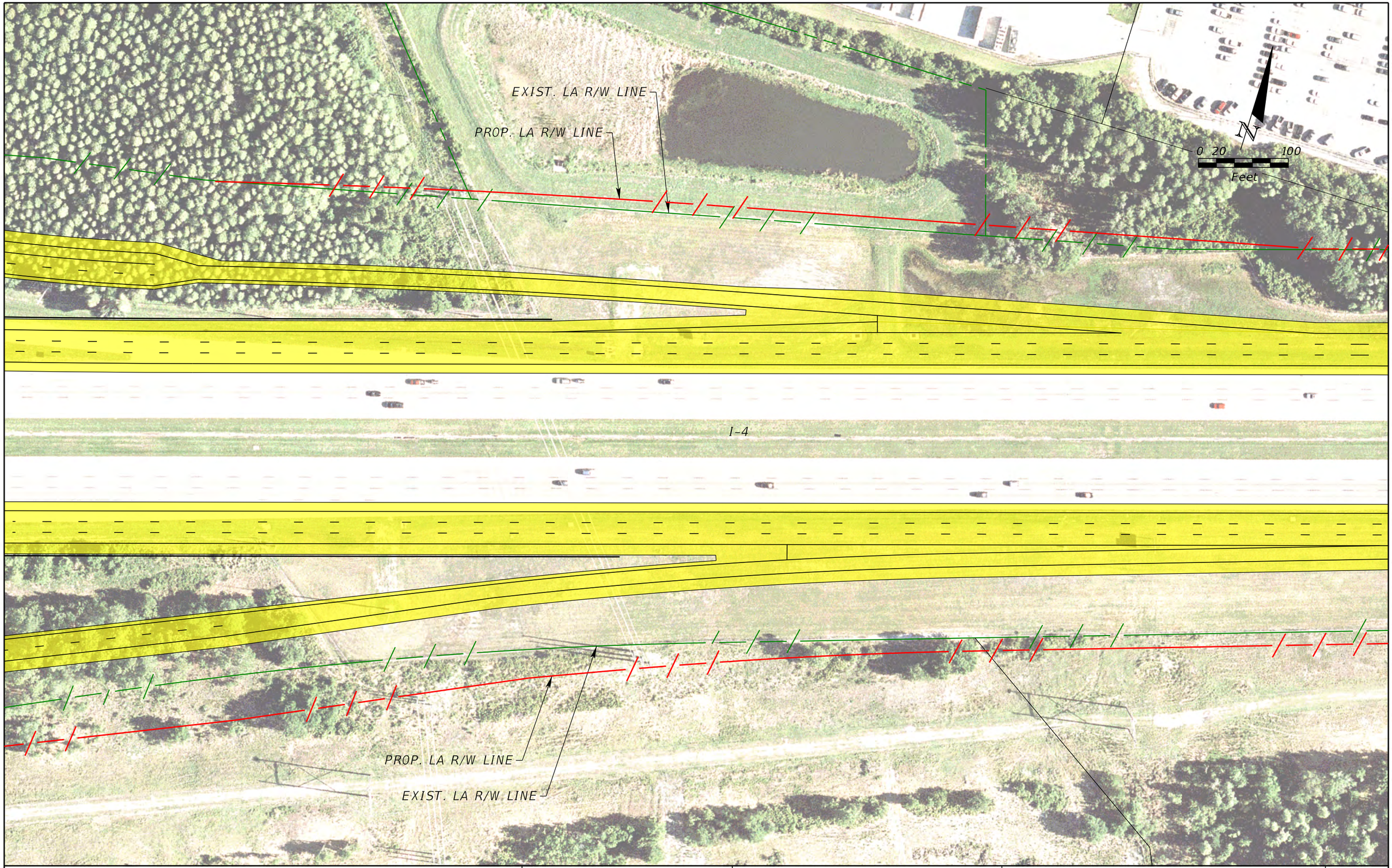
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 21



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
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PE No. 62430
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 22

