Cyrils Drive
from Narcoossee Road to Absher Road
Roadway Improvements

Design Documentation

Osceola County, Florida

Prepared For:

Tavistock Development Company
6900 Tavistock Lakes Blvd
Suite #200
Orlando, FL 32827
(407) 408-4442

Date
January 2022

POULOS & BENNETT

2602 E. Livingston Street | Orlando, Florida 32803 | Tel: 407.487.2594 | www.poulosandbennett.com
FBPE Certificate of Authorization No. 2856

Richard Bobletz, P.E.
Florida P.E. No. 40049
Date: 01/14/22

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1.0 PROJECT DESCRIPTION

1.1 PROJECT LOCATION

This project includes improvement of the existing Cyrils Drive from just east of Narcoossee Road to east of Absher Road where it ties to the existing four lane Cyrils Drive. The project is located in Sections 3, 4, 9 and 10, Township 25 South, Range 31 East in Osceola County. See **Exhibit 1.1** for a Location Map.

1.2 BACKGROUND

In addition to providing connectivity in eastern Osceola County, the proposed Cyrils Drive Roadway improvement will service the Northeast District Element of Osceola County's comprehensive plan (CP17-00002) and Sunbridge at Northeast District (CPA09-0009).

The improvements to Cyrils Drive are based on the Narcoossee Community Conceptual Roadway Design Study Report by Kimley-Horn and Associates, Inc. dated February 2018 and approved by the County.

2.0 EXISTING CONDITIONS

From Narcoossee Road to the Northeast District boundary (east of Absher Drive), Cyrils Drive is classified as a Boulevard and then transitions into a Planned Multimodal Corridor. The existing typical section for Cyrils Drive, from Narcoossee Road to Zuni Road, includes one westbound 12-feet travel lane and one eastbound 12-feet travel lane. Travel lane widths are reduced to 10.5-feet from east of Zuni Road to Absher Road. Narrow grass shoulders and shallow grass swales exist on both sides of the road connected with side drains and cross culverts. The east area of the alignment crosses Lake Ajay. From Narcoossee Road to Zuni Road, there is generally 80 feet of right-of-way. From Zuni Road to Absher Road, there is generally 60 feet of right-of-way.

The surrounding area consists of undeveloped and residential areas.

The intersection at Narcoossee Road currently includes dedicated turn lanes and a signal that was recently installed.

3.0 PROPOSED DESIGN

3.1 ROADWAY

This project addresses the reconstruction Cyrils Drive from Narcoossee Road to Absher Drive in Osceola County. The limits of the project are shown on the **Location Map** below. All improvements are intended to increase the future capacity of the roadway. A design criteria document is included as **Appendix A**.

The proposed Cyrils Drive typical section east of Narcoossee Road to Zuni Road includes a 15.5-feet wide raised, landscaped median, two 11-feet wide travel lanes, 4-feet wide designated bicycle lanes, curb and gutter in each direction with a 10-feet wide Multi-Use

Project Location

Cyrils & Narcoossee

1,250 0 1,250 2,500
SCALE IN FEET

February 26, 2020
P & B Job No.: 17-042

2602 E. Livingston St.
Orlando, Florida 32803- 407.487.2594

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Exhibit 1.1

Z:\2017\17-042 TAVISTOCK - SUNBRIDGE\CYRILS DR\NARCOSSEE TO ABSHER\CAD\EXH & FIGS\PROJECT LOCATION

Trail on the north side and a 5-feet wide sidewalk on the south side as shown in the approved typical section package (**Appendix B**). The proposed Cyrils Drive typical section from Zuni Road to Absher Road includes an 18-feet wide raised, landscaped median, two 11-feet wide travel lanes, 5-feet wide designated bicycle lanes and curb and gutter in each direction with a 12-feet wide Multi-Use Trail on the north side and a 5-feet wide sidewalk on the south side, also shown in the approved typical section package (**Appendix B**). The Cyrils Drive typical section from Absher to the End Project includes two 11-feet wide travel lanes, 5-feet wide bicycle lanes and curb and gutter in each direction with a 12-feet wide Multi-Use Trail on the north side and a 5-feet wide sidewalk on the south side. The widening along Cyrils Drive will be to the north west of Zuni and to the south east of Zuni. See **Appendices C (Horizontal and Vertical Geometry Data) and D (Superelevation Calculations)** for horizontal and vertical design calculations and information.

The number of turning lanes and turning lane length is taken from the Final Cyrils Drive Traffic Technical Memorandum included with the Kimley-Horn Study. See **Appendix H** for minutes of meetings regarding the roadway design.

3.2 DESIGN TRAFFIC

A Design Traffic Technical Memorandum (DTTM) was prepared by Kimley-Horn Associates as part of the Narcoossee Community Conceptual Design and on behalf of Osceola County. The study area includes Cyrils Drive, from Narcoossee Road to Rummell Road Extension.

The purpose of the DTTM was to provide design traffic volumes and traffic analyses in support of the Conceptual Roadway Design for key roads within the Narcoossee Community in Osceola County. This memorandum includes documentation of the development of future traffic volumes (year 2040) and recommended roadway design characteristics. Future design traffic volumes were developed and operating conditions were evaluated for recommended typical sections and intersection geometry.

The objective of the DTTM was to provide Osceola County with information to support roadway design within the Narcoossee Community. This information includes the Annual Average Daily Traffic (AADT), Peak Hour Volume (PHV), and roadway volume to capacity (V/C) ratio for the Opening Year (2020), Mid-Design Year (2030), and Design Year (2040). This report also involves the development of the design traffic characteristics including Peak Hour Demand (K factor), Design Hour Directional Demand (D factor), and percentage of trucks for both the design hour and daily demand (T_f and T_{24} factors) that will be used in calculating the future peak hour traffic volumes and future operational analyses. In addition, this report includes the development of intersection turning movement queue lengths to support intersection designs.

Future AADT volumes for Cyrils Drive were developed based on the travel demands projected by the regional model for 2040. The interim year volumes were estimated as being 20 percent of the 2040 volume in 2020 and 60 percent of the 2040 volume in 2030. The resulting AADT volumes for 2020, 2030 and 2040 and the associated V/C ratios are identified in the table below.

Cyrils Drive Future AADT Volumes Cyrils Dr.	Lanes	Capacity	2020		2030		2040	
			AADT	V/C	AADT	V/C	AADT	V/C
Narcoossee Rd. to Zuni Rd.	4	33,800	5,800	0.17	17,500	0.52	29,100	0.86
Zuni Rd. to McMichael Rd.	4	33,800	4,700	0.14	14,200	0.42	23,700	0.70
McMichael Rd. to Planned Rd.	4	33,800	2,800	0.08	8,500	0.25	14,100	0.42
East of Planned Rd.	4	33,800	5,600	0.17	16,900	0.50	28,200	0.83

All sections of Cyrils Drive are expected to operate with a V/C ratio below 1.0. The highest volume section is from Narcoossee Road to Zuni Road.

3.3 ACCESS MANAGEMENT

The median access spacing is based on Class 5 Access Management criteria (see Design Criteria Documentation, Appendix A). The table below summarizes the Access Management and intersection spacing:

Access Management

Location	Spacing (feet)	Type
39+50 (Zuni Road)		Full (Future Signal)
	1,320	
45+50 (Aversa Avenue)		Closed
	N/A	
52+70 (Franklin Road)		Full
	680	
59+50 (Addison Boulevard)		Directional
	650	
66+00 (Future Connection 1)		Full
	3330	
86+00 (McMichael Road)		Full (Future Signal)
	1,950	
105+50 (Absher Road)		Full

3.4 EXCEPTIONS AND VARIATIONS

A Design Variation is needed for the area where the trail is less than the required 5.0 feet distance from the face of the curb (see **Appendix F** for documentation).

No Design Exceptions are required.

3.5 DRAINAGE

The majority of this drainage study is within the Lake Hart Basin which discharges via Lake Ajay to the East Lake Tohopekaliga Basin. However, a portion of the area is within the Sunbridge Flood Study that drains south to the NED Basin as indicated in the LOMR.

The drainage design for the proposed Cyrils Drive widening is included in the **Master Drainage Report** and summarized below.

POND E-1:

The current permitted Cyrils Drive and Narcoossee Road Intersection design includes a portion of the Cyrils widening. Treatment, attenuation and compensating storage is currently permitted in Pond E-1 located north of that intersection (SFWMD application No. 200622-3730) on the east side of Narcoossee Road. Pond E-1 recovers and discharges via the modified existing structure to the permitted tailwater for MH-118, which is northwest of Pond E-1. The Pond E-1 discharge travels through the discharge structure on the north side of the pond. From there it travels west then north along Narcoossee Road to the discharge point at the Lake Ajay canal crossing. Pond E-1 has an additional control structure on its east berm designed to discharge only during the 100-year event to the east towards Lake Ajay North.

The proposed Cyrils Drive widening includes an additional 0.98-acre of roadway beyond the permitted storm water calculations mentioned in the above permit. The current weir design for E-1 is able to provide treatment for the additional area but fails to meet compensating storage requirements. Therefore, this project proposes the expansion of Pond E-1from 1.71 acres at NCL to 2.00 acres.

BORROW PIT:

The current basin map is based on the Dewberry Southern Oaks (SFWMD Permit No 48-02392-P) and Bridgewalk (SFWMD Application No. 200701-3799) pre development condition, which extends from Clapp Simms Duda Road to the north, Narcoossee Road to the west, Lake Hendon to the south and just past the borrow pit to the east along Cyrils Drive. The eastern edge of the Dewberry basin study flows east toward depressional areas and wetland areas that ultimately discharge to Lake Ajay North. This boundary line was refined using the basin map from Bridgewalk (2020). Two areas south of the borrow pit, Cyrils E and Franklin Wetland were incorporated from Bridgewalk into the predevelopment basin map. Franklin Wetland travels north and east to Cyrils E, Cyrils E travels east to a wetland area. Pre-development (existing) offsite flows are taken into account from Cyrils E in the proposed Bridgewalk calculations which ultimately discharge to Ajay North.

The Borrow Pit was a closed basin in pre-development. Bridgewalk permitted an outfall to Lake Ajay and is using this for their water quality treatment and water quantity attenuation storage from their inlet collection system. Upon coordination with Osceola Engineering

Inc. (engineering firm who designed the Bridgewalk model), it appears that the borrow pit has adequate capacity to attenuate runoff from Cyrils Drive as shown on the basin map. The addition of the proposed Cyrils Drive resulted in minor (0.13' for the 100yr-72hre event) impacts.

OFF6 WETLAND:
Continuing east along Cyrils there is a Zone A area bisected by the existing Cyrils Drive. The north, at Split Oak, is the head of this Zone A. This system flows south towards the Myrtle Creek Basin via an existing Control Structure EA-1 that discharges to south of Cyrils Drive.

FLOODPLAIN IMPACTS AND COMPENSATION:
Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) panel number 12097C0105G includes the project area. There are several areas that will impact the existing Flood Hazard Areas. Specific discussion of these areas is included below.

Floodplain Impacts and compensating storage provided in Pond E-1 are as permitted in SFWMD application No. 081117-25 and SFWMD application No. 200622-3730.

The pre-development floodplain of Lake Ajay was studied as a part of the pre-development routing analysis for the roadway and included in the Master Drainage Report. The existing Cyrils Drive cross culverts were analyzed for their effect on the floodplain elevations south of the roadway. The analysis indicated that a rise of 6.5' to elevation 62.5' occurred as a result of the existing culverts inability to convey the upstream runoff, thus requiring the flow to overtop the existing roadway and cause the stage increase. During the post-development routing analysis, a series of box culverts were analyzed to provide additional conveyance and better equalization of the south wetland area (Lake Ajay south) and the north Lake Ajay system. With the implementation of the post development eleven 6' x 3' box culverts, an equivalent conveyance of Lake Ajay North and Lake Ajay South storm elevations was created. This analysis indicates that the addition of floodplain impacts in the way of roadway fill (which was accounted for in the modeling), was offset by the addition of a properly sized conveyance system and thus causes no net floodplain impacts.

3.6 PAVEMENT DESIGN

The pavement design for Cyrils Drive is summarized in a report titled "Pavement Design Package" dated January 2022 (under separate cover). The pavement design was based on information contained in a report by Universal Engineering Sciences, Inc. **(Appendix F)** and coordinated with Cyrils Drive Phase 1 and the Narcoossee Road and Cyrils Drive Intersection pavement design to ensure consistency and compatibility of the pavement sections.

3.7 SIGNALIZATION

There are no signals included in this design. The intersections at Zuni and McMichael may have signals in the future per the Kimley-Horn Study and the intersections have been designed in anticipation of these signals.

3.8 SIGNING AND PAVEMENT MARKING

There are no overhead cantilever signs included in this improvement. All Signing and Pavement markings follow the MUTCD.

3.9 TEMPORARY TRAFFIC CONTROL

The TTC scheme includes construction of the westbound lanes in the first phase from Narcoossee to Zuni and the eastbound lanes in the firsts phase from Zuni to Absher, then the construction of the eastbound lanes in the second phase from Narcoossee to Zuni and the westbound lanes from Zuni to Absher and then construction of the median in the third phase.

A Lane Closure Analysis was completed for this project and is included under separate cover.

3.10 UTILITIES

Nine existing utilities have been identified in the vicinity of the Cyrils Drive Roadway Improvements. These include: AT&T Distribution, St. Cloud Water Wastewater, CenturyLink, Charter Communications, Comcast Communications, Orlando Utilities Commission – Electric, Osceola County Traffic, TECO Peoples Gas – Orlando and Uniti Fiber, LLC (see Exhibit 3.1). There is a backflow preventer assembly on the south side of existing Cyrils Drive which is an interconnect of the TWA and St. Cloud Utility System. There is also a Power Transmission line on the east side of Narcoossee Road that will impact the design of the proposed intersection.

3.11 ARCHAEOLOGICAL AND HISTORIC FEATURES

A Cultural Assessment Desktop Analysis was completed by SEARCH for the Conceptual Roadway Design by Kimley-Horn Associates for the Narcoossee Community in Osceola County.

The Florida Master Site File (FMSF) database updated in January 2016 was reviewed for this corridor.

CYRILS DRIVE CORRIDOR:

The FMSF database indicates that seven previous cultural resource surveys have been conducted within one mile of the Cyrils Drive corridor within the Narcoossee Community Conceptual Roadway Study. These include six surveys of property development areas/parcels and a survey of a segment of Narcoossee Road.

The Narcoossee Road survey (FMSF Survey No. 16026) was completed in 2008 to support proposed roadway improvements and intersects the Cyrils Drive corridor. This survey documented one historic structure within the one-mile buffer. The Springhead Lake

Property survey (FMSF Survey No. 20925) in 2014 also intersects the Cyrils Drive corridor, but identified no cultural resources within the buffer.

The FMSF review indicates one historic structure, five archaeological sites, and one linear resource (canal) have been recorded within one mile of the Cyrils Road corridor within the Narcoossee Community Conceptual Roadway. All of the previously recorded resources have been evaluated by the State Historic Preservation Officer (SHPO) as ineligible for NRHP. There are no previously recorded resources located within the Cyrils Drive corridor itself

3.12 WETLAND AND WILDLIFE IMPACTS

The onsite land uses and vegetative community types were classified according to the Florida Land Use, Cover and Forms Classification System. One upland plant community and urban areas exist within the project area, and two wetland plant communities exist within the project area (refer to the Ecological Impact Summary Report by Austin Environmental – **Appendix H**).

3.12.1 Uplands

100 - Urban and Built Up

These areas include the existing Cyrils Drive and its associated right of way as well as disturbed and natural areas associated with single family residences. This land use contains vegetated areas that are mostly bahia grass adjacent to the roadway and throughout the single-family residences. However, there are a few natural areas within the residences with vegetation including slash pine, long leaf pine, laurel oak, live oak, red maple, Brazilian pepper and wax myrtle.

400 – Upland Forest

The western upland forested area includes a canopy of live oak, laurel oak, long leaf pine, slash pine, red bay and southern magnolia. A patchy shrub layer of saw palmetto, gallberry and wax myrtle provides a transition to the adjacent forested wetland community. Another upland forested area is found at the far east end of the project area. This area resembles a scrubby pine flatwood community with long leaf pine, slash pine, and live oak comprising the canopy, Myrtle oak, saw palmetto, rusty lyonia and tarflower.

3.12.2 Wetlands & Surface Waters

500 – Other Surface Water

One upland cut, other surface water exists in the western portion of the project area. The OSW contains a mix of exotic species including Cuban bulrush, primrose willow and smartweed.

630 – Wetland Forested Mixed

These areas contain a diverse canopy including pond pine, slash pine, water oak, sweetbay magnolia, loblolly bay, dahoon holly, red maple, and laurel oak. Ground cover includes a variety of ferns such as cinnamon fern, swamp fern and royal fern.

640 – Freshwater Marsh
These areas contain a diverse ground cover including saw grass, chalky bluestem, soft rush, pickerel weed, duck potato, St. John's Wort and spatterdock.

LISTED WILDLIFE SPECIES
During the site review, pedestrian surveys were conducted for state and federally listed species with the potential to occur onsite. The results of these surveys is summarized below.

3.12.3 Bald Eagle
Although the bald eagle is no longer listed under the Endangered Species Act, it is still afforded protection by the USFWS. Site reviews did not identify any bald eagle nests on or immediately adjacent to the property. Additionally, a review of the FWC bald eagle nest database determined that there are no known nests within the vicinity of the project that would affect the timing or nature of construction within the project area.

3.12.4 Gopher Tortoise
All onsite uplands are considered potential habitat for gopher tortoises. An informal survey was conducted within portions of the property and did not discover any gopher tortoise burrows.

3.12.5 Audubon's Crested Caracara
The project area falls within the USFWS Consultation Area (CA) for this federally-listed, threatened species. Due to the lack of suitable habitat, it is not anticipated that the project would result in any adverse impacts to this species.

3.12.6 Everglade Snail Kite
The project area occurs within the USFWS CA for this federally-listed, endangered species. No snail kites were observed within the project area even though suitable nesting and foraging habitat occurs within the project boundary. According to 2021 survey data from the Florida Fish and Wildlife Conservation Commission there are no Everglades Snail Kites utilizing Lake Ajay for nesting. Additionally, there are no historical records of Everglades Snail Kites utilizing Lake Ajay. Therefore, it is unlikely that the proposed project will negatively affect this species.

3.12.7 Red Cockaded Woodpecker
The USFWS CA for this federally-listed, endangered species encompasses the entire subject property. No individuals of this species were observed on or adjacent to the project area during field reviews, and suitable habitat (i.e., stands of old-growth pines) does not occur onsite. Therefore, it is not anticipated that the project will result in adverse impacts to this species.

3.12.8 Florida Scrub-Jay
The project area falls within the CA for this federally-listed, threatened species. The USFWS considers the presence of scrub oaks to be the key indicator of

suitable habitat. Preliminary, informal surveys conducted did not identify the presence of this species on or adjacent to the property, and suitable scrub-jay habitat does not occur onsite. Based on a lack of onsite suitable habitat, it is not anticipated that the project will result in adverse impacts to this species.

3.12.9 Eastern Indigo Snake

The eastern indigo snake is a federally-listed, threatened species that utilizes various upland and wetland habitats throughout the state. Utilizing the USFWS Eastern Indigo Snake Programmatic Effect Determination Key (2013), the following effect determination is made: (NLAA) Not Likely to Adversely Affect.

3.12.10 Wood Stork

The wood stork is listed as threatened by the USFWS. Although wood storks were not observed during the field review, suitable foraging habitat (non-forested wetlands and ditches) occur onsite. The project is located within the Core Foraging Area (CFA) of five (5) wood stork colonies. For projects that occur within the CFA (circular area with an 18.6-mile radius from the colony) of a known wood stork colony, any impacts to suitable foraging habitat may require habitat compensation. All impacts to onsite wetland habitat will be offset using mitigation credits purchased from a mitigation bank within the same watershed. Therefore, habitat compensation is within the service area of a Service-approved mitigation bank and allows for an "NLAA" determination.

3.12.11 Florida Grasshopper Sparrow

The project area is within the USFWS Consultation Area for this federally-listed, endangered species. However, the subject property does not contain suitable habitat (dry prairie) to support this species. As such, it is anticipated that the proposed project will have no effect on this species.

ECOLOGICAL IMPACT ANALYSIS

3.12.13 Wetland Impacts and Mitigation

There are eight (8) wetlands and one (1) other surface water that occur within the project area. Overall, the project will directly impact 5.70 acres of wetlands and 0.13 acres of other surface water. An additional 4.18 acres of secondary impacts have also been assessed.

The estimated functional losses associated with the proposed direct and secondary impacts would result in a functional loss of 3.73 UMAM units (functional loss of 1.82 herbaceous units and 1.91 forested units).

Assessing secondary impacts 50' waterward from the direct impact seems logical. Essentially, it is likely that adjacent organisms and habitats have acclimated to the existing roadway and any additional impacts will be tolerated.

3.12.14 Elimination or Reduction of Impacts

There are no alignment alternatives that allow for unavoidable impacts. Any unavoidable impacts to wetlands will be mitigated to achieve a no net loss of wetland function.

3.13 LANDSCAPING

The landscaping plans were developed using the existing vegetation along the alignment to the greatest extent feasible.