PROP. LA R/W LINE

EXIST. LA R/W LINE

N

0 20 100

Feet

I-4

PROP. LA R/W LINE

EXIST. LA R/W LINE

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
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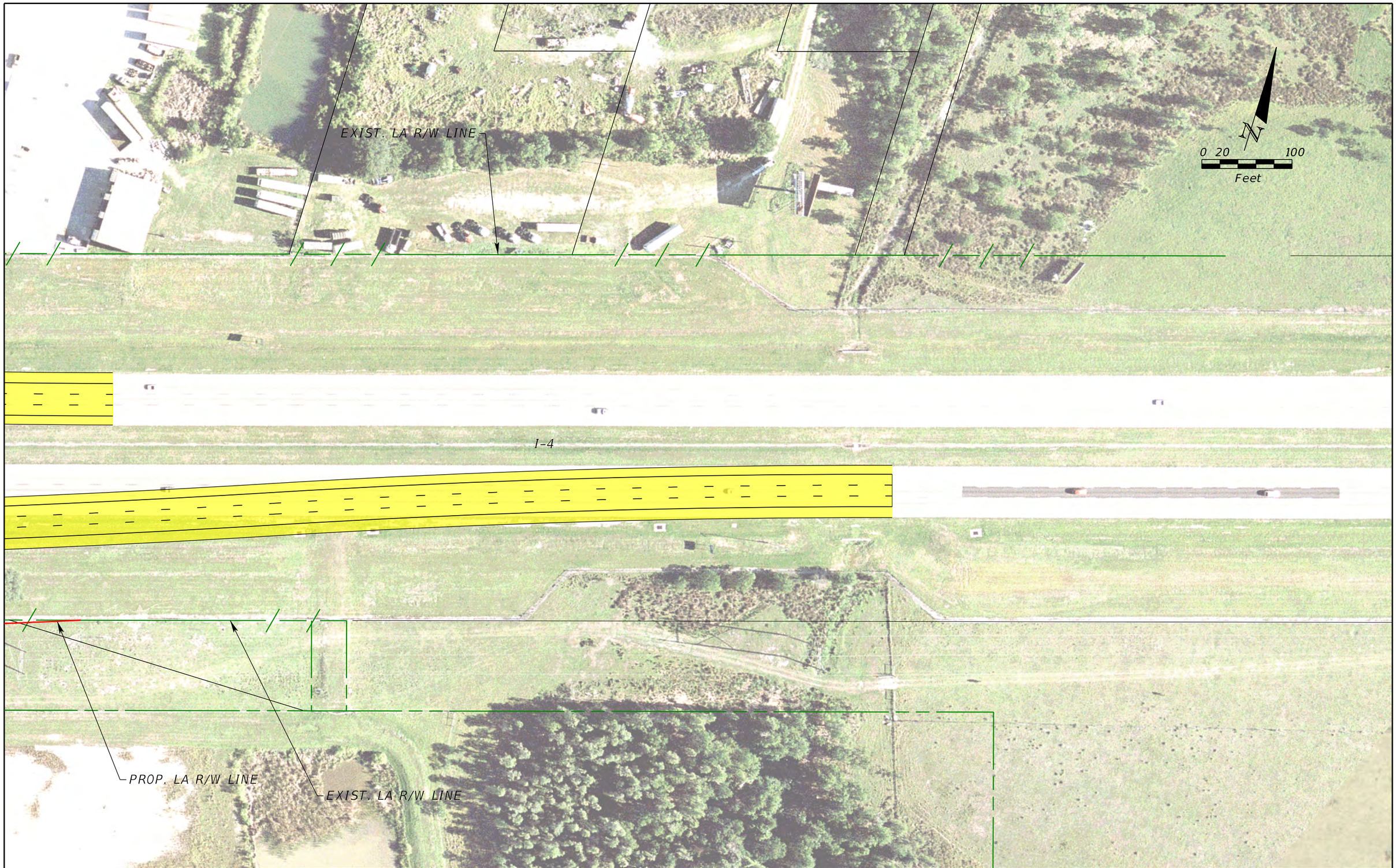
STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 23



REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

ENGINEER OF RECORD
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3000 Dovera Drive, Suite 200, Oviedo, Florida 32765
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STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
33	POLK	430185-1-22-01

PLAN
SAVE PAVT. ALTERNATIVE

SHEET NO. 24

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APPENDIX B – TRAFFIC DATA

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	59-3216593
FPID Number(s):	430185-1-22-01
State/Federal Route No.:	SR 33
Road Name:	Lakeland Hills Blvd
Project Description:	PD&E Study - Old Combee Rd to North of Tomkow Rd
Segment Description:	Old Combee Rd to Lake Luther Rd
Section Number:	16070000
Mile Post To/From:	From MP 4.993 to MP 5.490

Existing Facility:				
		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2012	Tpeak =	5.00%	% of Design Hour Volume
		MT =	1.75%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	840	HT =	3.21%	% of Design Hour Volume
Demand Peak Hour Volume:	409	B =	0.04%	% of Design Hour Volume
Posted Speed:	45 mph	MC =	0.80%	% of Design Hour Volume

No Build Alternative (Design Year):				
		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	5.00%	% of Design Hour Volume
		MT =	1.75%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	840	HT =	3.21%	% of Design Hour Volume
Demand Peak Hour Volume:	1720	B =	0.04%	% of Design Hour Volume
Posted Speed:	45 mph	MC =	0.80%	% of Design Hour Volume

Build Alternative (Design Year):				
		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	5.00%	% of Design Hour Volume
		MT =	1.75%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	1910	HT =	3.21%	% of Design Hour Volume
Demand Peak Hour Volume:	1720	B =	0.04%	% of Design Hour Volume
Posted Speed:	50 mph	MC =	0.80%	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Gregory S. Root (Print Name) Gregory S. Root (Signature) Date: 1/14/14

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Rax Jung (Print Name) (Signature) Date: 1/22/14

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	59-3216593
FPID Number(s):	430185-1-22-01
State/Federal Route No.:	SR 33
Road Name:	Lakeland Hills Blvd
Project Description:	PD&E Study - Old Combee Rd to North of Tomkow Rd
Segment Description:	Lake Luther Rd to N. Combee Rd (SR 659)
Section Number:	16070000
Mile Post To/From:	From MP 5.490 to MP 6.793

Existing Facility:		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2012	Tpeak =	5.00%	% of Design Hour Volume
		MT =	1.75%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	880	HT =	3.21%	% of Design Hour Volume
Demand Peak Hour Volume:	294	B =	0.04%	% of Design Hour Volume
Posted Speed:	55 mph	MC =	0.80%	% of Design Hour Volume

No Build Alternative (Design Year):		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	5.00%	% of Design Hour Volume
		MT =	1.75%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	880	HT =	3.21%	% of Design Hour Volume
Demand Peak Hour Volume:	1471	B =	0.04%	% of Design Hour Volume
Posted Speed:	55 mph	MC =	0.80%	% of Design Hour Volume

Build Alternative (Design Year):		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	5.00%	% of Design Hour Volume
		MT =	1.75%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	1910	HT =	3.21%	% of Design Hour Volume
Demand Peak Hour Volume:	1471	B =	0.04%	% of Design Hour Volume
Posted Speed:	50 mph	MC =	0.80%	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Gregory S. Root (Print Name) Gregory S. Root (Signature) Date: 11/14/14

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Rax Jung (Print Name) Rax Jung (Signature) Date: 11/21/14

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	59-3216593
FPID Number(s):	430185-1-22-01
State/Federal Route No.:	SR 33
Road Name:	Lakeland Hills Blvd
Project Description:	PD&E Study - Old Combee Rd to North of Tomkow Rd
Segment Description:	N. Combee Rd to University Blvd
Section Number:	16070000
Mile Post To/From:	From MP 6.793 to MP 7.880