APPENDIX A
DEISGN CRITERIA DOCUMENT

ROADWAY DESIGN CRITERIA

Project Name: Cyrils Drive Widening

Project Limits: Narcoossee Road to Absher Drive

Basis of Design: Tie to Narcoossee intersection and Cyrils Phase 1 designs
2018 Florida Green Book (GB)
2021-2022 FDOT Standard Plans
2021 FDOT Design Manual (FDM)
February 2018 Kimley Horn Alignment Study (KHA)
Cyrils Drive Mobility Fee Credit Agreement

Notes: KHA Study included a 22’ median, 10’ inside and 11’ outside lanes and a 7’ buffered bicycle lane in each direction
KHA Study included a 5’ sidewalk on the north side and a 12’ trail on the south side

	Design Element	Existing Condition	Design Criteria	Proposed Design	Criteria Source	Meets Design Criteria (Y/N)
General Criteria	Functional Classification	Rural Collector	Urban Collector/Boulevard	Urban Collector/Boulevard	Alignment Study/Comp Plan	Y
	Design vehicle	N/A	OsCo FT-Aerial	OsCo FT-Aerial	GB Table 3-2	Y
	Design/Posted Speed (mph)	45	30-50	35/35	GB Chapter 3, Table 3-1	Y
	Access Management Class	4	5	5	Rule Chapter 14-97	Y
	Access Management Spacing (ft)	N/A	1,320 Full Opening 660 Directional 1,320 Signal 245 Connection	1,320 Full Opening 660 Directional 1,320 Signal 245 Connection	Rule Chapter 14-97	Y
Typical Section No. 1	Lane width (feet)	12’ Narcoossee to Zuni Rd 10.5’ Zuni Rd to Absher Rd	10-11	11’ both lanes	Osceola LDC Table 4.7.1B	Y
	Multi-Use Trail Paved Width (feet)	None	10 min.	10’	GB Chapter 9, Section C.1	Y
	Min. Clear Area at Multi-Use Trail	N/A	2 ft both sides	2 ft both sides	GB Chapter 9, Section C.1	Y
	Min. Separation of Trail to Curb (ft)	N/A	5 to face of curb	5 to face of curb	GB Chapter 9, Section C.2	Y
	Min. Guiderail Offset to Curb	N/A	Outside CZ	Outside CZ	FDM Table 215.2.2	Y
	Min. Sidewalk Width (feet)	None	5	5	GB Chapter 8, Section B.1	Y
	Typical cross section slopes (ft/ft)	Varies	0.02 max.	0.02 max.	GB Chapter 3, Section C.7.b.2	Y

Design Element		Existing Condition	Design Criteria	Proposed Design	Criteria Source	Meets Design Criteria (Y/N)
	Bicycle Lane width (feet)	No Bicycle Lane	4 and 5	4 and 5	GB Chapter 9, Section B.1	Y
	Median width (feet)	None	22 (15.5’ min.)	22 (15.5’ min.)	GB Chapter 3, Table 3-23	Y
	Border Width (feet)	15	12	12	FDM Table 210.7.1	Y
	Clear Zone Width	14’	14	14	GB Chapter 4, Table 4-1	
	Lateral Offset Width	Clear Zone	4’ to face of curb	4’ to face of curb	GB Chapter 4, Table 4-2	Y
	Lateral offset to Power Pole	N/A	1.5’ to face of curb	1.5’ to face of curb	FDM Table 215.2.2	Y
	Steepest Roadside Slopes	N/A	1:3	1:3	FDM Table 215.2.3	Y
	Min. Separation of SW to AG Utilities	N/A	3’	3’	GB Chapter 3, Section C.2.a	Y
Typical Section No. 2 & 3	Lane width (feet)	12’ Narcoossee to Zuni Rd 10.5’ Zuni Rd to Absher Rd	10-11	11 both	Osceola LDC Table 4.7.1B	Y
	Multi-Use Trail Paved Width (feet)	None	10 min.	12	GB Chapter 9, Section C.1	Y
	Min. Clear Area at Multi-Use Trail (ft)	N/A	2 ft both sides	2 ft both sides	GB Chapter 9, Section C.1	Y
	Min. Separation of Trail to Curb (ft)	N/A	5 to face of curb	5 to face of curb	GB Chapter 9, Section C.2	Y
	Min. Guiderail Offset to Curb	N/A	Outside CZ	Outside CZ	FDM Table 215.2.2	Y
	Min. Sidewalk Width (feet)	None	5	5	GB Chapter 8, Section B.1	Y
	Typical Cross Slopes (ft/ft)	Varies	0.02 max.	0.02 max.	GB Chapter 3, Section C.7.b.2	Y
	Bicycle Lane width (feet)	None	5	5	GB	Y
	Median width (feet)	None	22 (15.5 min.)	22 (15.5 min.)	GB Chapter 3, Table 3-23	Y
	Border Width (ft)	15	12	12	FDM Table 210.7.1	Y
	Clear Zone Width	14’	14’	14’	GB Chapter 4, Table 4-1	
	Lateral Offset Width (feet)	Clear Zone	4 to face of curb	4 to face of curb	GB Chapter 4, Table 4-2	Y
	Steepest Roadside Slopes	N/A	1:4	1:4	GB Chapter 4, Section D.2	Y
	Min. Separation of SW to AG Utilities	N/A	3’	3’	GB Chapter 3, Section C.2.a	Y
Horiz	Minimum radius Normal Crown (feet)	N/A	1,146’	1,146’	GB Chapter 3, Table 3-11	Y
	Minimum radius Max. Super (feet)	N/A	409’	650’	GB Table 3-11	Y

Design Element		Existing Condition	Design Criteria	Proposed Design	Criteria Source	Meets Design Criteria (Y/N)
	Minimum Curve Length (feet)	N/A	525’ (400 min)	525’ (400 min)	GB Table 3-8 (see note)	Y
	Maximum Superelevation (%)	N/A	5.0	5.0	GB Table 3-11	Y
	Min. stopping sight distance (ft)	>250	250’	250’	FDM Table 210.11.1	Y
	Min. Turn Lane Length (feet)	N/A	245	245	FDM Exhibit 212-1	Y
	Min. Lane Drop Taper (feet)	N/A	204 (10’ shift)	245	FDM 210.2.5	Y
	Min. Lane Shift Transition (feet)	N/A	225 (11’ shift)	225	FDM 210.2.5	Y
Vertical geometry	Min. Vertical Clearance Bridge (ft)	N/A	16.5	16.5	GB Chapter 3, Section C.7.j.4 (b)	Y
	Min. Vertical Clearance Signal (ft)	N/A	17.5	17.5	FDM Section 210.10.3	Y
	Minimum K crest vertical curve	N/A	29	29	GB Section 3, Table 3-18	Y
	Minimum K sag vertical curve	N/A	49	49	GB Section 3, Table 3-18	Y
	Maximum profile grade (%)	N/A	9.0	9.0	GB Section 3, Table 3-16	Y
	Minimum profile grade (%)	N/A	0.30	0.30	GB Section 3.C.5.b	Y
	Max. grade change w/o VC (%)	N/A	0.90	0.90	GB Section 3, Table 3-17	Y
	Min. Length of VC (feet)	N/A	105’	105’	GB Section 3, Table 3-18	Y
	Minimum sight distance (ft)	>250	250’	250’	FDM Table 210.11.1	Y
Drainage	Ditch Min. Easement Width	N/A	20 ft one side	20 ft one side	Osceola County 4.5.1.C.1	Y
	Ditch Side Slopes	N/A	No steeper than 1:4	No steeper than 1:4	Osceola County 4.5.1.C.2	Y
	PGL Min. Elevation (Greater of)	N/A	NCL + 2.0’	NCL + 2.0’	SFWMD 3.5 (c) App HB Vol II	Y
		N/A	10/24 stage at peak inflow + 1.5’ at upstream inlet	10/24 stage at peak inflow + 1.5’ at upstream inlet	Osceola County LDC 4.5.3.F.2	Y
		N/A	Base Clearance: 2.0’	Base Clearance: 2.0’	Osceola County LDC 4.7.1.C (ESHWT to PGL: 6.5”+13”+24”)	Y
		N/A	2’ cover over CBC	2’ cover over CBC		Y
	Pond Design	N/A	Pre/Post 10-yr/72-hr storm event discharge	Pre/Post 10-yr/72-hr storm event discharge	Osceola County LDC	Y
		N/A	Pre/Post 25-yr/72-hr storm event discharge	Pre/Post 25-yr/72-hr storm event discharge	SFWMD	Y

	Design Element	Existing Condition	Design Criteria	Proposed Design	Criteria Source	Meets Design Criteria (Y/N)
	Maximum Allowable Spread (ft)	N/A	1/2 the outside lane	1/2 the outside lane	Osceola County LDC	Y
	Cross Drain Design Storm	N/A	50-year/24-hour	50-year/24-hour	Osceola County LDC	Y
	Secondary Minimum Tc	N/A	10 minutes	10 minutes	Osceola County LDC	Y
	Minimum Pipe Size (in)	N/A	18	18	Osceola County LDC 4.5.3 F	Y
	Minimum flow velocity (fps)	N/A	2.5 when flowing full	2.5 when flowing full	Osceola County LDC	Y
	Secondary System Design Storm	N/A	10-year event	10-year event	Osceola County LDC	Y
	Inlet Types	N/A	FDOT Type 5 & 6	FDOT Type 5 & 6	County Preference	Y
	HGL including minor losses	N/A	No higher than gutter	No higher than gutter	Osceola County LDC	Y
Side Streets	Longitudinal slope in vicinity of intersection	N/A	No steeper than 3%	No steeper than 3%	FDM 212.8	Y
	Intersection radius (feet)	N/A	50	50	FDM 212	Y

APPENDIX B
TYPICAL SECTION PACKAGE

KELVIN SOTO, ESQ. OSCEOLA COUNTY, DATE 10/11/2021 09:04:31 AM
FILE # 2021157579 Bk 6062 Pgs 1476-1494 (19 Pgs)REC FEES $0.00

FIRST AMENDMENT TO AGREEMENT FOR CYRILS DRIVE

THIS FIRST AMENDMENT TO AGREEMENT FOR CYRILS DRIVE (this "**Amendment**") is made and entered into this 13th day of September, 2021, by and between **OSCEOLA COUNTY**, a political subdivision of the State of Florida (the "**County**"), and **Tavistock East Services, LLC**, a Florida limited liability company (the "Developer"), as joined in and consented to by **Central Florida Property Holdings 700, LLC**, a Florida limited liability company, **Central Florida Property Holdings 600, LLC**, a Florida limited liability company, **Suburban Land Reserve, Inc.**, a Utah corporation, **Central Florida Property Holdings 500, LLC**, a Florida limited liability company, **Central Florida Property Holdings 300, LLC**, a Florida limited liability company, **Tavistock East I, LLC**, a Florida limited liability company, **Tavistock East II, LLC**, a Florida limited liability company, **Tavistock East III, LLC**, a Florida limited liability company and **Sunbridge Stewardship District**, a local unit of special-purpose government established pursuant to Chapter 2017-220, Laws of Florida (the "ISD") (collectively, the "Owners").

WITNESSETH:

WHEREAS, the County and Owners entered into that certain Agreement for Cyrils Drive (the "**Agreement**") dated November 02, 2020 and recorded November 05, 2020 in Official Records Book 5827, Pages 2213-2271 in the public records of Osceola County, Florida; and

WHEREAS, Section 13 of the Agreement states that no amendment, modification, or other changes to this Agreement shall be binding upon the County, the Owners, and the Developer, unless in writing and executed by all parties; and

WHEREAS, Section 2 of the Agreement is being amended for consistency with Addendum to the Cyrils Drive Typical Section Package within the Final Conceptual Design Study for the widening, rehabilitation, and reconstruction of roadways in the Narcoossee Community, and to accommodate a refined final design and construction of a four-lane Cyrils Drive from Narcoossee Road to Absher Road; and

WHEREAS, Exhibit "C" of the Agreement is being amended for consistency; and

WHEREAS, the Owners and County desire to make certain additional modifications to the Agreement as more specifically addressed herein; and

WHEREAS, by this Amendment, the parties desire to amend the Agreement to update Section 2. and Exhibit "C" in accordance with the terms hereof.

NOW THEREFORE, in consideration of the mutual covenants contained herein, and other good and valuable consideration, the receipt and sufficiency of which is hereby expressly acknowledged by the parties hereto, the parties agree as follows:

Section 1. **Recitals**. The foregoing recitals are true and correct and are incorporated herein by this reference. Any capitalized terms not defined hereunder shall have the meaning ascribed to it under the Agreement.

Section 2. The last sentence of the first paragraph of Section 2 of the Agreement shall be stricken and replaced as with the following:

<u>The design of the Cyrils Drive Improvements shall be consistent in all material respects with the cross sections as generally depicted in Exhibit "C", attached hereto and incorporated herein by this reference, which cross section was established in the Narcoossee Study Addendum.</u>

Section 3. Exhibit "C" to the Agreement shall be amended in its entirety to include the documents attached hereto as Exhibit "A" and is being amended for consistency with addendum to the Cyrils Drive Typical Section Package within the Final Conceptual Design Study for the widening, rehabilitation, and reconstruction of roadways in the Narcoossee Community, and to accommodate a refined final design and construction of a four-lane Cyrils Drive from Narcoossee Road to Absher Road.

Section 4. **No Further Changes.** Except as expressly provided in this Amendment, no other terms, conditions, provisions, or obligations of the Agreement have been amended or altered by this Amendment, and thus shall remain in full force and effect.

Section 5. **Conflicts.** If any of the terms contained in this Amendment shall conflict with any terms of the Agreement, then this Amendment shall supersede any such conflicting terms in the Agreement.

Section 6. **Counterparts.** This Amendment may be executed in any number of counterparts each of which, when executed and delivered, shall be an original, but all counterparts together constitute duplicates of the one and same instrument.

Section 7. **Recording.** The County shall record this Agreement in the Public Records of Osceola County, at the County's expense.

[Remainder of page left blank]

IN WITNESS WHEREOF, the parties hereto have, by their duly authorized representatives, executed this Amendment on the dates set forth below.

BOARD OF COUNTY COMMISSIONERS
OF OSCEOLA COUNTY, FLORIDA

By: ______________________________
Chair/~~Vice Chair~~

ATTEST:
OSCEOLA COUNTY CLERK OF THE BOARD

By: ______________________________
~~Clerk~~/ Deputy Clerk of the Board

As authorized for execution at the Board of County Commissioners meeting of:

9/13/2021
____

First Amendment to Agreement for Cyrils Drive

DEVELOPER:

Signed, sealed and delivered
in the presence of:

TAVISTOCK EAST SERVICES, LLC
a Florida limited liability company

By: ______________________________
James L. Zboril, President

____
Witness Signature

Desiree G Coleman
Witness (Print Name)

____
Witness Signature

Clint Beaty
Witness (Print Name)

STATE OF FLORIDA)
COUNTY OF ORANGE)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [__] online notarization, this 13 day of July, 2021, by James L. Zboril, as President of TAVISTOCK EAST SERVICES, LLC, a Florida limited liability company, on behalf of said company. He is personally known to me or has produced ______________________________ as identification (if left blank, then personally known to me).

____
(Signature of Notary Public)

Notary Public State of Florida
Cristyann Courtney
My Commission GG 331885
Expires 05/07/2023

Cristyann Courtney
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: GG331885
My Commission Expires: 05/07/2023

JOINDER AND CONSENT

The undersigned Owners hereby join in and consent to this Agreement for purposes of agreeing to dedicate, transfer and convey any portion of the Additional Property lying within the undersigned's lands as and when required by the Agreement, subject to the terms and provisions of this Agreement.

OWNER:

Signed, sealed and delivered

CENTRAL FLORIDA PROPERTY HOLDINGS 700, LLC, a Florida limited liability company

By: R. Steven Romney
R. Steven Romney, Manager

JDH

Marilyn F. Nielson
Witness Signature

Marilyn F. Nielson
Witness (Print Name)

Nick Anderson
Witness Signature

Nick Anderson
Witness (Print Name)

STATE OF UTAH)
COUNTY OF SALT LAKE)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [__] online notarization, this 14th day of July, 2021, by R. Steven Romney, as Manager of CENTRAL FLORIDA PROPERTY HOLDINGS 700, LLC, a Florida limited liability company, on behalf of said company. He is personally known to me or has produced ______________________________ as identification (if left blank, then personally known to me).

NICK ANDERSON
Notary Public - State of Utah
Commission # 702988
My Commission Expires
October 29, 2022

Nick Anderson
(Signature of Notary Public)

Nick Anderson
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: 702988
My Commission Expires: 10/29/2022

OWNER:

Signed, sealed and delivered
in the presence of:

CENTRAL FLORIDA PROPERTY HOLDINGS 600, LLC, a Florida limited liability company

Marilyn F. Nielson
Witness Signature

By: R. Steven Romney
R. Steven Romney, Manager

Marilyn F. Nielson
Witness (Print Name)

JDH

Nick Anderson
Witness Signature

Nick Anderson
Witness (Print Name)

STATE OF UTAH)
)
COUNTY OF SALT LAKE)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [__] online notarization, this 14th day of July, 2021, by R. Steven Romney, as Manager of CENTRAL FLORIDA PROPERTY HOLDINGS 600, LLC, a Florida limited liability company, on behalf of said company. He is personally known to me or has produced ______________________________ as identification (if left blank, then personally known to me).

NICK ANDERSON
Notary Public - State of Utah
Commission # 702988
My Commission Expires
October 29, 2022

Nick Anderson
(Signature of Notary Public)

Nick Anderson
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: 702988
My Commission Expires: 10/29/2022

OWNER:

Signed, sealed and delivered
in the presence of:

SUBURBAN LAND RESERVE, INC.,
a Utah corporation

Marilyn F. Nielson
Witness Signature

By: R. Steven Romney
R. Steven Romney, President

Marilyn F. Nielson
Witness (Print Name)

JDH

Nick Anderson
Witness Signature

Nick Anderson
Witness (Print Name)

STATE OF UTAH)
)
COUNTY OF SALT LAKE)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [__] online notarization, this 14th day of July, 2021, by R. Steven Romney, as President of SUBURBAN LAND RESERVE, INC., a Utah corporation, on behalf of said corporation. He is personally known to me or has produced ______________________ as identification (if left blank, then personally known to me).

NICK ANDERSON
Notary Public - State of Utah
Commission # 702988
My Commission Expires
October 29, 2022

Nick Anderson
(Signature of Notary Public)

Nick Anderson
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: 702988
My Commission Expires: 10/29/2022

OWNER:

Signed, sealed and delivered
in the presence of:

CENTRAL FLORIDA PROPERTY HOLDINGS 500, LLC, a Florida limited liability company

Marilyn F. Nielson
Witness Signature

Marilyn F. Nielson
Witness (Print Name)

Nick Anderson
Witness Signature

Nick Anderson
Witness (Print Name)

By: R. Steven Romney
R. Steven Romney, Manager

JDH

STATE OF UTAH)
)
COUNTY OF SALT LAKE)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [ ] online notarization, this 14th day of July, 2021, by R. Steven Romney, as Manager of CENTRAL FLORIDA PROPERTY HOLDINGS 500, LLC, a Florida limited liability company, on behalf of said company. He is personally known to me or has produced ______________________________ as identification (if left blank, then personally known to me).

NICK ANDERSON
Notary Public - State of Utah
Commission # 702988
My Commission Expires
October 29, 2022

Nick Anderson
(Signature of Notary Public)

Nick Anderson
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: 702988
My Commission Expires: 10/29/2022

OWNER:

Signed, sealed and delivered
in the presence of:

CENTRAL FLORIDA PROPERTY HOLDINGS 300, LLC, a Florida limited liability company

Marilyn F. Nielsen
Witness Signature

Marilyn F. Nielson
Witness (Print Name)

Nick Anderson
Witness Signature

Nick Anderson
Witness (Print Name)

By: R. Steven Romney
R. Steven Romney, Manager

JDH

STATE OF UTAH)
)
COUNTY OF SALT LAKE)

The foregoing instrument was acknowledged before me by means of [__] physical presence or [__] online notarization, this 14th day of July, 2021, by R. Steven Romney, as Manager of CENTRAL FLORIDA PROPERTY HOLDINGS 300, LLC, a Florida limited liability company, on behalf of said company. He is personally known to me or has produced ______________________ as identification (if left blank, then personally known to me).

NICK ANDERSON
Notary Public - State of Utah
Commission # 702988
My Commission Expires
October 29, 2022

Nick Anderson
(Signature of Notary Public)

Nick Anderson
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: 702988
My Commission Expires: 10/29/2022

OWNER:

Signed, sealed and delivered
in the presence of:

TAVISTOCK EAST I, LLC
a Florida limited liability company

By: ______________________________
James L. Zboril, President

____
Witness Signature

Desiree G Coleman
Witness (Print Name)

____
Witness Signature

Clint Beaty
Witness (Print Name)

STATE OF FLORIDA)
COUNTY OF ORANGE)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [__] online notarization, this 13 day of July, 2021, by James L. Zboril, as President of TAVISTOCK EAST I, LLC, a Florida limited liability company, on behalf of said company. He is personally known to me or has produced ______________________ as identification (if left blank, then personally known to me).

Notary Public State of Florida
Cristyann Courtney
My Commission GG 331885
Expires 05/07/2023

____
(Signature of Notary Public)

Cristyann Courtney
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: GG 331885
My Commission Expires: 05/07/2023

OWNER:

Signed, sealed and delivered
in the presence of:

Desiree G Coleman
Witness Signature

Desiree G Coleman
Witness (Print Name)

Witness Signature

Clint Beaty
Witness (Print Name)

TAVISTOCK EAST II, LLC
a Florida limited liability company

By: ______________________
James L. Zboril, President

STATE OF FLORIDA)
COUNTY OF ORANGE)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [__] online notarization, this 13 day of July, 2021, by James L. Zboril, as President of TAVISTOCK EAST II, LLC, a Florida limited liability company, on behalf of said company. He is personally known to me or has produced ______________________ as identification (if left blank, then personally known to me).