Existing Facility:				
		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2012	Tpeak =	7.00%	% of Design Hour Volume
		MT =	2.46%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	880	HT =	4.50%	% of Design Hour Volume
Demand Peak Hour Volume:	496	B =	0.04%	% of Design Hour Volume
Posted Speed:	60 mph	MC =	0.80%	% of Design Hour Volume

No Build Alternative (Design Year):				
		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	7.00%	% of Design Hour Volume
		MT =	2.46%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	880	HT =	4.50%	% of Design Hour Volume
Demand Peak Hour Volume:	1690	B =	0.04%	% of Design Hour Volume
Posted Speed:	60 mph	MC =	0.80%	% of Design Hour Volume

Build Alternative (Design Year):				
		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	7.00%	% of Design Hour Volume
		MT =	2.46%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	1910	HT =	4.50%	% of Design Hour Volume
Demand Peak Hour Volume:	1690	B =	0.04%	% of Design Hour Volume
Posted Speed:	50 mph	MC =	0.80%	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Gregory S. Root (Print Name) Gregory S. Root (Signature) Date: 11/14/14

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Rax Jung (Print Name) (Signature) Date: 1/22/14

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	59-3216593
FPID Number(s):	430185-1-22-01
State/Federal Route No.:	SR 33
Road Name:	Lakeland Hills Blvd
Project Description:	PD&E Study - Old Combee Rd to North of Tomkow Rd
Segment Description:	University Blvd to EB I-4 On-/Off-Ramps
Section Number:	16070000
Mile Post To/From:	From MP 7.880 to MP 8.359

Existing Facility:		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2012	Tpeak =	7.00%	% of Design Hour Volume
		MT =	2.46%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	880	HT =	4.50%	% of Design Hour Volume
Demand Peak Hour Volume:	524	B =	0.04%	% of Design Hour Volume
Posted Speed:	60 mph	MC =	0.80%	% of Design Hour Volume

No Build Alternative (Design Year):		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	7.00%	% of Design Hour Volume
		MT =	2.46%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	880	HT =	4.50%	% of Design Hour Volume
Demand Peak Hour Volume:	1471	B =	0.04%	% of Design Hour Volume
Posted Speed:	60 mph	MC =	0.80%	% of Design Hour Volume

Build Alternative (Design Year):		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	7.00%	% of Design Hour Volume
		MT =	2.46%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	1910	HT =	4.50%	% of Design Hour Volume
Demand Peak Hour Volume:	1471	B =	0.04%	% of Design Hour Volume
Posted Speed:	50 mph	MC =	0.80%	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Gregory S. Root (Print Name) Gregory S Root (Signature) Date: 1/14/14

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Rax Jung (Print Name) Rax Jung (Signature) Date: 1/22/14

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	59-3216593
FPID Number(s):	430185-1-22-01
State/Federal Route No.:	SR 33
Road Name:	Lakeland Hills Blvd
Project Description:	PD&E Study - Old Combee Rd to North of Tomkow Rd
Segment Description:	EB I-4 On-/Off-Ramps to WB I-4 On-/Off-Ramps
Section Number:	16070000
Mile Post To/From:	From MP 8.359 to MP 8.513

Existing Facility:		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2012	Tpeak =	7.00%	% of Design Hour Volume
		MT =	2.46%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	880	HT =	4.50%	% of Design Hour Volume
Demand Peak Hour Volume:	588	B =	0.04%	% of Design Hour Volume
Posted Speed:	60 mph	MC =	0.80%	% of Design Hour Volume

No Build Alternative (Design Year):		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	7.00%	% of Design Hour Volume
		MT =	2.46%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	880	HT =	4.50%	% of Design Hour Volume
Demand Peak Hour Volume:	1361	B =	0.04%	% of Design Hour Volume
Posted Speed:	60 mph	MC =	0.80%	% of Design Hour Volume

Build Alternative (Design Year):		D =	55.40%	%
		T24 =	13.00%	% of 24 Hour Volume
Year:	2036	Tpeak =	7.00%	% of Design Hour Volume
		MT =	2.46%	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	1910	HT =	4.50%	% of Design Hour Volume
Demand Peak Hour Volume:	1361	B =	0.04%	% of Design Hour Volume
Posted Speed:	50 mph	MC =	0.80%	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Gregory S. Root (Print Name) Gregory S Root (Signature) Date: 11/14/14