NOTARY PUBLIC STATE OF FLORIDA
Notary Public State of Florida
Cristyann Courtney
My Commission GG 331885
Expires 05/07/2023

Cristyann Courtney
(Signature of Notary Public)

Cristyann Courtney
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: GG 331885
My Commission Expires: 05/07/2023

OWNER:

Signed, sealed and delivered
in the presence of:

Richard Levey
Witness Signature

RICHARD LEVEY
Witness (Print Name)

Reckie Rosario
Witness Signature

Rechie Rosario
Witness (Print Name)

TAVISTOCK EAST III, LLC
a Florida limited liability company

By: ______________________
James L. Zboril, President

STATE OF FLORIDA)
COUNTY OF ORANGE)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [__] online notarization, this 13th day of July, 2021, by James L. Zboril, as President of TAVISTOCK EAST III, LLC, a Florida limited liability company, on behalf of said company. He is personally known to me or has produced ______________________ as identification (if left blank, then personally known to me).

Notary Public State of Florida
Cristyann Courtney
My Commission GG 331885
Expires 05/07/2023

Cristyann Courtney
(Signature of Notary Public)

Cristyann Courtney
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: GG 331885
My Commission Expires: 05/07/23

OWNER/ISD:

Signed, sealed and delivered
in the presence of:

Desiree G Coleman
Witness Signature

Desiree G Coleman
Witness (Print Name)

Witness Signature

Clint Beaty
Witness (Print Name)

SUNBRIDGE STEWARDSHIP DISTRICT,
a local unit of special-purpose government established pursuant to Chapter 2017-220, Laws of Florida

By: Richard L. Levey
Richard L. Levey, Chairman

STATE OF FLORIDA)
COUNTY OF ORANGE)

The foregoing instrument was acknowledged before me by means of [X] physical presence or [__] online notarization, this 13 day of July, 2021, by Richard L. Levey, as Chairman of the SUNBRIDGE STEWARDSHIP DISTRICT, a local unit of special-purpose government established pursuant to Chapter 2017-220, Laws of Florida, on behalf of said DISTRICT. He is personally known to me or has produced ______________________ as identification (if left blank, then personally known to me).

NOTARY PUBLIC • STATE OF FLORIDA
Notary Public State of Florida
Cristyann Courtney
My Commission GG 331885
Expires 05/07/2023

Cristyann Courtney
(Signature of Notary Public)

Cristyann Courtney
(Typed name of Notary Public)
Notary Public, State of Florida
Commission No.: GG331885
My Commission Expires: 05/07/2023

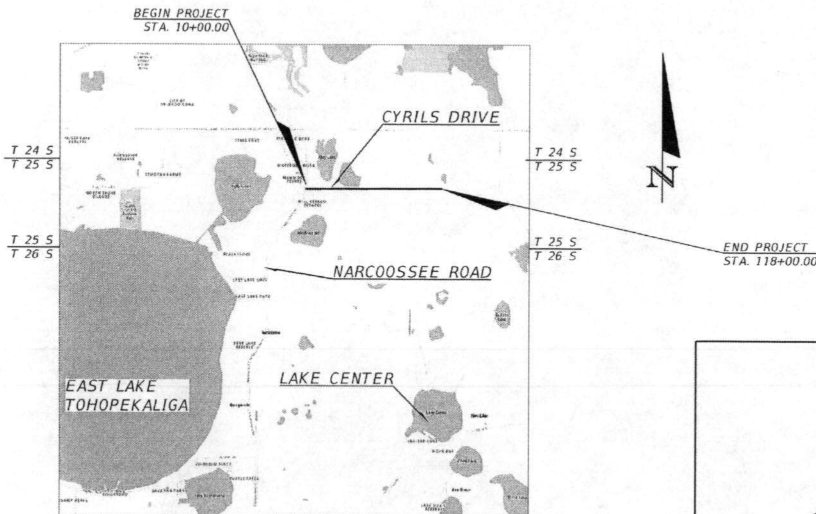
Exhibit A

Exhibit "C"
CROSS SECTION FROM NARCOOSSE STUDY ADDENDUM

TYPICAL SECTION PACKAGE

OSCEOLA COUNTY (92)

CYRILS DRIVE
RECONSTRUCTION OF CYRILS DRIVE FROM
2-LANE TO 4-LANE DIVIDED



RICHARD DEAN BOBLETZ
LICENSE
No. 40049
STATE OF FLORIDA
PROFESSIONAL ENGINEER

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY:
Richard Bobletz
ON THE DATE ADJACENT TO THE SEAL

PRINTED COPIES OF THIS DOCUMENT ARE NOT CONSIDERED SIGNED AND SEALED AND THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

POULOS & BENNETT, LLC
2602 EAST LIVINGSTON STREET
ORLANDO, FL, 32803
CERTIFICATE OF AUTHENTICATION: 28567
RICHARD BOBLETZ, P.E. NO. 40049

THE ABOVE NAMED PROFESSIONAL ENGINEER SHALL BE RESPONSIBLE FOR THE FOLLOWING SHEETS IN ACCORDANCE WITH RULE 61G15-23.004, F.A.C.

TYPICAL SECTION PACKAGE

SHEET NO.	SHEET DESCRIPTION
1	COVER SHEET
2	TYPICAL SECTION 1
3	TYPICAL SECTION 2
4	TYPICAL SECTION 3
5	TYPICAL SECTION 4

TYPICAL SECTION CONCURRENCE

TRANSPORTATION ENGINEER
TRANSPORTATION & TRANSIT
STEVEN KANE, PE

TRAFFIC OPERATIONS ENGINEER
TRANSPORTATION & TRANSIT
KATHY LEE, PE

EXECUTIVE DIRECTOR OF
TRANSPORTATION & TRANSIT
TAWNY OLORE, PE

DESIGN SPEED AND POSTED
SPEED CONCURRENCE

TRANSPORTATION ENGINEER
TRANSPORTATION & TRANSIT
STEVEN KANE PE

TRAFFIC OPERATIONS ENGINEER
TRANSPORTATION & TRANSIT
KATHY LEE, PE

SHEET NO. 1

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL	( ) C3C : SUBURBAN COMM.
( ) C2 : RURAL	( ) C4 : URBAN GENERAL
( ) C2T : RURAL TOWN	( ) C5 : URBAN CENTER
( ) C3R : SUBURBAN RES.	( ) C6 : URBAN CORE
( ) N/A : L.A. FACILITY	(X) N/A : FL. GREENBOOK

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE	(X) MAJOR COLLECTOR
( ) FREEWAY/EXPWY.	( ) MINOR COLLECTOR
( ) PRINCIPAL ARTERIAL	( ) LOCAL
( ) MINOR ARTERIAL	

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
(X) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
( ) 7 - BOTH MEDIAN TYPES

CRITERIA

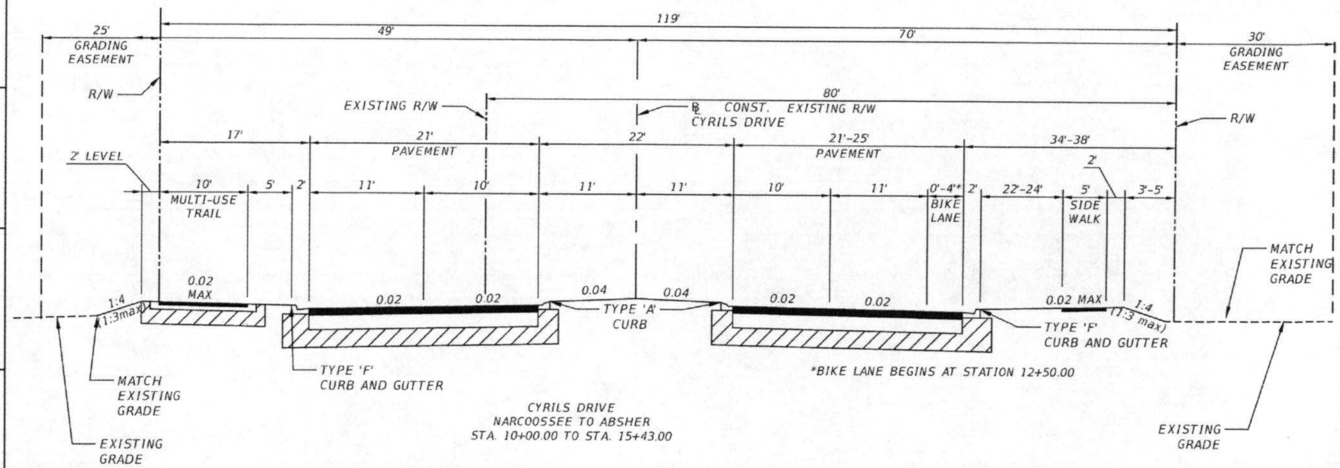
(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTIONS

DESIGN VARIATIONS

1. NONE

TYPICAL SECTION No. 1



CYRILS DRIVE
NARCOOSSEE TO ABSHER
STA. 10+00.00 TO STA. 15+43.00

NOT TO SCALE

TRAFFIC DATA

CURRENT YEAR	= 2020 AADT	=	5800
ESTIMATED OPENING YEAR	= 2023 AADT	=	6830
ESTIMATED DESIGN YEAR	= 2040 AADT	=	29100

K = 8% D = 55% T = 6% (24 HOUR)

DESIGN HOUR T = 3%

DESIGN SPEED = 35 MPH

POSTED SPEED = 35 MPH

FINANCIAL PROJECT ID	SHEET NO.
N/A	2

Alice Brantley 6/14/2021 2:10:57 PM Z:\2017\17-042 Tavistock - Sunbridge\CYRILS DR\Narcossee to Absher\CAD\FINAL\COUNTY\Typical Section

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) N/A : L.A. FACILITY
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
(X) N/A : FL. GREENBOOK

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
(X) MAJOR COLLECTOR
( ) MINOR COLLECTOR
( ) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
(X) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
( ) 7 - BOTH MEDIAN TYPES

CRITERIA

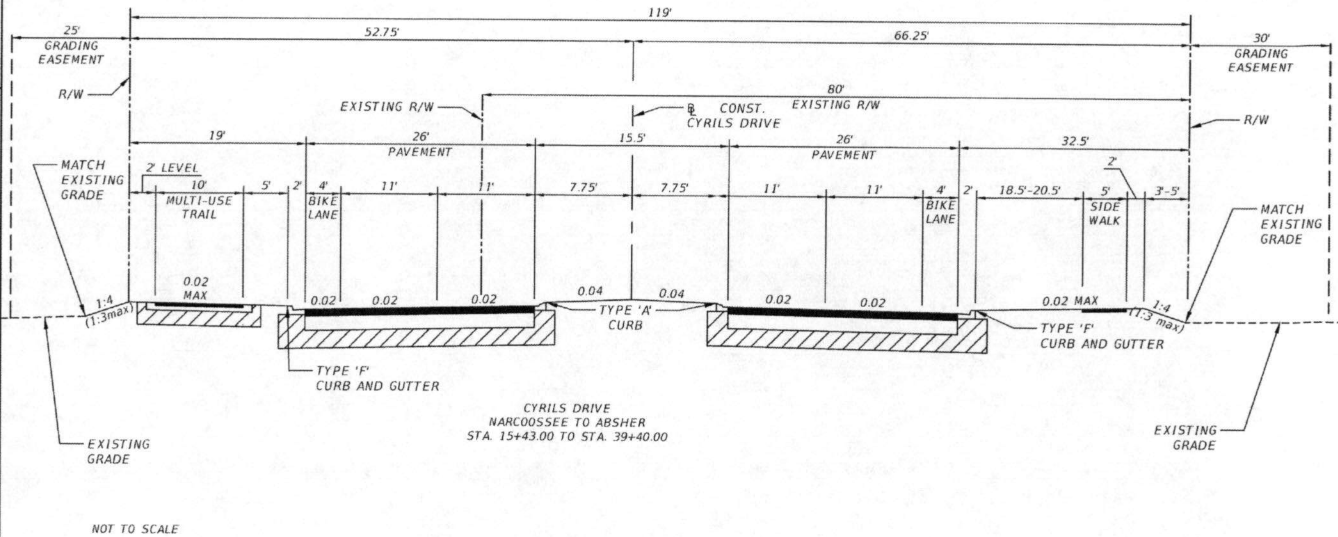
(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTIONS

DESIGN VARIATIONS

1. NONE

TYPICAL SECTION No. 2



TRAFFIC DATA

CURRENT YEAR	= 2020 AADT	=	5800
ESTIMATED OPENING YEAR	= 2023 AADT	=	6830
ESTIMATED DESIGN YEAR	= 2040 AADT	=	29100

K = 8% D = 55% T = 6% (24 HOUR)

DESIGN HOUR T	= 3%
DESIGN SPEED	= 35 MPH
POSTED SPEED	= 35 MPH

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

FINANCIAL PROJECT ID	SHEET NO.
N/A	3

Alice Brantley 6/14/2021 1:58:00 PM Z:\2017\17-042 Tavistock - Sunbridge\CYRILS DR\Narcossee to Absher\CAD\FINAL\COUNTY\Typical Section

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) N/A : L.A. FACILITY
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
(X) N/A : FL. GREENBOOK

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
(X) MAJOR COLLECTOR
( ) MINOR COLLECTOR
( ) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
(X) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
( ) 7 - BOTH MEDIAN TYPES

CRITERIA

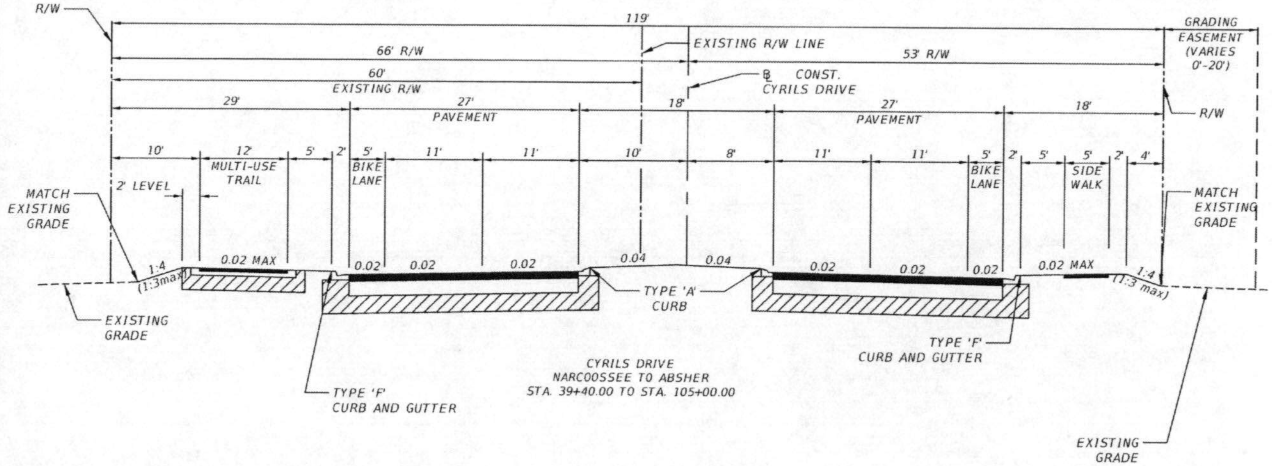
(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTIONS

DESIGN VARIATIONS

1. NONE

TYPICAL SECTION No. 3



TRAFFIC DATA

CURRENT YEAR	= 2020 AADT	=	4700
ESTIMATED OPENING YEAR	= 2023 AADT	=	6830
ESTIMATED DESIGN YEAR	= 2040 AADT	=	23700

K = 8% D = 55% T = 6% (24 HOUR)

DESIGN HOUR T	= 3%
DESIGN SPEED	= 35 MPH
POSTED SPEED	= 35 MPH

NOT TO SCALE

FINANCIAL PROJECT ID	SHEET NO.
N/A	4

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

PROJECT CONTROLS

CONTEXT CLASSIFICATION

( ) C1 : NATURAL
( ) C2 : RURAL
( ) C2T : RURAL TOWN
( ) C3R : SUBURBAN RES.
( ) N/A : L.A. FACILITY
( ) C3C : SUBURBAN COMM.
( ) C4 : URBAN GENERAL
( ) C5 : URBAN CENTER
( ) C6 : URBAN CORE
(X) N/A : FL. GREENBOOK

FUNCTIONAL CLASSIFICATION

( ) INTERSTATE
( ) FREEWAY/EXPWY.
( ) PRINCIPAL ARTERIAL
( ) MINOR ARTERIAL
(X) MAJOR COLLECTOR
( ) MINOR COLLECTOR
( ) LOCAL

HIGHWAY SYSTEM

( ) NATIONAL HIGHWAY SYSTEM
( ) STRATEGIC INTERMODAL SYSTEM
( ) STATE HIGHWAY SYSTEM
(X) OFF-STATE HIGHWAY SYSTEM

ACCESS CLASSIFICATION

( ) 1 - FREEWAY
( ) 2 - RESTRICTIVE w/Service Roads
( ) 3 - RESTRICTIVE w/660 ft. Connection Spacing
( ) 4 - NON-RESTRICTIVE w/2640 ft. Signal Spacing
(X) 5 - RESTRICTIVE w/440 ft. Connection Spacing
( ) 6 - NON-RESTRICTIVE w/1320 ft. Signal Spacing
( ) 7 - BOTH MEDIAN TYPES

CRITERIA

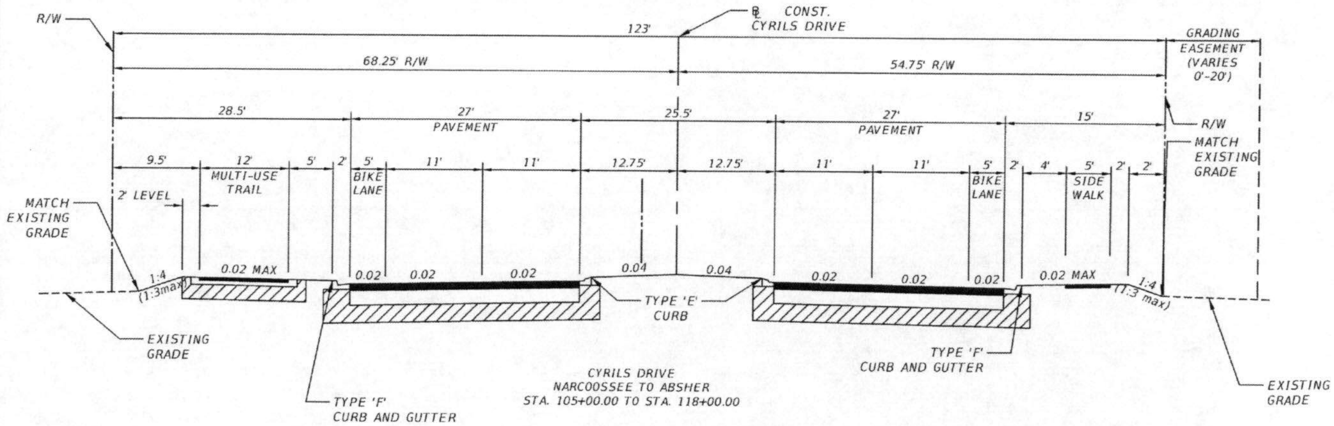
(X) NEW CONSTRUCTION / RECONSTRUCTION
( ) RESURFACING (LA FACILITIES)
( ) RRR (ARTERIALS & COLLECTORS)

POTENTIAL EXCEPTIONS AND VARIATIONS RELATED TO TYPICAL SECTIONS

DESIGN VARIATIONS

1. NONE

TYPICAL SECTION No. 4



TRAFFIC DATA

CURRENT YEAR	= 2020 AADT	= 4700
ESTIMATED OPENING YEAR	= 2023 AADT	= 6830
ESTIMATED DESIGN YEAR	= 2040 AADT	= 23700

K = 8% D = 55% T = 6% (24 HOUR)

DESIGN HOUR T = 3%

DESIGN SPEED = 35 MPH

POSTED SPEED = 35 MPH

NOT TO SCALE

FINANCIAL PROJECT ID	SHEET NO.
N/A	5

Alice Brantley 6/14/2021 2:00:28 PM Z:\2017\17-042 Tavistock - Sunbridge\CYRILS DR\Narcossee to Absher\CAD\FINAL\COUNTY\Typical Section

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APPENDIX C
HORIZONTAL AND VERTICAL GEOMETRY

Table 2.3 - Horizontal Stopping Sight Distance

Curve	PC Sta.	PT Sta.	Design Speed (mph)	Radius (ft)	FDOT Minimum SSD (ft)	*HSO for FDOT SSD (ft)	AASHTO Minimum SSD (ft)	*HSO for AASHTO SSD (ft)	**Existing SSD (ft)	***Existing HSO (ft)	Recommendation
Curve 1	27+17.01	31+17.01	35	650.00	250	11.98	250	11.98	626	74	Meets Criteria
Curve 2	33+69.99	37+99.74	35	695.00	250	11.21	250	11.21	557	55	Meets Criteria

* $M = R\{1 - \cos[(28.65 \times S)/R]\}$ where M = HSO (ft), R = radius of curve (ft) and S = SSD (ft) (AASHTO or FDOT)

** $S = R/28.65 \times \{\cos^{-1}[(R-M)/R]\}$ where M = HSO (ft) (AASHTO), R = radius of curve (ft) and S = SSD (ft)

HSO = Horizontal Sightline Offset

*** Based on field measurements and Google Earth

Crest Vertical Curve Stopping Sight Distance

Location	PVC Sta.	PVT Sta.	Design Speed (mph)	Algebraic Grade Difference (%) (A)	Curve Length (ft) (L)	Calculated K Value	Minimum K Value	Comp. Sight Dist. (2' obj.) [2] (S)	Min. Sight Distance (2' Obj. Height) (ft)	Comp. Sight Dist. (ft.) (6" obj.) [1] (S)	Min. Sight Distance (6" Obj. Height) (ft)	SIGHT DISTANCE 6" Object Height	SIGHT DISTANCE 2' Object Height
Mainline	38+25.00	39+75.00	35	2.215	150	67.7	29	562	250	375.00	250	MEETS	MEETS
Mainline	70+07.00	71+57.00	35	1.025	150	146.3	29	1128	250	723.29	250	MEETS	MEETS

(1) S = ((1329L)/A)^0.5 for S < L and S = [L+(1329/A)]/2 for S>L (AASHTO) Equations 3-41 & 3-42
(2) S = ((2158L)/A)^0.5 for S < L and S = [L+(2158/A)]/2 for S>L (AASHTO) Equations 3-43 & 3-44

Sag Vertical Curve Stopping Sight Distance

Location	PVC Sta.	PVT Sta.	Design Speed (mph)	Algebraic Grade Difference (%) (A)	Curve Length (ft) (L)	Calculated K Value	Minimum K Value	Min. Curve Length Required (ft.) [1]	Min. Sight Distance (ft) (S)	SIGHT DISTANCE
Mainline	34+85.00	36+35.00	35	2.210	150	67.9	49	-76.92	250	MEETS
Mainline	54+85.00	56+35.00	35	1.490	150	100.7	49	-355.70	250	MEETS
Mainline	75+25.00	76+75	35	0.901	150	166.5	49	-915.09	250	MEETS

(1) L = AS^2/(400+3.5S) for S < L and L = 2S-((400+3.5S)/A) for S>L (AASHTO) Equations 3-48 & 3-50
Note: Negative minimum curve length required means vertical curve of 0 length is needed.

Equation for SSD constant based on varying eye height and object height:
C= 100*((2*h1)^0.5+(2*h2)^0.5)^2

h1=	3.5	feet	Eye Height
h2=	2.0	feet	Object Height
C=	2158		

APPENDIX D
SUPERELEVATION

Assumes 1 rotation point

Begin Transition Station:	26+33.820
Transition Length:	104.00
Slope Ratio:	100

Negative slope ratio = transitior

SUPER ELEVATION TRANSITION:

STATION KNOWN:

Begin Transition	26+33.820
Begin SE	-0.02
End Transition	27+37.820
End SE	0.02
Station of SE Needed	27+10.000
Super at Needed Station	**0.00930**

SUPER ELEVATION TRANSITION

SUPER KNOWN:

Begin Transition	26+33.820
Begin SE	-0.02
End Transition	27+37.820
End SE	0.02
SE at Station Needed	0.000
Station Needed	**26+85.820**

SLOPE ALONG CURVE

Sta.	Cross Slope
26+33.820	**-0.0200**
26+43.820	**-0.0162**
26+63.820	**-0.0085**
26+83.820	**-0.0008**
27+03.820	**0.0069**
27+23.820	**0.0146**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**

Assumes 1 rotation point

Begin Transition Station: 30+96.210
Transition Length: 104.00
Slope Ratio: 100

Negative slope ratio = transitior

SUPER ELEVATION TRANSITION:

STATION KNOWN:

Begin Transition	30+96.210
Begin SE	0.02
End Transition	32+00.210
End SE	-0.02
Station of SE Needed	32+00.000
Super at Needed Station	**-0.01992**

SUPER ELEVATION TRANSITION

SUPER KNOWN:

Begin Transition	30+96.210
Begin SE	0.02
End Transition	32+00.210
End SE	-0.02
SE at Station Needed	0.000
Station Needed	**31+48.210**

SLOPE ALONG CURVE

Sta.	Cross Slope
30+96.210	**0.0200**
31+16.210	**0.0123**
31+36.210	**0.0046**
31+56.210	**-0.0031**
31+76.210	**-0.0108**
31+96.210	**-0.0185**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**

Assumes 1 rotation point

Begin Transition Station:	32+86.790
Transition Length:	104.00
Slope Ratio:	100

Negative slope ratio = transitior

SUPER ELEVATION TRANSITION:

STATION KNOWN:

Begin Transition	32+86.790
Begin SE	-0.02
End Transition	33+90.790
End SE	0.02
Station of SE Needed	33+64.000
Super at Needed Station	**0.00970**

SUPER ELEVATION TRANSITION

SUPER KNOWN:

Begin Transition	32+86.790
Begin SE	-0.02
End Transition	33+90.790
End SE	0.02
SE at Station Needed	0.000
Station Needed	**33+38.790**

SLOPE ALONG CURVE

Sta.	Cross Slope
32+86.790	**-0.0200**
33+06.790	**-0.0123**
33+26.790	**-0.0046**
33+46.790	**0.0031**
33+66.790	**0.0108**
33+86.790	**0.0185**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**

Assumes 1 rotation point

Begin Transition Station:	37+78.940
Transition Length (ft):	104.00
Slope Ratio:	100

Negative slope ratio = transitior

SUPER ELEVATION TRANSITION:

STATION KNOWN:

Begin Transition	37+78.940
Begin SE	0.02
End Transition	38+82.940
End SE	-0.02
Station of SE Needed	38+30.940
Super at Needed Station	**0.00000**

SUPER ELEVATION TRANSITION

SUPER KNOWN:

Begin Transition	37+78.940
Begin SE	0.02
End Transition	38+82.940
End SE	-0.02
SE at Station Needed	0.000
Station Needed	**38+30.940**

SLOPE ALONG CURVE

Sta.	Cross Slope
37+78.940	**0.0200**
37+98.940	**0.0123**
38+18.940	**0.0046**
38+38.940	**-0.0031**
38+58.940	**-0.0108**
38+78.940	**-0.0185**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**
+0.000	**0.0000**

APPENDIX E
PAVEMENT DESIGN

CYRILS DRIVE

from Narcoossee Road to Absher Road
Osceola County

Pavement Design

POULOS & BENNETT

2602 E. Livingston Street | Orlando, Florida 32803 | Tel: 407.487.2594 | www.poulosandbennett.com
FBPE Certificate of Authorization No. 2856

EXECUTIVE SUMMARY

Cyrils Drive is being widened from two to four lanes from Narcoossee Road to Absher Drive in Osceola County, approximately 1.96 miles. This pavement design addresses the reconstruction of Cyrils Drive.

Existing Conditions
Within the project limits, Cyrils Drive is a two-lane rural roadway without paved shoulders. Based on the pavement cores (see roadway geotechnical report), the existing pavement section consists of the following:

Travel Lane Pavement

2.0” – 5.0” Asphalt
2.0” – 11.0” Base Course
12.0” Stabilized Subgrade

Traffic Data
Refer to the appendices for Traffic Data and ESAL values in **Appendix A**. The design ESALs for the 20-year design period (2022 to 2042) is 2,646,000.

Design Approach
The proposed pavement structures are designed in accordance with the criteria and guidelines established in the following FDOT publications:

a. Flexible Pavement Design Manual, January 2021
b. Standard Plans, FY 2021-22

A design period of 20 years is utilized beginning in year 2022. A Reliability factor of 90% will be used.

The base clearance is reduced for the section of Cyrils from sta. 62+22 to sta. 111+33 to remove the need for a wall along the north side. In accordance with the FDOT pavement design manual Section 5.2.2, for a 1-ft base clearance the Design Resilient Modulus must be reduced by 50%. Also included in **Appendix C** is a letter from the Geotechnical Engineer confirming that the roadway profile satisfies base clearance requirements and underdrain is not needed.

Typical Section Development (See Section E for Typical Sections)
The typical section for Cyrils will be two eleven-foot lanes in each direction separated by a 15.5 - 18 feet wide raised, grassed median.

Existing Pavement Evaluation
The existing pavement will be removed.

Reconstruction Recommendations
The Pavement Design Summary Sheets are included. Cyrils Road will be reconstructed with 1.0” of Type SP-9.5 (Traffic B) Surface Course, 2.0” Type SP-12.5 Structural Course and 10” Limerock Base with 12” of Stabilized Subgrade. For the section of Cyrils from sta. 62+22 to sta. 111+33, the structural course is increased to 3.0” due to lowering the base clearance from 2.0’ to 1.0’. The base clearance was reduced to eliminate the need for walls along the north side of Cyrils Drive in the area of Split Oak Forest that is within a conservation easement. Appropriate Traffic Levels are shown on respective Pavement Summary Sheets. Lift thicknesses may vary due to constructability considerations.

Other Design Considerations:
Osceola has expressed a desire to provide at least 1.5 feet of base clearance or provide an underdrain. This would require raising the profile approximately 0.5 feet. Black base was also considered using the proposed profile and the minimum 1’ base clearance. The equivalent thickness of black base is 6” which would increase the base clearance by 4” and provide a minimum 16” base clearance. This would be needed for the length of the 1’ base clearance

which is 4,911 feet. This would be a substantial cost increase (approximately $13/SY cost increase. For 4,911 feet length of black base and 52 feet wide roadway the total cost increase would be approximately $370,000).

Pavement Design Calculations

Subject: Cyrils Widening from Narcoossee to Absher

Description: Mainline Widening

Computed By: RDB
Checked By: DK
Date: 9/1/2021
Sheet No.:
Job Nos.: N/A
N/A

Required Structural Number:

***M_R (psi) =**	6,000	50% reduction for 1' base clearance
M_R (Mpa) =		
%R =	90%	per FPDM Table 5.2
Design Period (yrs) =	20	per FPDM Table 3.1
Design ESALs =	2,646,000	

Million ESALs		**M_R psi x 1000**	
	6.00	6.00	6.00
2.500	4.36	4.36	4.36
2.646		4.40	
3.000	4.48	4.48	4.48

Interpolating from Table A.7A (FPDM, pg. A.17.0) **SN_R =** **4.40**

*M_R (psi) for 2' base clearance = 12,000 psi from FPDM 5.2.4 Max LBR = 40 and Table 5.1

Adjacent Pavement Structure: (proposed resurfaced section)

New Type SP = **0"** Traffic Level =

Layer	Thickness(in)	Structural Coefficient	Structural Value
FC-5	0	0.00	0.00
Ty SP (TL-E)	0.00	0.00	0.00
Limerock	0.00	0.00	0.00
Stabilization (Typ B)	0.00	0.00	0.00
			0.00

Proposed Pavement Structure:

Type SP = **3.0"** + 1.0 inch FC-9.5 Traffic Level = **B**

Note: PG Binder 76-22 required in all superpave structural courses

Layer	Thickness	Structural Coefficient	Structural Value
FC-9.5	1.00	0.44	0.44
Ty SP (TL-B)	3.00	0.44	1.32
*Optional Base	10.00	0.18	1.80
Stabilization (Typ B)	12.00	0.08	0.96
			4.52

Check

If **4.52** is equal/greater than **4.40** Then **OK**

NOTE:

*Optional Base group 9 (10.0" limerock)

Pavement Design Calculations

Subject: Cyrils Widening from Narcoossee to Absher

Description: Mainline Widening

Computed By: RDB
Checked By: DK
Date: 09/01/21
Sheet No.:
Job Nos.: N/A
N/A

Required Structural Number:

M_R (psi) =	12,000	
M_R (Mpa) =		
%R =	90%	per FPDM Table 5.2
Design Period (yrs) =	20	per FPDM Table 3.1
Design ESALs =	2,646,000	

Million	**M_R psi x 1000**		
ESALs	12.00	12.00	12.00
2.500	3.38	3.38	3.38
2.646		3.41	
3.000	3.48	3.48	3.48

Interpolating from Table A.10B (FPDM, pg. A.24.0) SN_R = **3.41**

Existing Pavement Structure: (Fair Condition)

Layer	Thickness(in)	Structural Coefficient	Structural Value
FC-2	0.00	0.00	0.00
*Limerock	0.00	0.00	0.00
**Stabilization (Typ B)	0.00	0.00	0.00
		SN_E =	**0.00**

**10.5" limerock assumed for existing base thickness - per SLDs*
***Stabilization assumed*

Milling Recommendation:

mill = **0"** typical at centerline of existing lanes NB & SB

Proposed Pavement Structure:

Resurfacing: ARMI + **Ty SP 4"** + 3/4 inch FC-5 Traffic Level = **B**

Note: PG Binder 76-22 required in all superpave structural courses

Layer	Thickness(in)	Structural Coefficient	Structural Value
FC-9.5	1.00	0.44	0.44
Ty SP (TL-E)	2.00	0.44	0.88
Limerock	10.00	0.18	1.80
Stabilization (Typ B)	12.00	0.08	0.96
			4.08

Check

If **4.08** is greater than SN_R **3.41** Then **OK**

TABLE A.4A

REQUIRED STRUCTURAL NUMBER (SN_R)
90% RELIABILITY (%R)
RESILIENT MODULUS (M_R) RANGE 4,000 PSI TO 18,000 PSI

	RESILIENT MODULUS (M_R), (PSI x 1000)														
$ESAL_D$	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
100,000	3.02	2.77	2.59	2.44	2.31	2.21	2.12	2.04	1.97	1.91	1.86	1.81	1.76	1.72	1.68
150,000	3.23	2.97	2.77	2.61	2.47	2.36	2.27	2.19	2.11	2.05	1.99	1.94	1.89	1.84	1.80
200,000	3.39	3.11	2.90	2.73	2.60	2.48	2.38	2.30	2.22	2.15	2.09	2.03	1.98	1.94	1.89
250,000	3.52	3.23	3.01	2.84	2.69	2.57	2.47	2.38	2.30	2.23	2.17	2.11	2.06	2.01	1.97
300,000	3.62	3.33	3.10	2.92	2.78	2.65	2.55	2.46	2.37	2.30	2.24	2.18	2.12	2.07	2.03
350,000	3.71	3.41	3.18	3.00	2.85	2.72	2.61	2.52	2.44	2.36	2.30	2.23	2.18	2.13	2.08
400,000	3.79	3.49	3.25	3.07	2.91	2.78	2.67	2.58	2.49	2.42	2.35	2.29	2.23	2.18	2.13
450,000	3.87	3.56	3.32	3.13	2.97	2.84	2.73	2.63	2.54	2.46	2.39	2.33	2.27	2.22	2.17
500,000	3.93	3.62	3.38	3.18	3.02	2.89	2.77	2.67	2.59	2.51	2.44	2.37	2.31	2.26	2.21
600,000	4.05	3.73	3.48	3.28	3.12	2.98	2.86	2.76	2.67	2.58	2.51	2.45	2.39	2.33	2.28
700,000	4.14	3.82	3.57	3.36	3.20	3.05	2.93	2.83	2.73	2.65	2.58	2.51	2.45	2.39	2.34
800,000	4.23	3.90	3.64	3.44	3.27	3.12	3.00	2.89	2.80	2.71	2.63	2.57	2.50	2.44	2.39
900,000	4.31	3.97	3.71	3.51	3.33	3.18	3.06	2.95	2.85	2.76	2.69	2.62	2.55	2.49	2.44
1,000,000	4.38	4.04	3.78	3.57	3.39	3.24	3.11	3.00	2.90	2.81	2.73	2.66	2.60	2.54	2.48
1,500,000	4.65	4.30	4.03	3.81	3.62	3.46	3.33	3.21	3.10	3.01	2.92	2.85	2.78	2.71	2.65
2,000,000	4.85	4.50	4.21	3.99	3.79	3.63	3.49	3.36	3.25	3.16	3.07	2.99	2.91	2.85	2.78
2,500,000	5.01	4.65	4.36	4.13	3.93	3.76	3.62	3.49	3.38	3.27	3.18	3.10	3.02	2.95	2.89
3,000,000	5.14	4.77	4.48	4.25	4.05	3.88	3.73	3.60	3.48	3.37	3.28	3.19	3.12	3.04	2.98
3,500,000	5.25	4.88	4.59	4.35	4.14	3.97	3.82	3.69	3.57	3.46	3.36	3.28	3.20	3.12	3.06
4,000,000	5.35	4.98	4.68	4.44	4.23	4.06	3.90	3.77	3.65	3.54	3.44	3.35	3.27	3.19	3.12
4,500,000	5.44	5.06	4.76	4.52	4.31	4.13	3.98	3.84	3.72	3.61	3.51	3.42	3.33	3.26	3.19
5,000,000	5.52	5.14	4.83	4.59	4.38	4.20	4.04	3.90	3.78	3.67	3.57	3.47	3.39	3.31	3.24
6,000,000	5.66	5.27	4.96	4.71	4.50	4.32	4.16	4.02	3.89	3.78	3.67	3.58	3.49	3.41	3.34
7,000,000	5.78	5.38	5.07	4.82	4.61	4.42	4.26	4.12	3.99	3.87	3.77	3.67	3.58	3.50	3.43
8,000,000	5.88	5.48	5.17	4.91	4.70	4.51	4.35	4.20	4.07	3.95	3.85	3.75	3.66	3.58	3.50
9,000,000	5.97	5.57	5.26	5.00	4.78	4.59	4.43	4.28	4.15	4.03	3.92	3.82	3.73	3.65	3.57
10,000,000	6.06	5.65	5.33	5.07	4.85	4.66	4.50	4.35	4.22	4.10	3.99	3.89	3.79	3.71	3.63
15,000,000	6.39	5.97	5.64	5.37	5.14	4.95	4.77	4.62	4.48	4.36	4.25	4.14	4.05	3.96	3.88
20,000,000	6.63	6.20	5.86	5.59	5.35	5.15	4.98	4.82	4.68	4.55	4.44	4.33	4.23	4.14	4.06
25,000,000	6.82	6.38	6.04	5.76	5.52	5.32	5.14	4.98	4.84	4.71	4.59	4.48	4.38	4.29	4.20
30,000,000	6.98	6.53	6.18	5.90	5.66	5.45	5.27	5.11	4.96	4.83	4.71	4.60	4.50	4.41	4.32
35,000,000	7.12	6.66	6.31	6.02	5.78	5.57	5.38	5.22	5.07	4.94	4.82	4.71	4.61	4.51	4.42
40,000,000	7.24	6.78	6.42	6.13	5.88	5.67	5.48	5.32	5.17	5.04	4.91	4.80	4.70	4.60	4.51
45,000,000	7.34	6.88	6.52	6.22	5.97	5.76	5.57	5.41	5.26	5.12	5.00	4.88	4.78	4.68	4.59
50,000,000	7.44	6.97	6.61	6.31	6.06	5.84	5.65	5.49	5.34	5.20	5.07	4.96	4.85	4.76	4.66
60,000,000	7.61	7.13	6.76	6.46	6.21	5.99	5.79	5.62	5.47	5.33	5.21	5.09	4.98	4.88	4.79
70,000,000	7.76	7.27	6.90	6.59	6.33	6.11	5.91	5.74	5.59	5.45	5.32	5.20	5.09	4.99	4.90
80,000,000	7.88	7.40	7.01	6.70	6.44	6.22	6.02	5.85	5.69	5.55	5.42	5.30	5.19	5.09	4.99
90,000,000	8.00	7.51	7.12	6.80	6.54	6.31	6.11	5.94	5.78	5.64	5.51	5.39	5.28	5.17	5.08
100,000,000	8.10	7.60	7.21	6.90	6.63	6.40	6.20	6.02	5.86	5.72	5.59	5.47	5.35	5.25	5.15

APPENDIX A
TRAFFIC DATA

APPENDIX E

Design Traffic Report

Narcoossee Community
Conceptual Roadway Design
Design Traffic Technical Memorandum

Prepared For:

MAY 2017

Prepared By:

Kimley»Horn

Table of Contents

Tables

Figures

1.0 PROJECT INFORMATION

1.1 INTRODUCTION

This Design Traffic Technical Memorandum (DTTM) has been prepared by Kimley-Horn and Associates, Inc. on behalf of Osceola County. The study area consists of four roadways within the Narcoossee Community, including:

- Cyrils Drive, from Narcoossee Road to Rummell Road Extension;
- Jack Brack Road, from Narcoossee Road to Rummell Road Extension;
- Jones Road, from Narcoossee Road to Rummell Road Extension; and,
- Rummell Road Extension, from Narcoossee Road to Cyrils Drive.

The purpose of this DTTM is to provide design traffic volumes and traffic analyses in support of the Conceptual Roadway Design for key roads within the Narcoossee Community in Osceola County. This memorandum includes documentation of the development of future traffic volumes (year 2040) and recommended roadway design characteristics. Future design traffic volumes were developed and operating conditions were evaluated for recommended typical sections and intersection geometry.

1.2 OBJECTIVE

The objective of this DTTM is to provide Osceola County with information to support conceptual roadway design studies within the Narcoossee Community overlay. This information includes the Annual Average Daily Traffic (AADT), Peak Hour Volume (PHV), and roadway volume to capacity (V/C) ratio for the Opening Year (2020), Mid-Design Year (2030), and Design Year (2040). This report also involves the development of the design traffic characteristics including Peak Hour Demand (K factor), Design Hour Directional Demand (D factor), and percentage of trucks for both the design hour and daily demand (T_f and T_{24} factors) that will be used in calculating the future peak hour traffic volumes and future operational analyses. In addition, this report includes the development of intersection turning movement queue lengths to support intersection designs.

1.3 METHODOLOGY

The methodology for this DTTM includes steps to collect existing data from multiple sources, determine forecast development levels, and develop the anticipated future year design traffic volumes. Future year traffic volumes and operational analyses are provided for existing and planned roadways using procedures described in the Florida Department of Transportation (FDOT) 2014 Project Traffic Forecasting (PTF) Handbook.