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Rax Jung (Print Name) (Signature) Date: 11/21/14

TRAFFIC DATA FOR NOISE STUDIES - SUMMARY OUTPUT
FDOT DISTRICT 1

Federal Aid Number(s):	59-3216593
FPID Number(s):	430185-1-22-01
State/Federal Route No.:	SR 33
Road Name:	Lakeland Hills Blvd
Project Description:	PD&E Study - Old Combee Rd to North of Tomkow Rd
Segment Description:	WB I-4 On-/Off-Ramps to Tomkow Rd
Section Number:	16070000
Mile Post To/From:	From MP 8.513 to MP 8.714

Existing Facility:		D =	**55.40%**	%
		T24 =	**13.00%**	% of 24 Hour Volume
Year:	**2012**	Tpeak =	**7.00%**	% of Design Hour Volume
		MT =	**2.46%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**880**	HT =	**4.50%**	% of Design Hour Volume
Demand Peak Hour Volume:	**618**	B =	**0.04%**	% of Design Hour Volume
Posted Speed:	**60 mph**	MC =	**0.80%**	% of Design Hour Volume

No Build Alternative (Design Year):		D =	**55.40%**	%
		T24 =	**13.00%**	% of 24 Hour Volume
Year:	**2036**	Tpeak =	**7.00%**	% of Design Hour Volume
		MT =	**2.46%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**880**	HT =	**4.50%**	% of Design Hour Volume
Demand Peak Hour Volume:	**1127**	B =	**0.04%**	% of Design Hour Volume
Posted Speed:	**60 mph**	MC =	**0.80%**	% of Design Hour Volume

Build Alternative (Design Year):		D =	**55.40%**	%
		T24 =	**13.00%**	% of 24 Hour Volume
Year:	**2036**	Tpeak =	**7.00%**	% of Design Hour Volume
		MT =	**2.46%**	% of Design Hour Volume
LOS C Peak Hour Directional Volume:	**1910**	HT =	**4.50%**	% of Design Hour Volume
Demand Peak Hour Volume:	**1127**	B =	**0.04%**	% of Design Hour Volume
Posted Speed:	**50 mph**	MC =	**0.80%**	% of Design Hour Volume

I certify that the above information is accurate and appropriate for use with the traffic noise analysis.

Prepared By: Gregory S. Root (Print Name) Gregory S Root (Signature) Date: 1/14/14

I have reviewed and concur that the above information is appropriate for use with the traffic noise analysis.

FDOT Reviewer: Rax Jung (Print Name) (Signature) Date: 1/22/14

APPENDIX C – VALIDATION DOCUMENTATION

NOISE MEASUREMENT DATA SHEET

Measurements Taken By: Wayne Arner, Paola Pringle, & Lindsay Baumaister Date: 6/13/13
Time Study Started: 10:15 AM Time Study Ended: 11:00 PM
Project Identification:
Financial Project ID: 430185 1 22 0
Project Location: SR 33 PD&E – Old Combee Rd to E of Tomkow Rd
Lakeland, Polk County, FL
Site Identification: Site 1 – SR 33 at Sunset Way South

Weather Conditions:
Sky: Clear X Partly Cloudy Cloudy Other
Temperature 83F Wind Speed 1 mph Wind Direction NW Humidity 88%
Equipment:
Sound Level Meter:
Type: Larson Davis 831 Serial Number(s): 1285
Did you check the battery? Yes X No
Calibration Readings: Start 113.98 End 114.07
Response Settings: Fast Slow X
Weighting: A X Other
Calibrator:
Type: Larson Davis CAL 200 Serial Number: 5592
Did you check the battery? Yes X No