1.4 DESIGN PERIOD

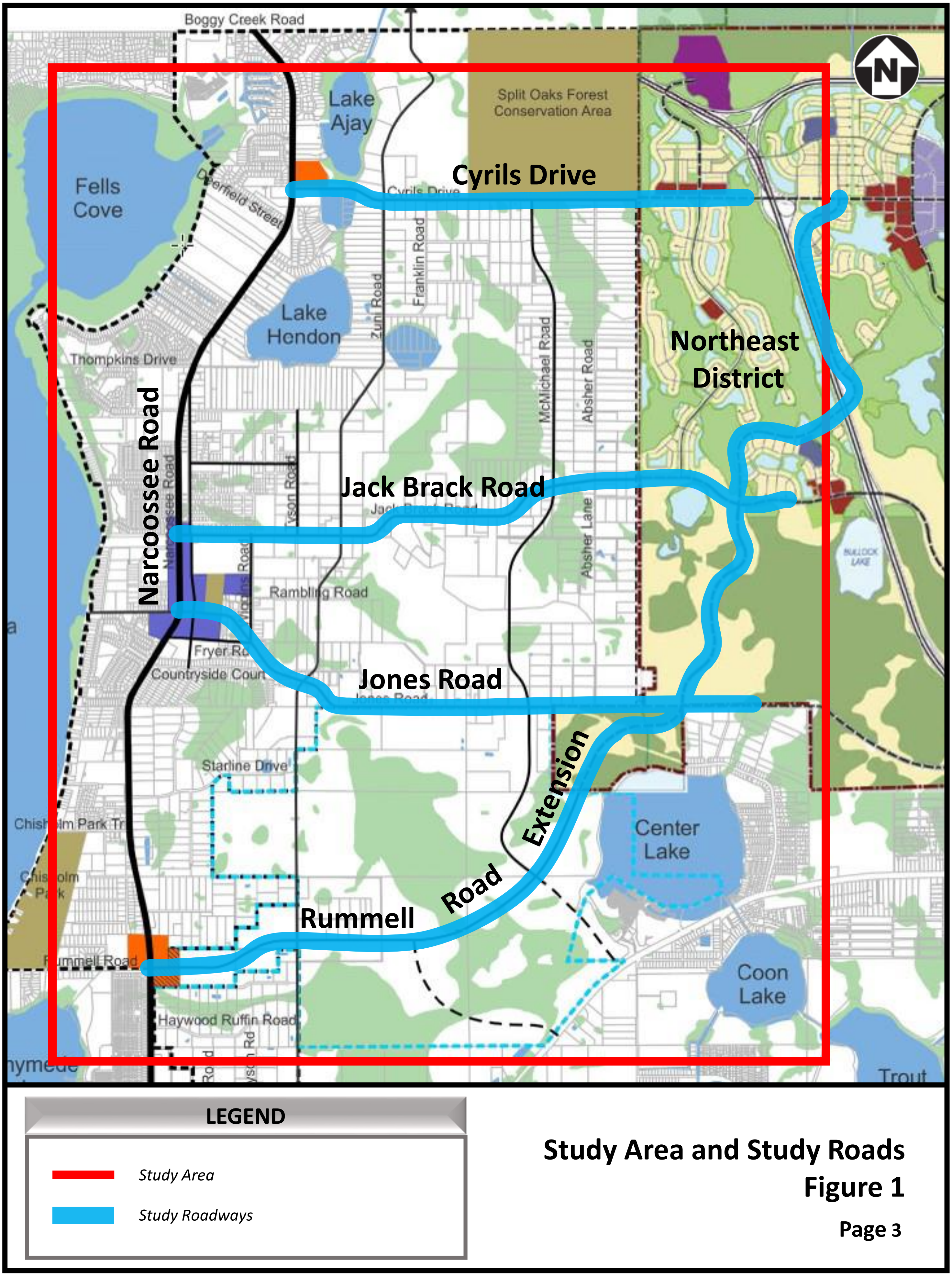
The following analysis years were used to evaluate conditions for project roadways:

- Opening Year – 2020
- Mid-Design Year – 2030
- Design Year – 2040

1.5 PROJECT LOCATION AND STUDY AREA

The study area is bounded to the north by the Osceola County / Orange County line, to the south by Nova Road, to the west by Narcoossee Road, and to the east by the Northeast District. The four study roadways and the study area are shown in **Figure 1**.

Narcoossee Road is a principal arterial (and Planned Multimodal Corridor) through the study area with four-lanes. Nova Road is a minor arterial (and Planned Avenue) with two-lanes. Jones Road is a two-lane minor collector (and Planned Avenue) and all the other roads within the study area are two-lane local roads. Jack Brack Road is a Planned Avenue and Cyrils Drive is a Planned Boulevard.



Study Area and Study Roads
Figure 1

2.0 EXISTING CONDITIONS

Data collection was conducted to establish existing geometry and available roadway segment counts. The results of this data collection are presented in the subsequent sections, tables, and figures.

2.1 EXISTING GEOMETRY

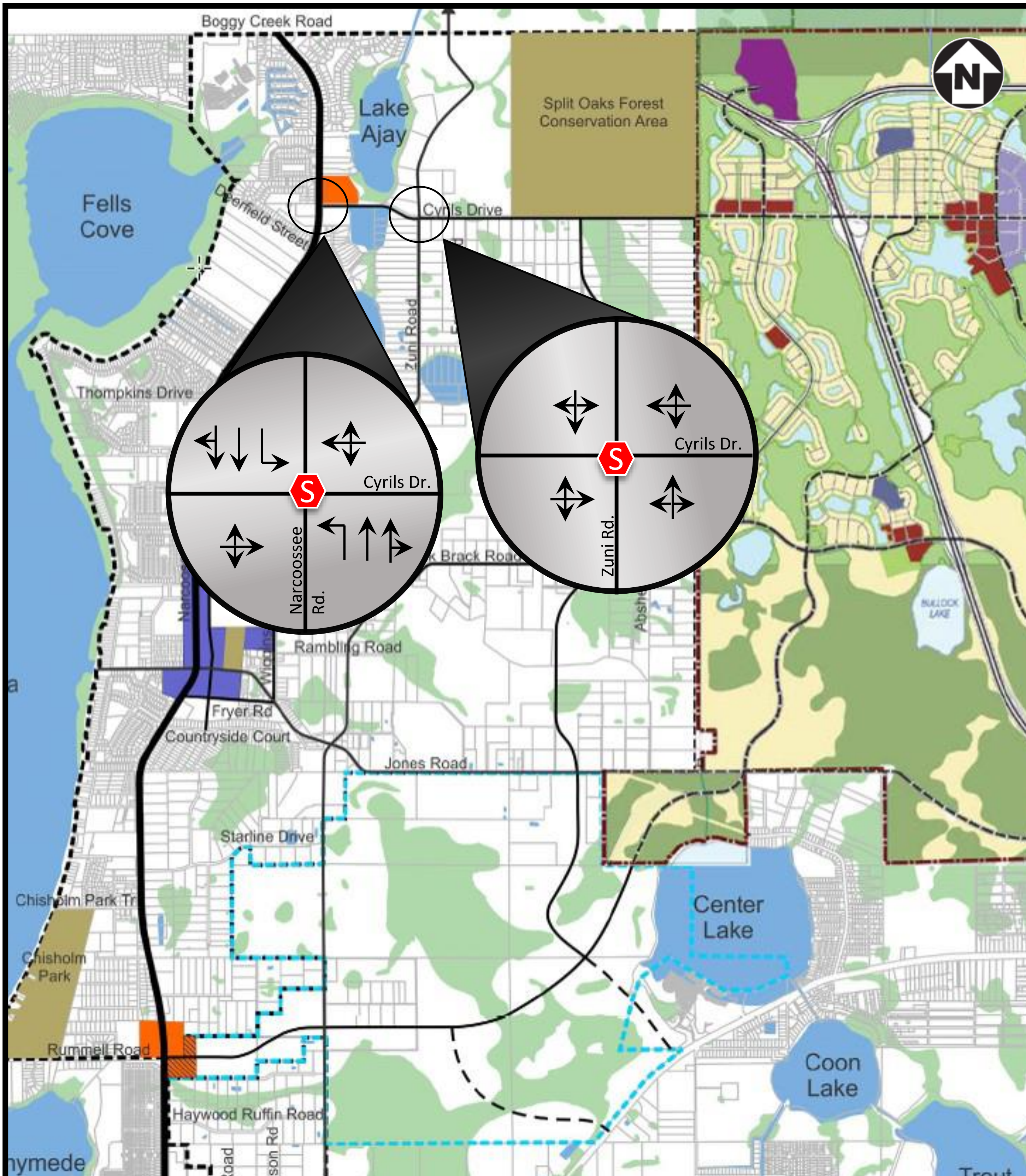
The existing geometry in the study area was obtained through a review of aerial imagery, and confirmed through field observations. Narcoossee Road, which is a four-lane divided roadway, is the only road in the study area that is not two-lanes. Two study area intersections are currently signalized, Narcoossee Road at Jones Road and Narcoossee Road at Rummell Road. Existing geometry and control at each of the study intersections is illustrated in **Figure 2** (Cyrils Road), **Figure 3**, (Jack Brack Road), **Figure 4** (Jones Road) and **Figure 5** (Rummell Road).

2.2 EXISTING TRAFFIC VOLUMES

Segment counts were available on Narcoossee Road, Nova Road and Jones Road. A summary of the existing segment traffic data is shown in **Table 1.** Existing AADTs for the study area roadway segments are shown in **Figure 6.**

Table 1: Existing Year 2015 AADT

Roadway	AADT
Narcoossee Road	
North of Cyrils Drive	17,200
Jones Road to Rummell Road	16,400
South of Rummell Road	15,600
Jones Road	
East of Narcoossee Road	800
Nova Road	
North of US 192	3,600



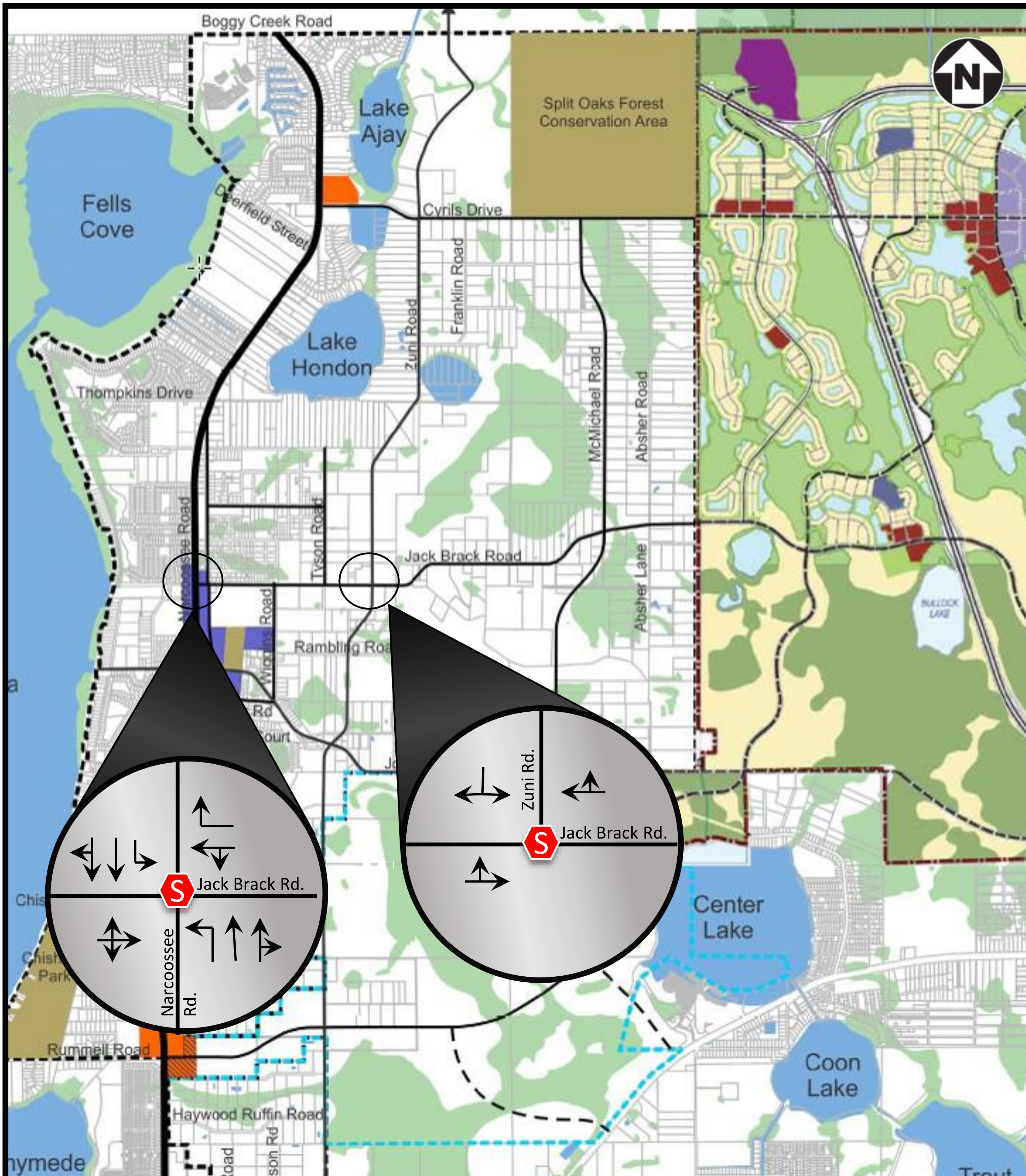
LEGEND

Signalized Intersection

Stop Controlled Intersection

Cyrils Drive Existing Geometry

Figure 2



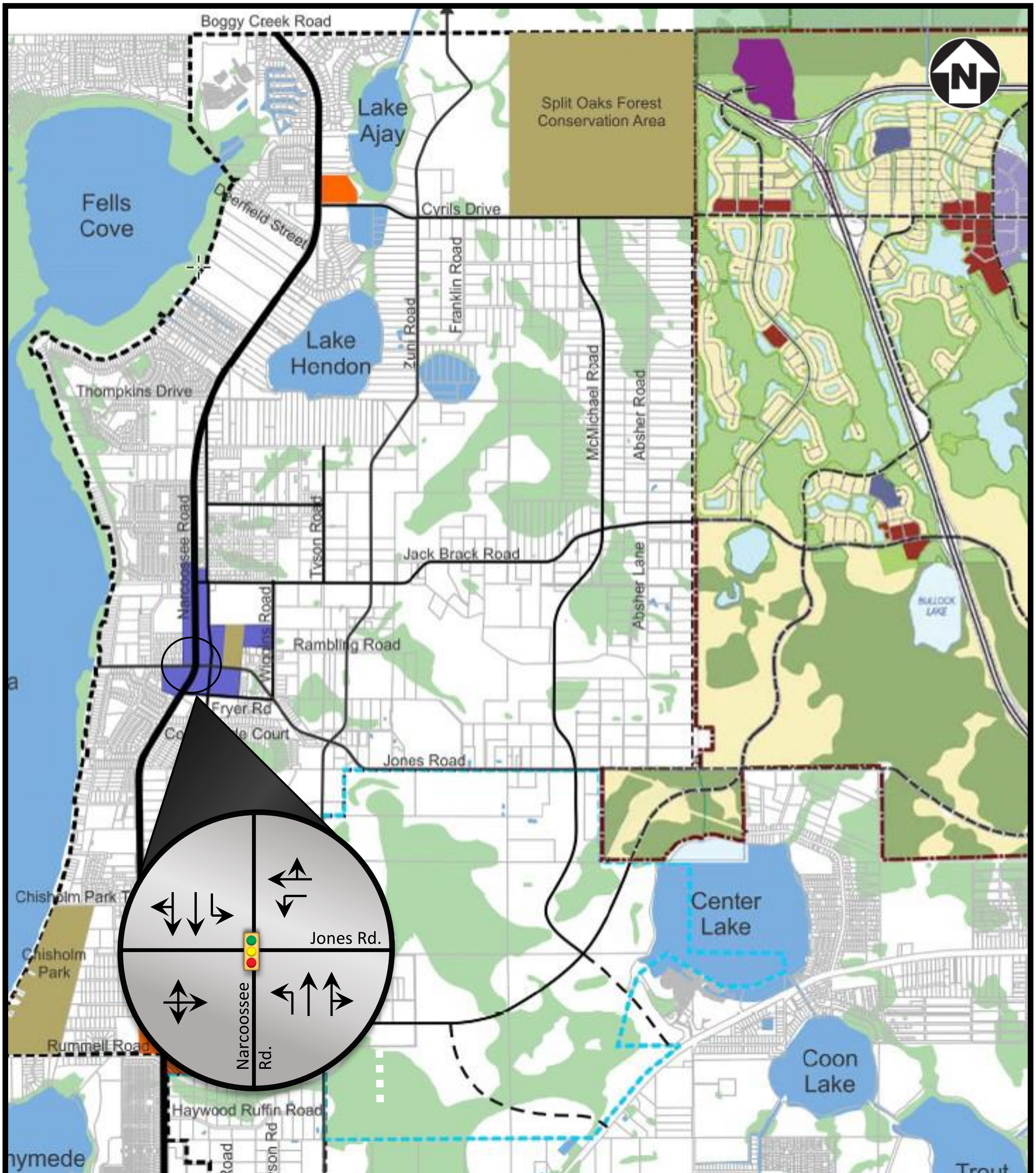
LEGEND

Signalized Intersection

Stop Controlled Intersection

Jack Brack Road Existing Geometry

Figure 3

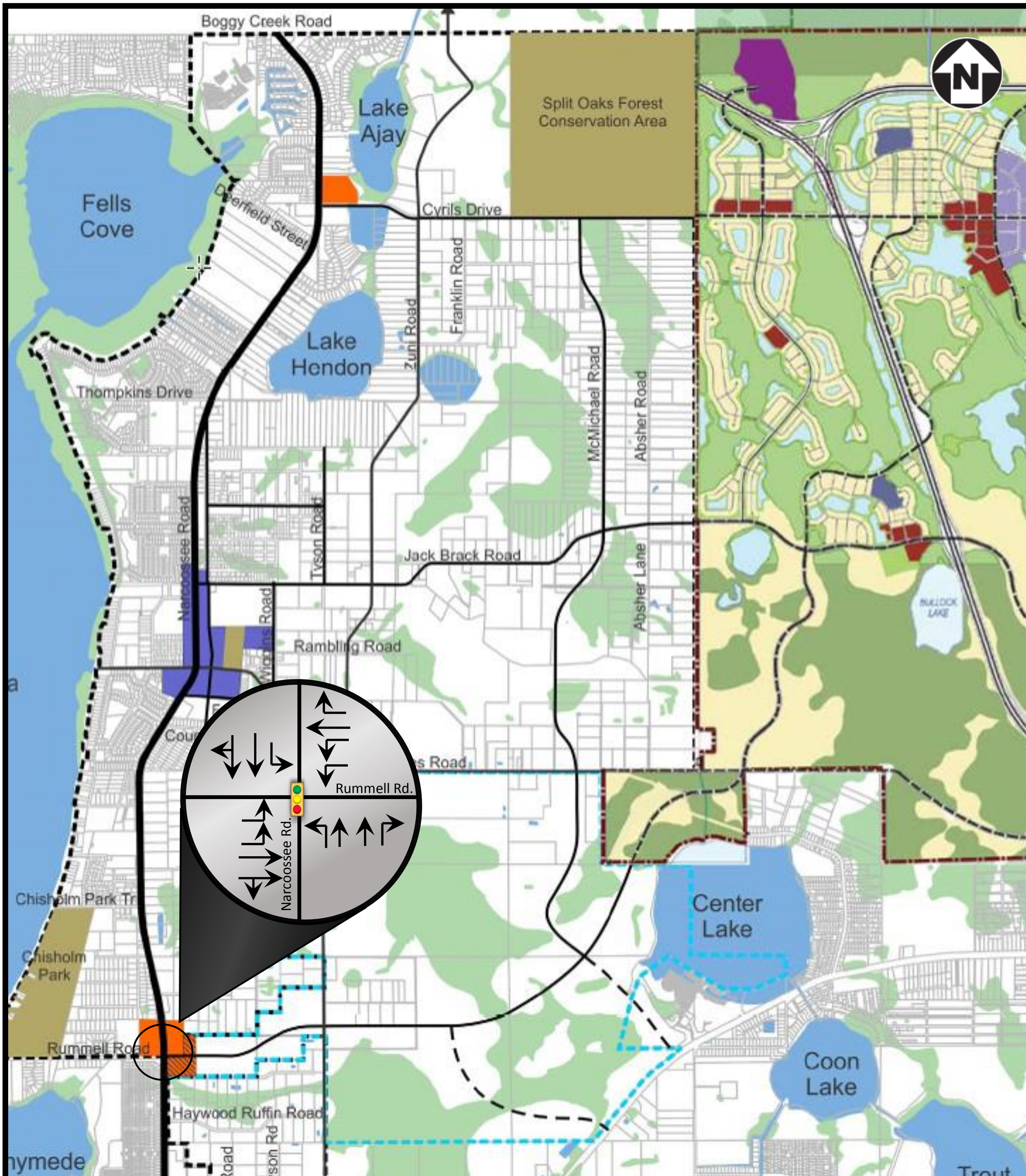


LEGEND

Signalized Intersection

Stop Controlled Intersection

Jones Road Existing Geometry
Figure 4



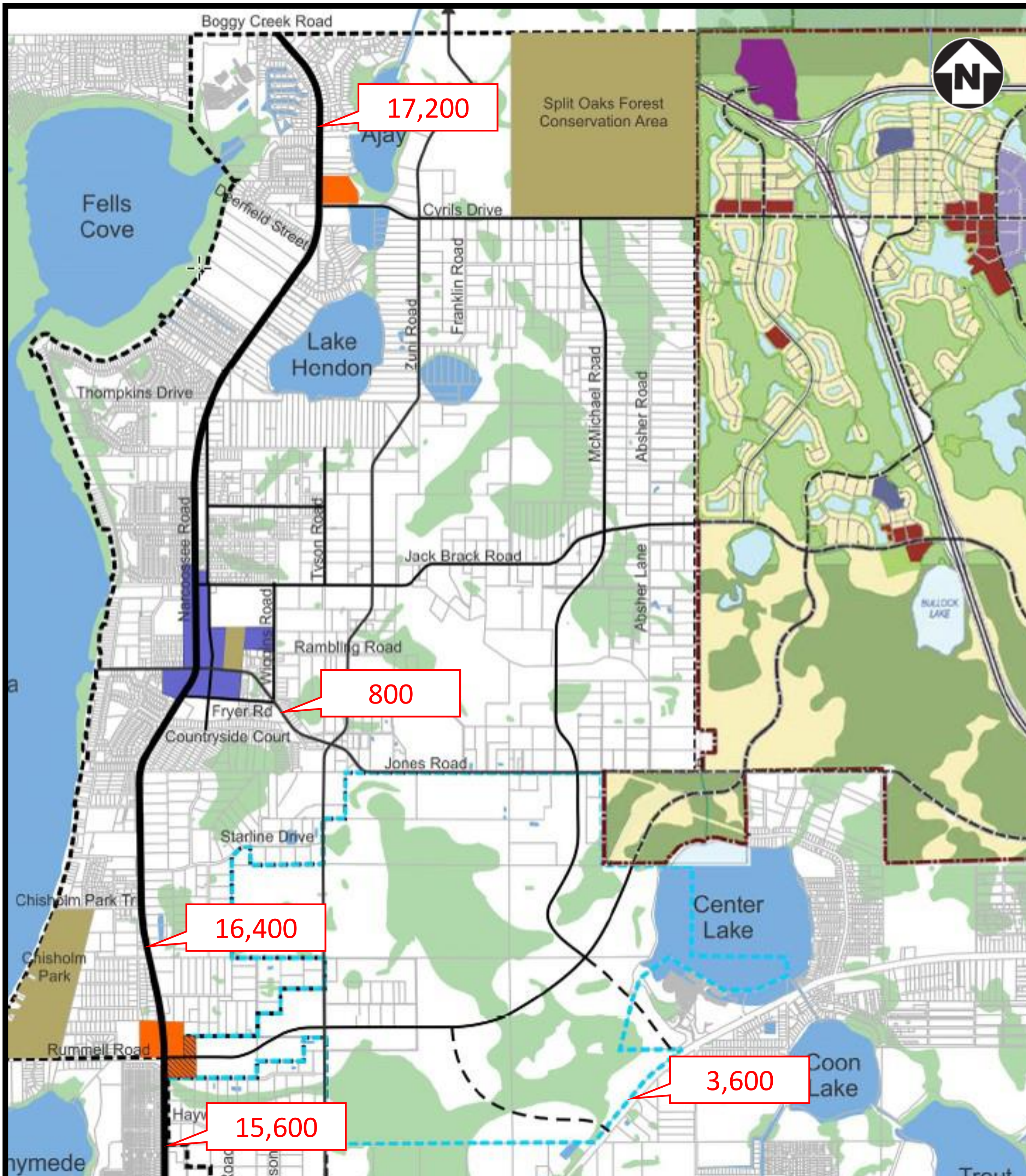
LEGEND

Signalized Intersection

Stop Controlled Intersection

Rummell Road Existing Geometry

Figure 5



LEGEND

XX Vehicles Per Day

Year 2015 AADT
Figure 6

3.0 DEVELOPMENT OF DESIGN CHARACTERISTICS

The primary traffic design characteristics are the peak hour volume to AADT ratio (K factor), Design Hour Directional Demand (D Factor), and percentage of trucks for both the design hour and daily demand (T_f and T_{24} Factors). These characteristics will be used in developing the future traffic volumes and conducting future operational analyses.

3.1 K FACTOR

The K factor defines the proportion between the design hour volume (DHV) and daily volume. Under typical conditions in urban areas, a 9.0% K factor is considered standard by FDOT. However, as areas develop, the K factor becomes lower because traffic during the peak hour tends to spread out over multiple hours due to congestion throughout the regional network. The K factor also tends to become lower as the land uses become more mixed. Recognizing that the study area roads will be serving the surrounding development, as well as the mixed use Northeast District, it is expected that the characteristics will be more consistent with urban roads and will have a K factor lower than FDOT's standard K. Therefore, a K factor of 8.0 percent is recommended for the design hour, which is typically the P.M. peak hour.

3.2 D FACTOR

The D factor is used to determine the directional split of traffic during the design hour.

Based on FDOT information, a typical D factor for an urban arterial is from 50.8% to 67.1%. Higher D factors generally occur where there is not a mixture of land uses (like a roadway serving mainly residential development). Recognizing that the County seeks to provide a good mixture of land uses within the Northeast District, a 55% D factor is recommended for this project.

3.3 T_{24} AND T_F FACTORS

Truck percentages are calculated for both Daily (T_{24}) and Peak Hour (T_f) conditions for use in developing future year truck volumes. The measured T_{24} factor for Narcoossee Road is 6.9%. The expectation is that most trucks traveling through the study area will use Osceola Parkway Extension and the Northeast Connector Expressway. In addition to the expressways, Cyrils Drive and Rummell Road Extension will carry trucks serving the Northeast District, but the T factor is expected to be less than what is experienced on Narcoossee Road. Therefore, the recommended T_{24} factor for Cyrils Drive and Rummell Road Extension is 6.0% and the recommended T_{24} factor for Jones Road and Jack Brack Road is 4.0%. Typically, the peak hour T factor is half the daily T factor, so the recommended T_f factor for Cyrils Drive and Rummell Road is 3.0% and the recommended T_f factor for Jones Road and Jack Brack Road Extension is 2.0%.

3.4 RECOMMENDED DESIGN TRAFFIC CHARACTERISTICS

The recommended design characteristics for this study are identified in **Table 2**, based on a review of existing and future land use and traffic characteristics.

Table 2: Recommended Design Traffic Characteristics

Roadway	K Factor	D Factor	T_{24} Factor	T_f Factor
Cyrils Drive	8.0	55.0	6.0	3.0
Jack Brack Road	8.0	55.0	4.0	2.0
Jones Road	8.0	55.0	4.0	2.0
Rummell Road	8.0	55.0	6.0	3.0

4.0 FUTURE TRAVEL DEMAND

The future travel characteristics in the Narcoossee Area are expected to be significantly different than the existing or historic characteristics. For this reason, the future travel demand estimates relied heavily on the regional travel demand model, as compared to reviewing historic trends.

4.1 OUATS 4.0 TRAVEL DEMAND MODEL

Future Orlando Urban Area Transportation Study v4.0 (OUATS 4.0) travel demand models were developed to represent future 2040 conditions. The model networks were based on the cost feasible network, with adjustments and refinements made as described below.

4.1.1 MODEL NETWORK ADJUSTMENTS

The OUATS model network was adjusted to provide additional detail in the Narcoossee area so that traffic demands could be projected for the subject roadways. In addition, the recommended alignment for the Osceola Parkway Extension was incorporated into the model. Finally, based on a review of the base year model performance in the area, the facility type for Narcoossee Road through the study area was changed from 31 (Undivided Arterial) to 24 (Divided Arterial) and the area type was changed from 51 (Developed Rural Area) to 42 (Other Outside Business District). These changes resulted in more accurate traffic forecasts on Narcoossee Road.

4.1.2 MODEL SOCIO-ECONOMIC ADJUSTMENTS

In addition to the coding of additional roadway network detail within the Narcoossee area, traffic analysis zones (TAZs) were split to be consistent with the revised network to obtain more accurate traffic loadings on the roadways. In addition, the full build-out of the Northeast District was assumed to identify the total demand to be placed on the subject roadways. Additional detail as to the socio-economic data by TAZ is provided in **Appendix A**.

4.2 SCENARIOS EVALUATED AND RECOMMENDATIONS

Four scenarios with various numbers of lanes on the roadways serving the Narcoossee area were evaluated to identify an optimized network that provides sufficient capacity without over building roadways. **Table 3** summarizes the four scenarios, the number of lanes on each roadway, the 2040 AADT on the road, its capacity, and the resulting volume to capacity (V/C) ratio (both average and maximum).

Table 3: 2040 Conditions by Scenario

Road by Scenario	Lanes	AADT	Capacity	Avg. V/C	Max V/C
Scenario 1					
Osceola Parkway Ext.	4	23,100	79,900	0.29	0.29
Cyrils Drive	2	14,000	15,600	0.90	1.27
Jack Brack Road	2	7,500	15,600	0.48	0.89
Jones Road	2	5,100	15,600	0.33	0.74
Rummell Road	4	15,800	33,800	0.47	0.67
Scenario 2					
Osceola Parkway Ext.	4	22,700	79,900	0.28	0.28
Cyrils Drive	4	19,200	33,800	0.57	0.84
Jack Brack Road	4	9,300	33,800	0.28	0.50
Jones Road	4	4,100	33,800	0.12	0.29
Rummell Road	4	16,100	33,800	0.48	0.70
Scenario 3					
Osceola Parkway Ext.	6	24,600	123,300	0.20	0.20
Cyrils Drive	2	14,700	15,600	0.94	1.31
Jack Brack Road	2	7,700	15,600	0.49	0.87
Jones Road	2	4,800	15,600	0.31	0.72
Rummell Road	6	17,100	50,900	0.34	0.49
Scenario 4					
Osceola Parkway Ext.	4	22,700	79,900	0.28	0.28
Cyrils Drive	4	19,300	33,800	0.57	0.83
Jack Brack Road	2	7,700	15,600	0.49	0.84
Jones Road	2	4,500	15,600	0.29	0.65
Rummell Road	4	16,300	33,800	0.48	0.72

Scenario 1 assumed four-lanes on Osceola Parkway and Rummell Road Extension and two-lanes on the other roads. While average V/Cs on all roads were below 1.0, Cyrils Drive had multiple segments with higher V/C ratios. This scenario would result in significant congestion on Cyrils Drive.

Scenario 2 assumed four-lanes on all the subject roads. While all average and maximum V/Cs are below 1.0, this scenario would result in over building some roadways.

Scenario 3 assumed six-lanes on Osceola Parkway and Rummell Road Extension and two-lanes on the other roads. While average V/Cs on all roads were below 1.0, Cyrils Drive had multiple segments with higher V/C ratios. This scenario would result in significant congestion on Cyrils Drive as well as overbuilding both Osceola Parkway Extension and Rummell Road Extension.

Scenario 4 assumed four-lanes on Osceola Parkway, Cyrils Drive and Rummell Road Extension and two-lanes on Jack Brack Road and Jones Road. This scenario resulted in the best balancing of roadway capacity with the projected demand and this scenario became the recommended Scenario to develop design traffic study for the study roadways.

5.0 DESIGN TRAFFIC

Design traffic was developed for Cyrils Drive (four-lanes), Jack Brack Road (two-lanes), Jones Road (two-lanes) and Rummell Road Extension (four lanes).

5.1 CYRILS DRIVE

Future AADT volumes and peak hour turning movements were developed for Cyrils Drive. These volumes were used to develop recommended geometry at intersections, as well as queue lengths to be used for turning lanes.

5.1.1 DESIGN TRAFFIC VOLUMES

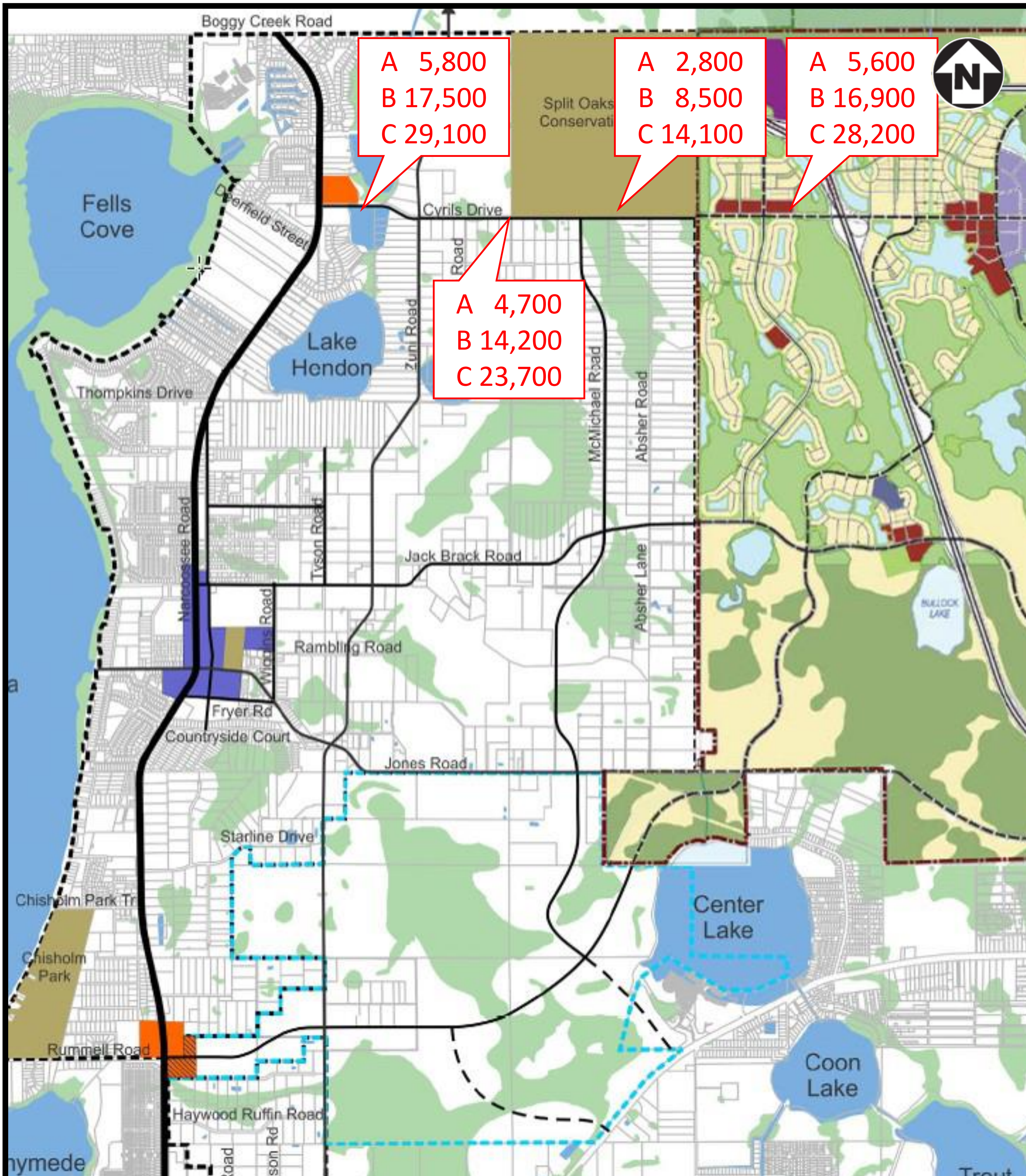
Future AADT volumes for Cyrils Drive were developed based on the travel demands projected by the regional model for 2040. The interim year volumes were estimated as being 20 percent of the 2040 volume in 2020 and 60 percent of the 2040 volume in 2030. The resulting AADT volumes for 2020, 2030 and 2040 and the associated V/C ratios are identified in **Table 4**, and illustrated in **Figure 7**.

Table 4: Cyrils Drive Future AADT Volumes

			2020		2030		2040	
Cyrils Dr.	**Lanes**	**Capacity**	**AADT**	**V/C**	**AADT**	**V/C**	**AADT**	**V/C**
Narcoossee Rd. to Zuni Rd.	4	33,800	5,800	0.17	17,500	0.52	29,100	0.86
Zuni Rd. to McMichael Rd.	4	33,800	4,700	0.14	14,200	0.42	23,700	0.70
McMichael Rd. to Planned Rd.	4	33,800	2,800	0.08	8,500	0.25	14,100	0.42
East of Planned Rd.	4	33,800	5,600	0.17	16,900	0.50	28,200	0.83

All sections of Cyrils Drive are expected to operate with a V/C ratio below 1.0. The highest volume section is from Narcoossee Road to Zuni Road.

Future design hour turning movement volumes were developed based on the AADTs, in combination with the recommended design characteristics. These values were used as inputs to a spreadsheet which calculates turning movements based on the K and D factors, as well as daily quadrant movements obtained from the travel demand model. Output from the spreadsheet was compared to results from FDOT's Turns5 spreadsheet and were found to be similar; therefore, reasonable. In addition to the design hour (which is the P.M. peak hour), A.M. peak hour turning movements were developed to check operating conditions and lane requirements during the morning peak hour. The 2040 AM and PM design hour volumes are identified in **Figure 8**. Turning movement worksheets are included in **Appendix B**.

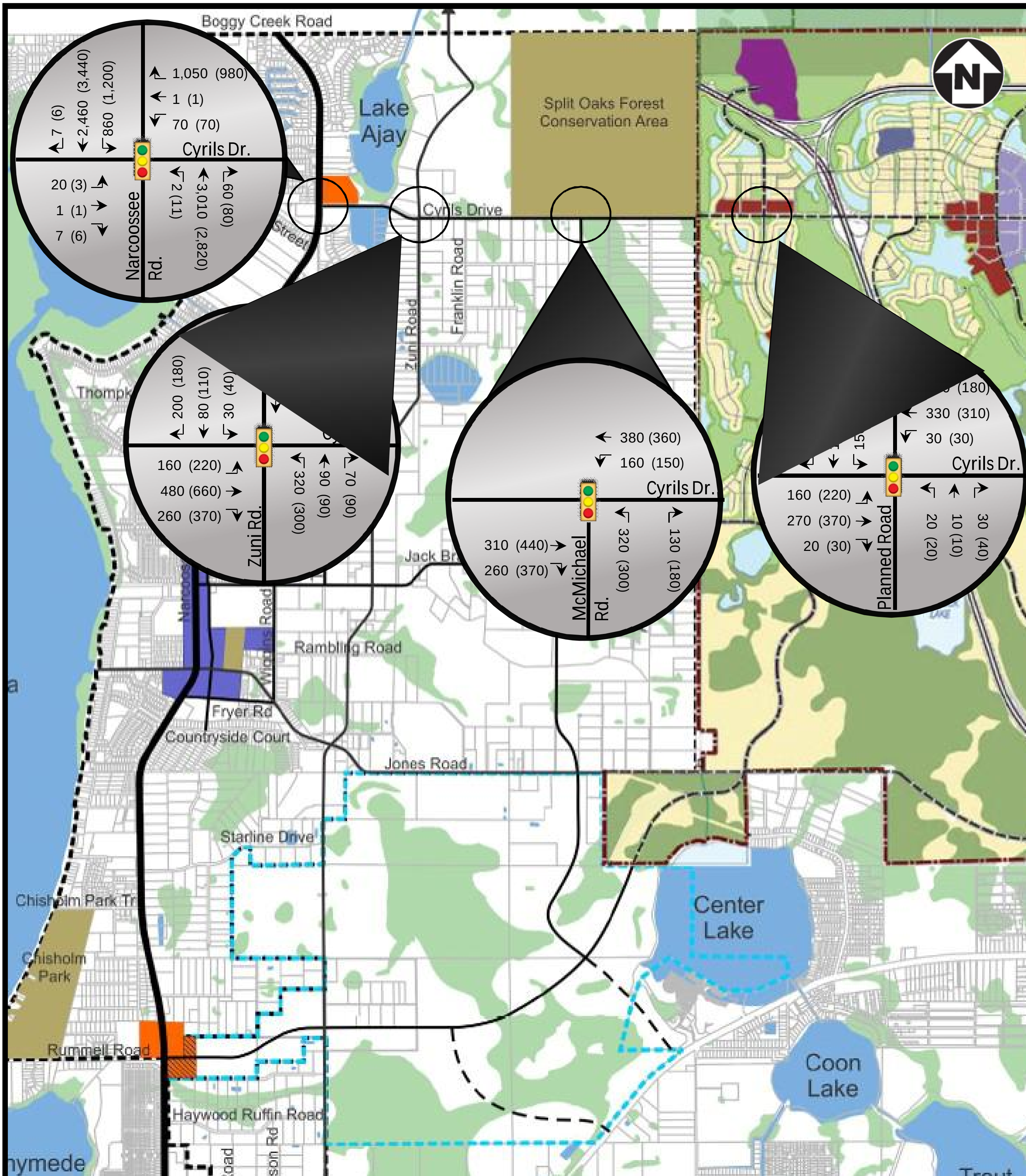


LEGEND

A	*Year 2020 AADT*
B	*Year 2030 AADT*
C	*Year 2040 AADT*

Cyrils Drive Future Year AADT Volumes

Figure 7



LEGEND

Signalized Intersection

Stop Controlled Intersection

AM (PM) Turn Movements

Cyrils Drive 2040 Peak Hour Turning Movements

Figure 8

5.1.2 RECOMMENDED GEOMETRY AND INTERSECTION OPERATIONS

The AM and PM peak hour volumes for 2040 were analyzed using Synchro software. A minimum of a separate left turn lane was assumed for each intersection. Based on Synchro runs, additional turn lanes were identified when needed to keep the intersection operating with a V/C ratio below 1.0. The results of the analyses are summarized in **Table 5** and the recommended geometry at the intersections is illustrated in **Figure 9**. Synchro analysis reports are provided in **Appendix C**.

Table 5: Cyrils Drive 2040 Intersection Summary

Cyrils Dr. at	Traffic Control	V/C
PM Peak Hour		
Narcoossee Rd.	Signal	1.580
Zuni Rd.	Signal	0.770
McMichael Rd.	Signal	0.810
Planned Rd.	Signal	0.730
AM Peak Hour		
Narcoossee Rd.	Signal	1.630
Zuni Rd.	Signal	0.710
McMichael Rd.	Signal	0.720
Planned Rd.	Signal	0.560

In 2040, the intersection of Cyrils Drive and Narcoossee Road is expected to be over capacity and operate with a V/C ratio above 1.0 during both AM and PM peak hours. The other intersections along Cyrils Drive will operate with maximum V/C ratios that are less than 1.0. At Cyrils Drive and Narcoossee Road, dual southbound left turn lanes and dual westbound right turn lanes will be needed. The intersection of Cyrils Drive and Zuni Road will need dual northbound left turn lanes.