TRAFFIC DATA

Roadway Identification	SR 33 Westbound		SR 33 Eastbound	
Vehicle Type	Volume	Speed (mph)	Volume	Speed (mph)
Autos	240-216-240	45-49-49	162-138-228	45-49-43
Medium Trucks	12-18-0	46-41-0	1-6-6	46-45-47
Heavy Trucks	12-0-0	50-0-0	6-0-18	0-0-44
Buses	0-0-0	0-0-0	0-0-0	0-0-0
Motorcycles	0-6-0	0-0-0	0-0-0	0-0-0
Duration	Three 10-minute sample periods		Three 10-minute sample periods	
Note: Because traffic counts and speeds are collected manually, vehicle speeds may not have been obtained for all vehicle types.				

RESULTS [dB(A)]

L_{EQ} 61.7/59.4/60.9 Lmax 100.9/95.2/97.1

Background Noise: Birds chirping, cicadas
Major Sources: SR 33 Unusual Events: Truck backup alarm, lawn mower, dog barking, helicopter

NOISE MEASUREMENT DATA SHEET

Measurements Taken By: Wayne Arner, Paola Pringle, & Lindsay Baumaister Date: 6/13/13
Time Study Started: 11:15 AM Time Study Ended: 11:58_PM
Project Identification:
Financial Project ID: 430185 1 22 0
Project Location: SR 33 PD&E – Old Combee Rd to E of Tomkow Rd
Lakeland, Polk County, FL
Site Identification: Site 2 – SR 33 at Spanish Oaks

Weather Conditions:
Sky: Clear X Partly Cloudy Cloudy Other
Temperature 93F Wind Speed 3 mph Wind Direction WNW Humidity 52%
Equipment:
Sound Level Meter:
Type: Larson Davis 831 Serial Number(s): 1285
Did you check the battery? Yes X No
Calibration Readings: Start 114.13 End 114.22
Response Settings: Fast Slow X
Weighting: A X Other
Calibrator:
Type: Larson Davis CAL 200 Serial Number: 5592
Did you check the battery? Yes X No

TRAFFIC DATA

Roadway Identification	SR 33 Westbound		SR 33 Eastbound	
Vehicle Type	Volume	Speed (mph)	Volume	Speed (mph)
Autos	180-222-174	51-48-52	120-198-156	52-49-53
Medium Trucks	12-0-6	44-0-45	0-6-0	0-24-0
Heavy Trucks	0-6-0	0-53-0	6-0-6	40-0-52
Buses	0-0-0	0-0-0	0-0-0	0-0-0
Motorcycles	0-6-0	0-0-0	0-6-0	0-0-0
Duration	Three 10-minute sample periods		Three 10-minute sample periods	
Note: Because traffic counts and speeds are collected manually, vehicle speeds may not have been obtained for all vehicle types.				

RESULTS [dB(A)]

L_{EQ} 57.0/58.4/55.1 Lmax 89.1/98.7/97.3

Background Noise: Birds chirping, cicadas
Major Sources: SR 33
Unusual Events: Some activity on Shadow Ln, garbage truck leaving Spanish Oaks, siren nearby

APPENDIX D – POLK COUNTY LAND DEVELOPMENT CODE

POLK COUNTY, FL
LAND DEVELOPMENT CODE
CHAPTER 7 SITE DEVELOPMENT STANDARDS

Section 720 Landscaping and Buffering (Rev. 3/18/09 – Ord. 09-006; 12/04/03 Ord. 03-82; Rev. 06/08/04 Ord. 04-09;)

A. Purpose and Intent (Rev. 3/18/09 – Ord. 09-006)

Landscaping and buffering serves to benefit many functions of new development as well as to enhance the value of existing development. Landscaping reduces the drift of noise, airborne sediments, provides erosion control, mitigates the effects of heat islands and light pollution as well as promotes a successful economic perception by enhancing the visual quality and aesthetics of a community. The intent of this section is also to establish guidelines for landscape design, promote appropriate plant selection and maintenance, promote water conservation measures intended to reduce the need for supplemental irrigation beyond natural rainfall, and establish guidelines for mitigating potential conflicts between different land uses.