Recommended queue lengths for the storage area of each turn lane were developed based on the recommended intersection geometry. Queue lengths were derived based on the 2040 Synchro outputs for both the AM and PM peak hours (the longer queue length needed was used). Recommended queue lengths for Cyrils Drive intersections are provided in **Table 6**.

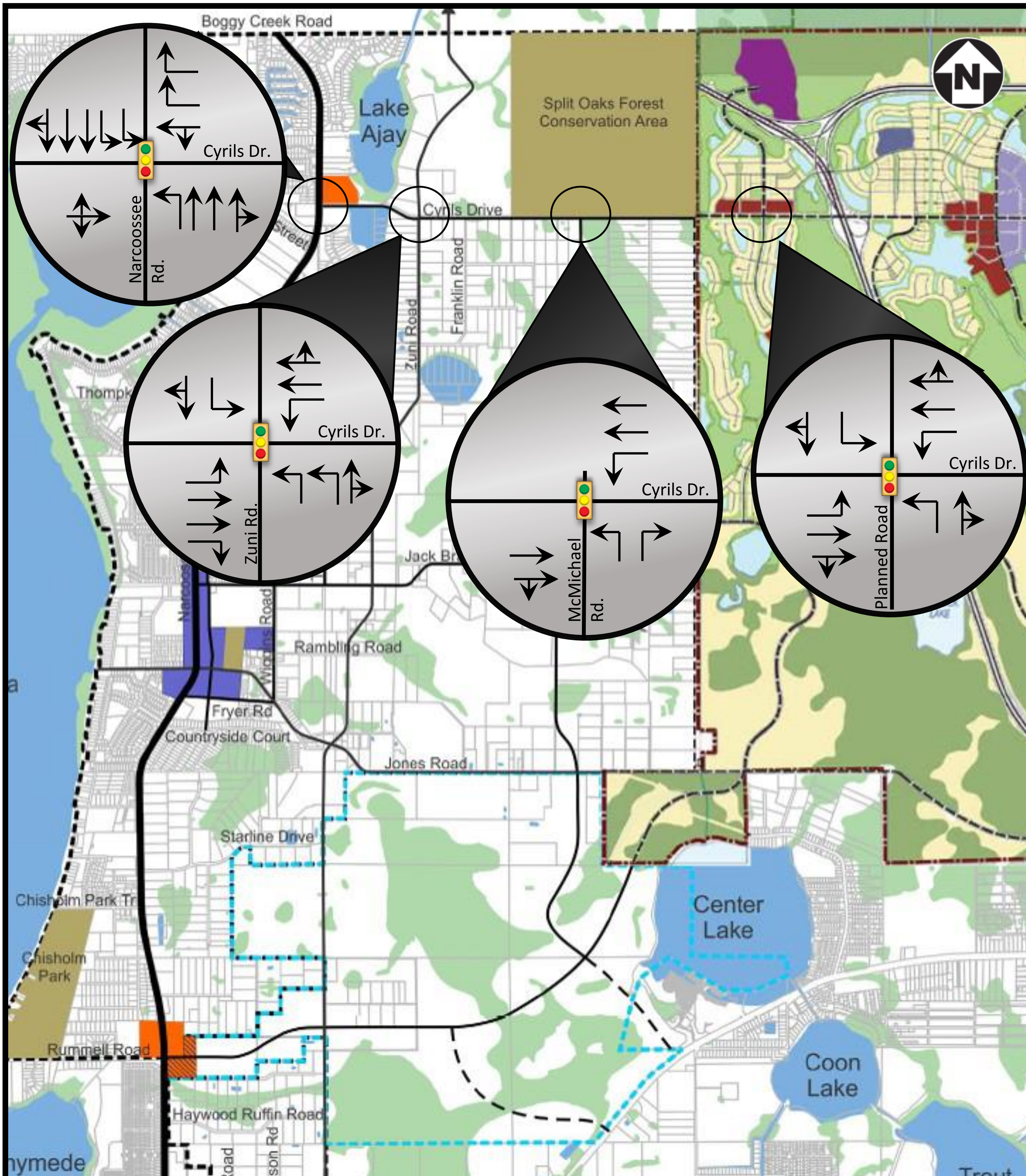
Table 6: Recommended Cyrils Drive Queue Lengths

Cyrils Dr. at	Turn Lane Queue Length (feet)							
	EBL	EBR	WBL	WBR	NBL	NBR	SBL	SBR
Narcoossee Rd.	n/a	n/a	n/a	550*	n/a	n/a	800*	n/a
Zuni Rd.	Std.	75	125	n/a	200*	n/a	Std.	n/a
McMichael Rd.	n/a	n/a	150	n/a	350	Std.	n/a	n/a
Planned Rd.	150	n/a	25	n/a	25	n/a	100	n/a

** Denotes dual turn lanes. Queue length reported is recommended for each turn lane.*

Std. - Use County standard storage. Actual storage to be determined based on development.

Lengths provided in the table do not include the deceleration distance needed for turn lanes. When designing the overall turn lane lengths, the designer should use the most recent FDOT Design Standards, and reference Index No. 301.



LEGEND

Signalized Intersection

Stop Controlled Intersection

Cyrils Drive 2040 Geometry
Figure 9

5.2 JACK BRACK ROAD

Future AADT volumes and peak hour turning movements were developed for Jack Brack Road. These volumes were used to develop recommended geometry at intersections, as well as queue lengths to be used for turning lanes.

5.2.1 DESIGN TRAFFIC VOLUMES

Future AADT volumes for Jack Brack Road were developed based on the travel demands projected by the regional model for 2040. The interim year volumes were estimated as being 20 percent of the 2040 volume in 2020 and 60 percent of the 2040 volume in 2030. The resulting AADT volumes for 2020, 2030 and 2040 and the associated V/C ratios are identified in **Table 7**, and illustrated in **Figure 10**.

Table 7: Jack Brack Road Drive Future AADT Volumes

			2020		2030		2040	
Jack Brack Rd.	**Lanes**	**Capacity**	**AADT**	**V/C**	**AADT**	**V/C**	**AADT**	**V/C**
Narcoossee Rd. to Zuni Rd.	2	15,600	1,300	0.08	3,800	0.24	6,300	0.40
Zuni Rd. to McMichael Rd.	2	15,600	2,900	0.19	8,700	0.56	14,500	0.93
McMichael Rd. to Planned Rd.	2	15,600	1,100	0.07	3,200	0.21	5,300	0.34
Planned Rd. to Rummell Rd.	2	15,600	1,100	0.07	3,400	0.22	5,600	0.36
East of Rummell Rd.	2	15,600	1,400	0.09	4,200	0.27	7,100	0.46

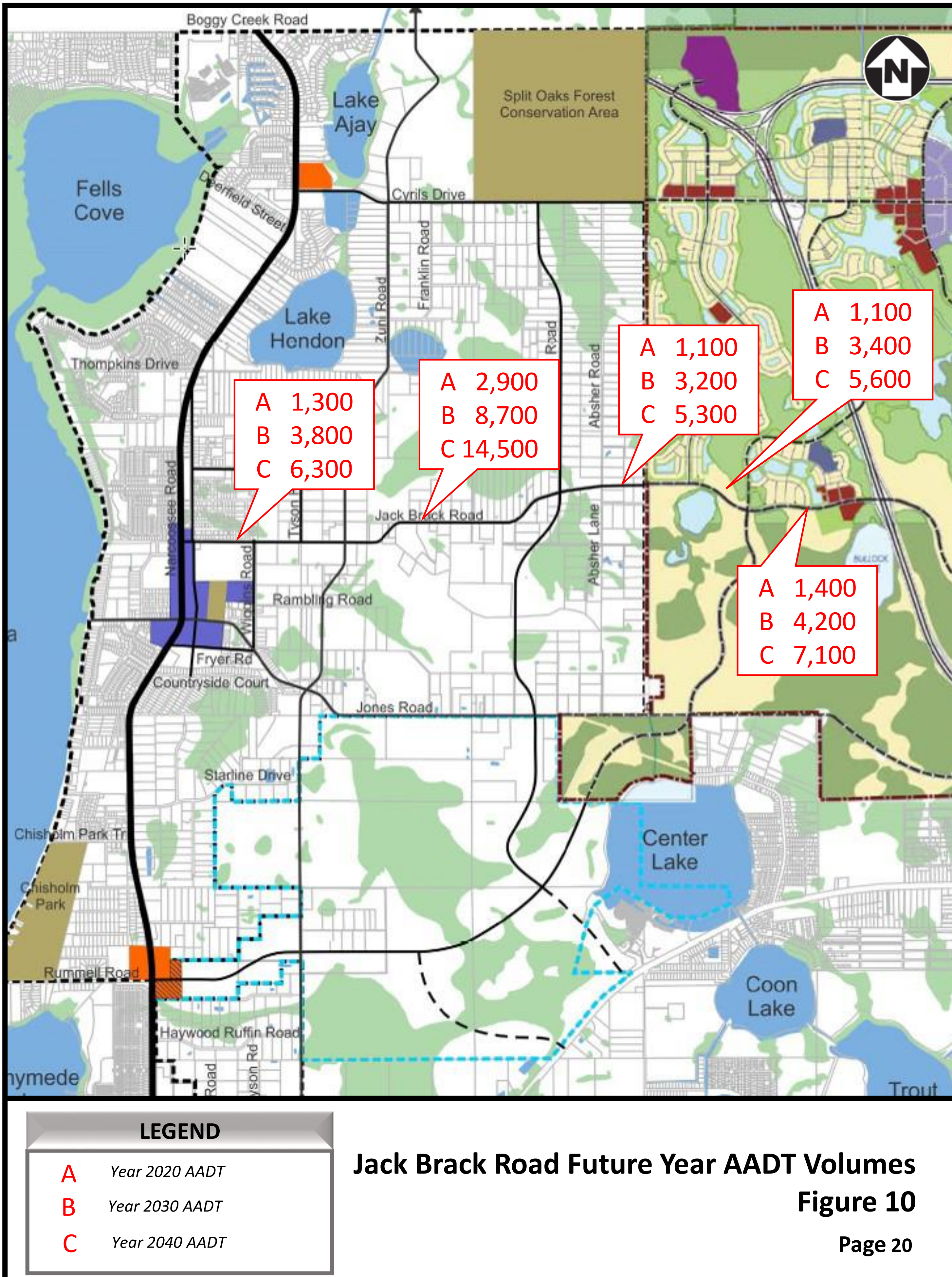
All sections of Jack Brack Road are expected to operate with a V/C ratio below 1.0. The highest volume section is from Zuni Road to McMichael Road.

Future design hour turning movement volumes were developed using the previously described methodology for Cyrils Drive. The 2040 AM and PM design hour volumes are identified in **Figure 11**. Turning movement worksheets are included in **Appendix D**.

5.2.2 RECOMMENDED GEOMETRY AND INTERSECTION OPERATIONS

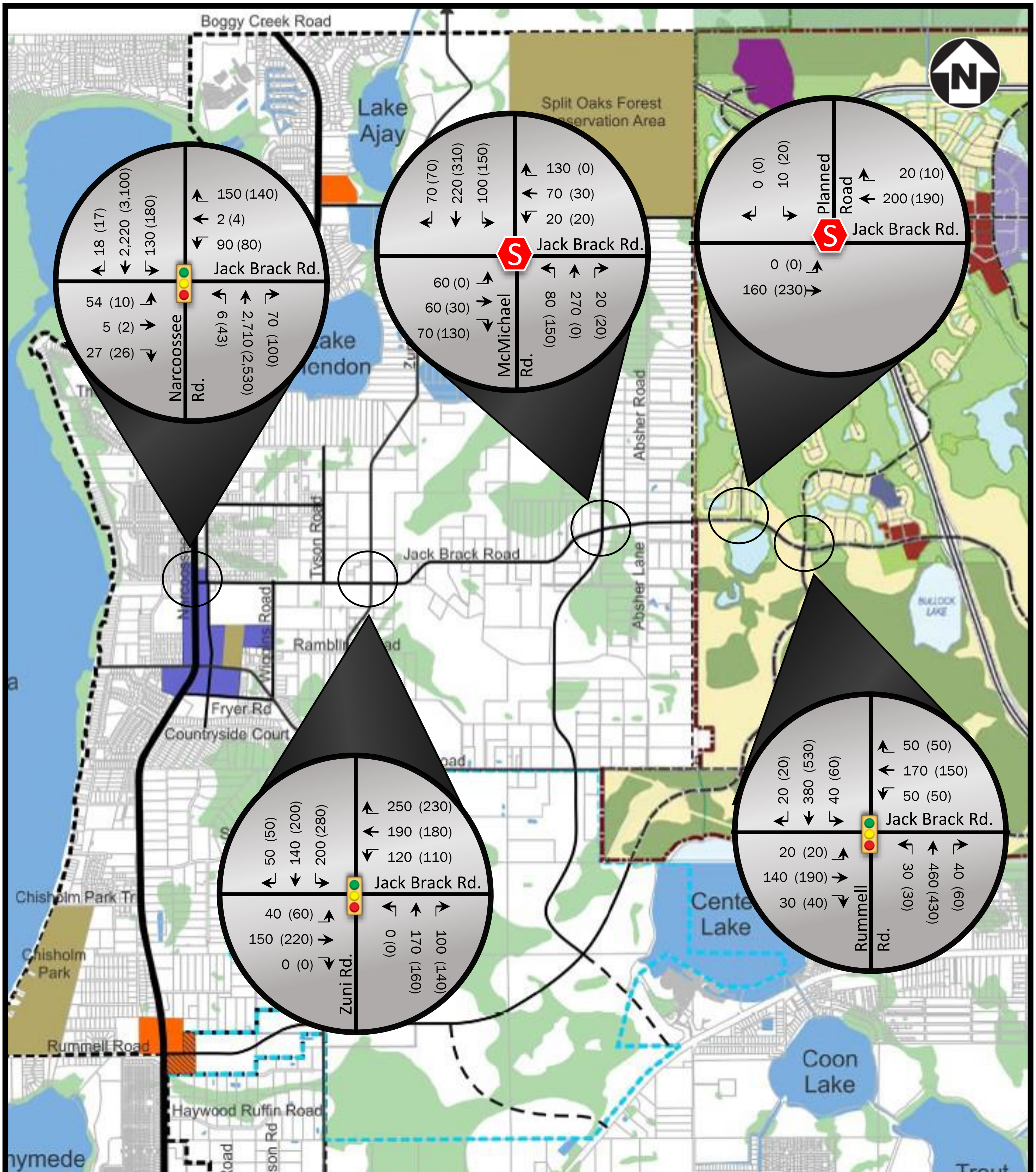
The AM and PM peak hour volumes for 2040 year were analyzed using Synchro software. A minimum of a separate left turn lane was assumed for each intersection. Based on Synchro runs; additional turn lanes were identified when needed to keep the intersection operating with a V/C ratio below 1.0. The results of the analyses are summarized in **Table 8** and the recommended geometry at the intersections is illustrated in **Figure 12**. Synchro analysis reports are provided in **Appendix E**.

In 2040, all intersections along Jack Brack Road are expected to operate with V/C ratios below 1.0, during the AM and PM peak hours. The intersections of Jack Brack Road and McMichael Road, and Jack Brack Road and Planned Road (west of Rummell Road Extension) are not expected to warrant signalization.



Jack Brack Road Future Year AADT Volumes

Figure 10



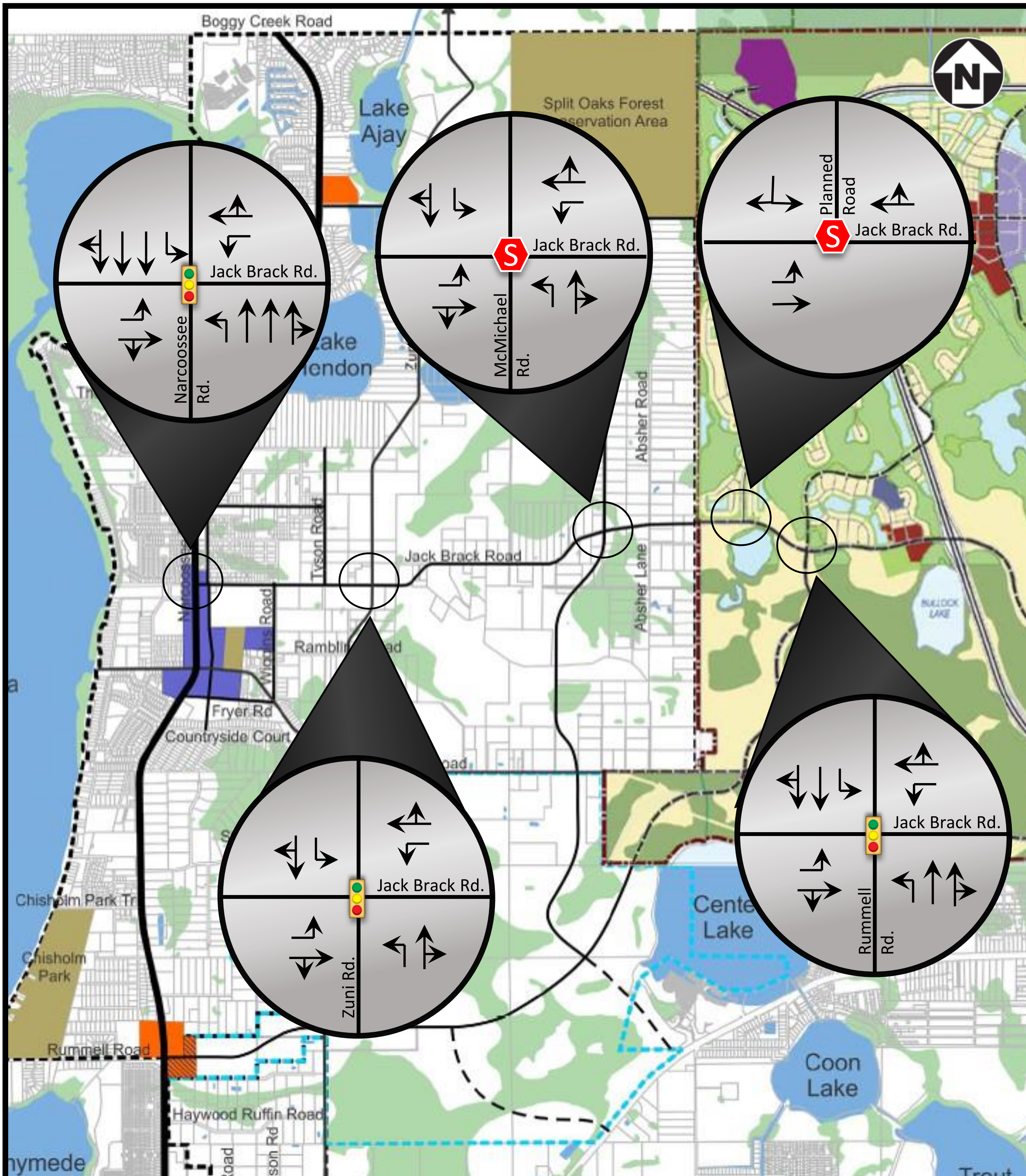
LEGEND

Signalized Intersection

Stop Controlled Intersection

AM (PM) Turn Movements

Jack Brack Road
2040 Peak Hour Turning Movements
Figure 11



LEGEND

Signalized Intersection

Stop Controlled Intersection

Jack Brack Road 2040 Geometry
Figure 12

Table 8: Jack Brack Road 2040 Intersection Summary

Jack Brack Rd. at	Traffic Control	V/C
PM Peak Hour		
Narcoossee Rd.	Signal	0.980
Zuni Rd.	Signal	0.690
McMichael Rd.	Stop (NB/SB)	0.976
Planned Rd.	Stop (NB/SB)	0.039
Rummell Rd.	Signal	0.500
AM Peak Hour		
Narcoossee Rd.	Signal	0.970
Zuni Rd.	Signal	0.720
McMichael Rd.	Stop (NB/SB)	0.681
Planned Rd.	Stop (NB/SB)	0.018
Rummell Rd.	Signal	0.490

Recommended queue lengths for the storage area of each turn lane were developed based on the recommended intersection geometry. Queue lengths were derived based on the 2040 Synchro outputs for both the AM and PM peak hours (the longer queue length needed was used). Recommended queue lengths for Jack Brack Road intersections are provided in **Table 9**.

Table 9: Recommended Jack Brack Road Queue Lengths

Jack Brack Rd. at	Turn Lane Queue Length (feet)							
	EBL	EBR	WBL	WBR	NBL	NBR	SBL	SBR
Narcoossee Rd.	Std.	n/a	200	n/a	Std.	n/a	350	n/a
Zuni Rd.	50	n/a	50	n/a	Std.	n/a	175	n/a
McMichael Rd.	Std.	n/a	Std.	n/a	25	n/a	25	n/a
Planned Rd.	Std.	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Rummell Rd.	25	n/a	50	n/a	25	n/a	50	n/a

Std. - Use County standard storage. Actual storage to be determined based on development.

Lengths provided in the table do not include the deceleration distance needed for turn lanes. When designing the overall turn lane lengths, the designer should use the most recent FDOT Design Standards, and reference Index No. 301.

5.3 JONES ROAD

Future AADT volumes and peak hour turning movements were developed for Jones Road. These volumes were used to develop recommended geometry at intersections, as well as queue lengths to be used for turning lanes.

5.3.1 DESIGN TRAFFIC VOLUMES

Future AADT volumes for Jones Rd were developed based on the travel demands projected by the regional model for 2040. The interim year volumes were estimated as being 20 percent of the 2040 volume in 2020 and 60 percent of the 2040 volume in 2030. The resulting AADT volumes for 2020, 2030 and 2040 and the associated V/C ratios are identified in **Table 10**, and illustrated in **Figure 13**.

Table 10: Jones Road Drive Future AADT Volumes

			2020		2030		2040	
Jones Rd.	**Lanes**	**Capacity**	**AADT**	**V/C**	**AADT**	**V/C**	**AADT**	**V/C**
Narcoossee Rd. to Zuni Rd.	2	15,600	1,500	0.10	4,600	0.29	7,700	0.49
Zuni Rd. to McMichael Rd.	2	15,600	300	0.02	1,000	0.06	1,600	0.10
McMichael Rd. to Rummell Rd.	2	15,600	500	0.03	1,400	0.09	2,400	0.15
East of Rummell Rd.	2	15,600	300	0.02	1,000	0.06	1,700	0.11

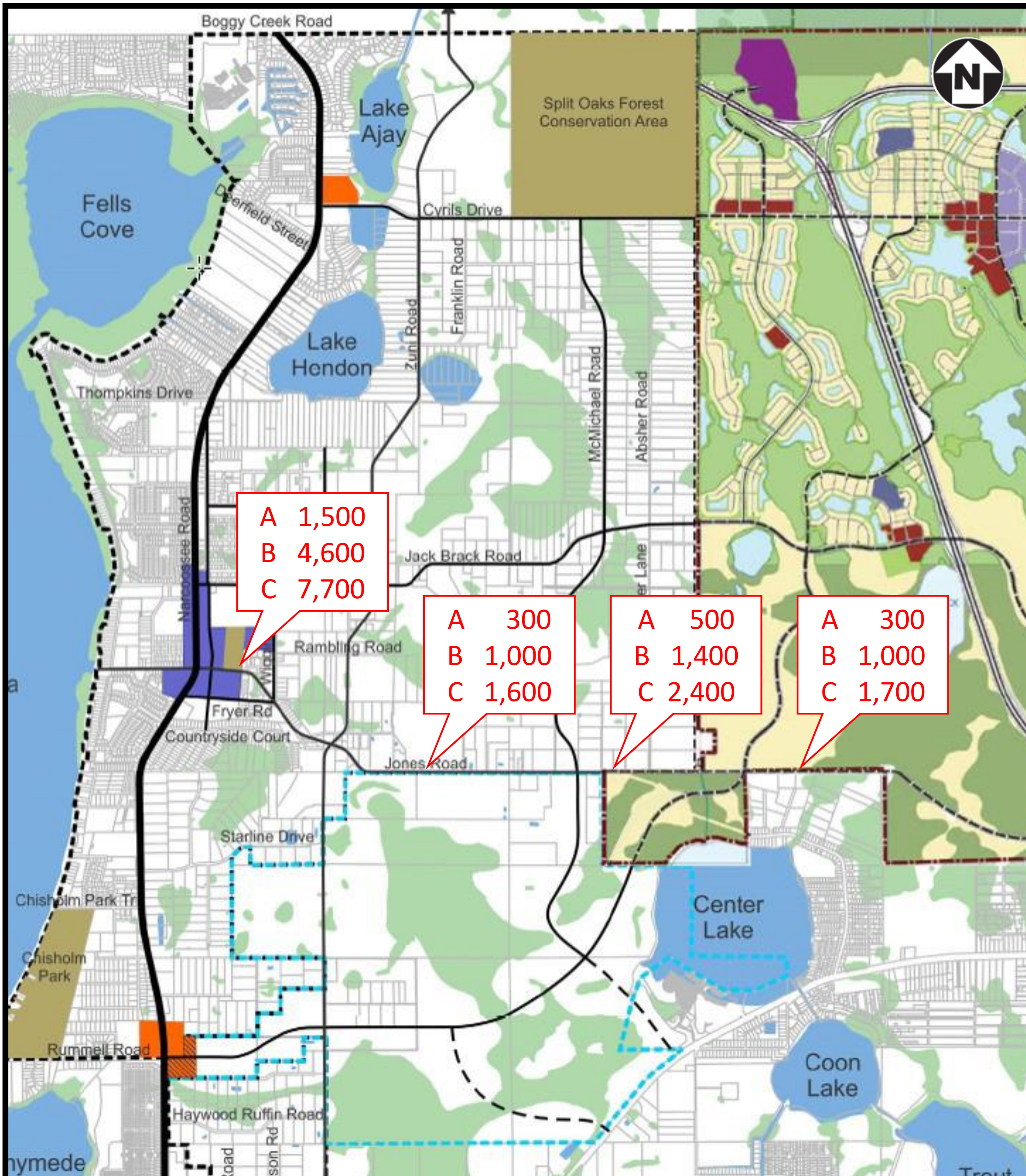
All sections of Jones Road are expected to operate with a V/C ratio below 1.0. The highest volume section is from Narcoossee Road to Zuni Road.

Future design hour turning movement volumes were developed using the previously described methodology for Cyrils Drive. The 2040 AM and PM design hour volumes are identified in **Figure 14**. Turning movement worksheets are included in **Appendix F**.

5.3.2 RECOMMENDED GEOMETRY AND INTERSECTION OPERATIONS

The AM and PM peak hour volumes for 2040 were analyzed using Synchro software. A minimum of a separate left turn lane was assumed for each intersection. Based on Synchro runs; additional turn lanes were identified when needed to keep the intersection operating with a V/C ratio below 1.0. The results of the analyses are summarized in **Table 11** and the recommended geometry at the intersections is illustrated in **Figure 15**. Synchro analysis reports are provided in **Appendix G**.

In 2040, the signalized intersections along Jones Road (at Narcoossee Road and at Zuni Road) are expected to operate with V/C ratios less than 1.0 during the AM and PM peak hours. The intersections of Jones Road at McMichael Road and Jones Road at Rummell Road Extension are not expected to warrant signalization. The Jones Road intersections, under stop control, will operate with V/C ratios less than 1.0 during the AM and PM peak hours.

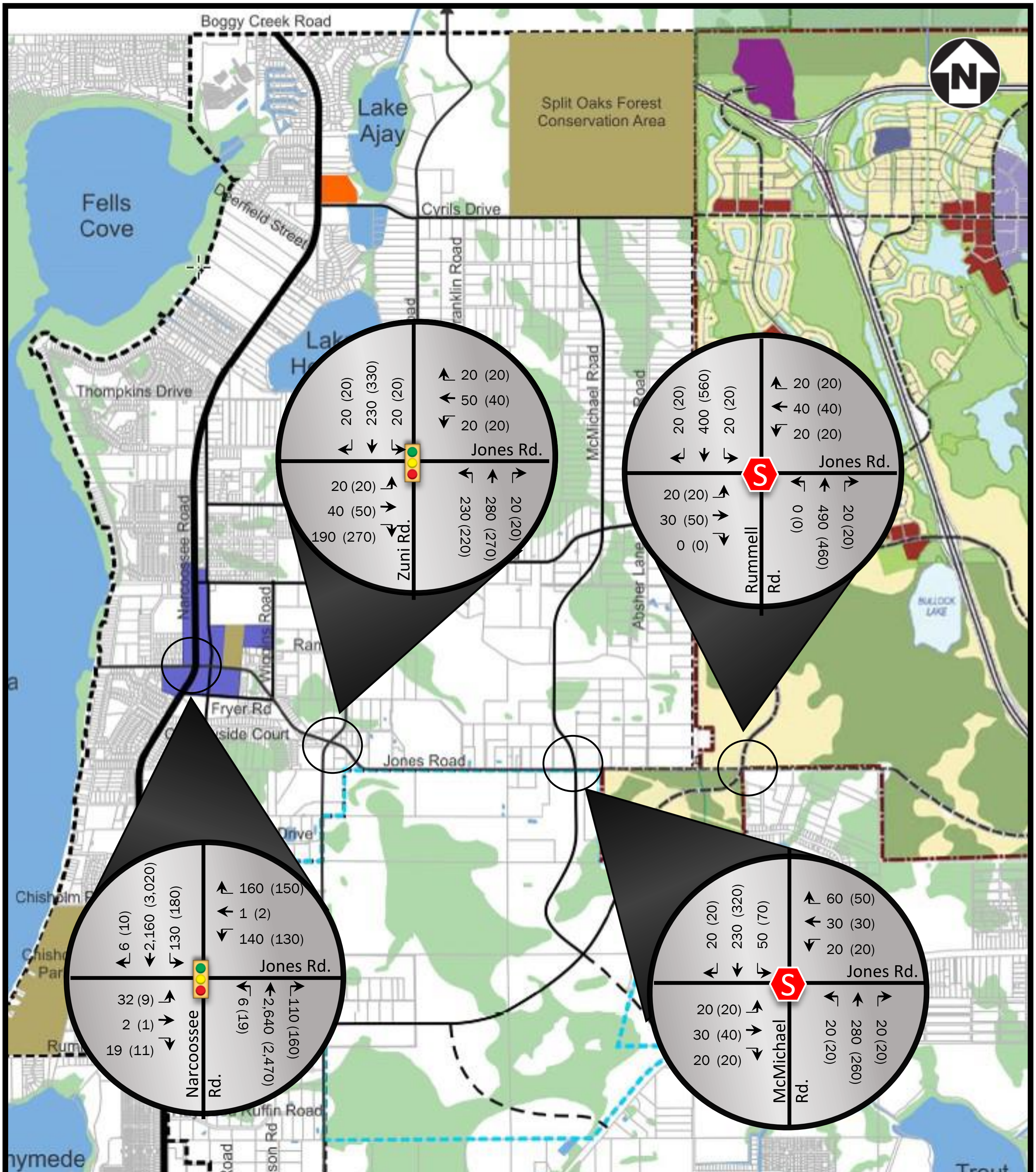


LEGEND

A	*Year 2020 AADT*
B	*Year 2030 AADT*
C	*Year 2040 AADT*

Jones Road Future Year AADT Volumes

Figure 13



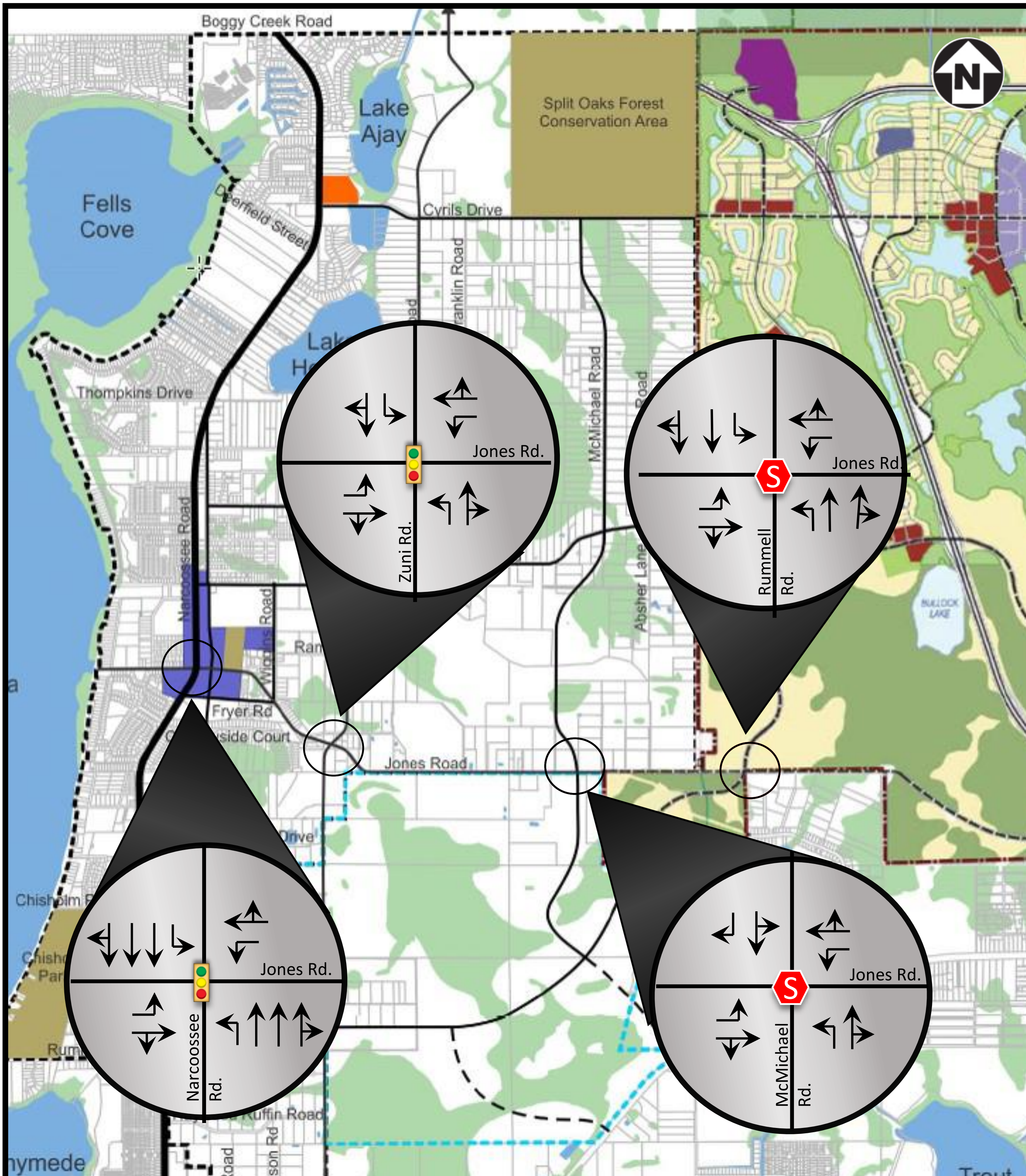
LEGEND

Signalized Intersection

Stop Controlled Intersection

AM (PM) Turn Movements

Jones Road
2040 Peak Hour Turning Movements
Figure 14



LEGEND

Signalized Intersection

Stop Controlled Intersection

Jones Road Geometry

Figure 15

Table 11: Jones Road 2040 Intersection Summary

Jones Rd. at	Traffic Control	V/C
PM Peak Hour		
Narcoossee Rd.	Signal	0.870
Zuni Rd.	Signal	0.590
McMichael Rd.	Stop (NB/SB)	0.544
Rummell Rd.	Stop (EB/WB)	0.295
AM Peak Hour		
Narcoossee Rd.	Signal	0.920
Zuni Rd.	Signal	0.490
McMichael Rd.	Stop (NB/SB)	0.488
Rummell Rd.	Stop (EB/WB)	0.225

Recommended queue lengths for the storage area of each turn lane were developed based on the recommended intersection geometry. Queue lengths were derived based on the 2040 Synchro outputs for both the AM and PM peak hours (the longer queue length needed was used). Recommended queue lengths for Jones Road intersections are provided in **Table 12**.

Table 12: Recommended Jones Road Queue Lengths

Jones Rd. at	Turn Lane Queue Length (feet)							
	EBL	EBR	WBL	WBR	NBL	NBR	SBL	SBR
Narcoossee Rd.	Std.	n/a	250	n/a	Std.	n/a	300	n/a
Zuni Rd.	25	n/a	25	n/a	100	n/a	25	n/a
McMichael Rd.	Std.	n/a	Std.	n/a	25	n/a	25	n/a
Rummell Rd.	Std.	n/a	Std.	n/a	Std.	n/a	Std.	n/a

Std. - Use County standard storage. Actual storage to be determined based on development.

Lengths provided in the table do not include the deceleration distance needed for turn lanes. When designing the overall turn lane lengths, the designer should use the most recent FDOT Design Standards, and reference Index No. 301.

5.4 RUMMELL ROAD EXTENSION

Future AADT volumes and peak hour turning movements were developed for Rummell Road Extension. These volumes were used to develop recommended geometry at intersections, as well as queue lengths to be used for turning lanes.

5.4.1 DESIGN TRAFFIC VOLUMES

Future AADT volumes for Rummell Road Extension were developed based on the travel demands projected by the regional model for 2040. The interim year volumes were estimated as being 20 percent of the 2040 volume in 2020 and 60 percent of the 2040 volume in 2030. The resulting AADT volumes for 2020, 2030 and 2040 and the associated V/C ratios are identified in **Table 13**, and illustrated in **Figure 16**.

Table 13: Rummell Road Extension Future AADT Volumes

			2020		2030		2040	
Rummell Rd.	**Lanes**	**Capacity**	**AADT**	**V/C**	**AADT**	**V/C**	**AADT**	**V/C**
Narcoossee Rd. to Zuni Rd.	4	33,800	2,800	0.08	8,500	0.25	14,200	0.42
Zuni Rd. to Center Lake DRI Rd.	4	33,800	2,100	0.06	6,400	0.19	10,700	0.32
McMichael Rd. to Jones Rd.	4	33,800	2,600	0.08	7,800	0.23	13,000	0.38
Jones Rd. to Jack Brack Rd.	4	33,800	5,500	0.16	16,500	0.49	27,500	0.81
Jack Brack Rd. to Cyrils Dr.	4	33,800	2,800	0.08	8,300	0.25	13,800	0.41

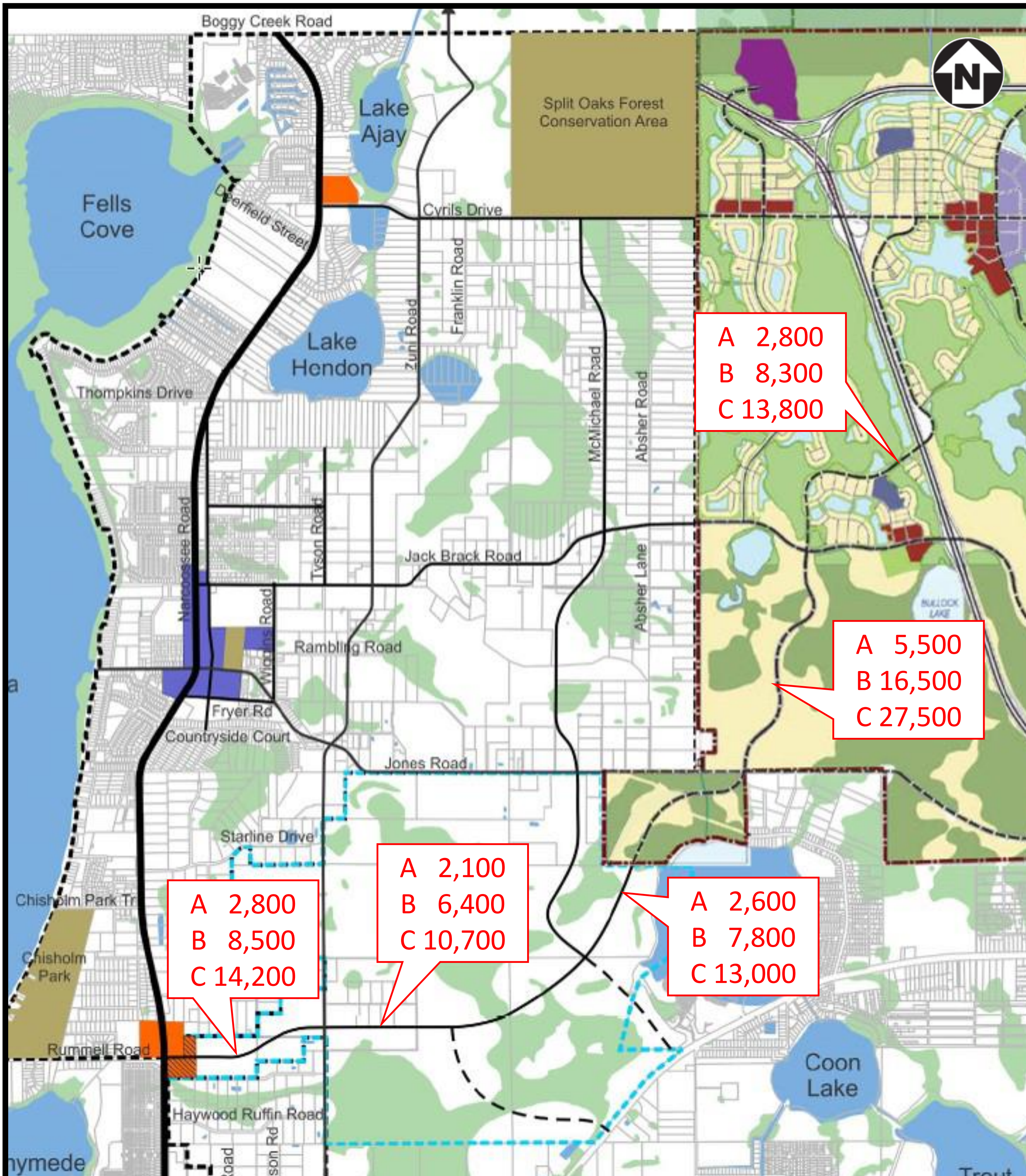
All sections of Rummell Road Extension are expected to operate with a V/C ratio below 1.0. The highest volume section is from Jones Road to Jack Brack Road.

Future design hour turning movement volumes were developed using the previously described methodology for Cyrils Drive. The 2040 AM and PM design hour volumes are identified in **Figure 17**. Turning movement worksheets are included in **Appendix H**.

5.4.2 RECOMMENDED GEOMETRY AND INTERSECTION OPERATIONS

The AM and PM peak hour volumes for 2040 were analyzed using Synchro software. A minimum of a separate left turn lane was assumed for each intersection. Based on Synchro runs; additional turn lanes were identified when needed to keep the intersection operating with a V/C ratio below 1.0. The results of the analyses are summarized in **Table 14** and the recommended geometry at the intersections is illustrated in **Figure 18**. Synchro analysis reports are provided in **Appendix I**.

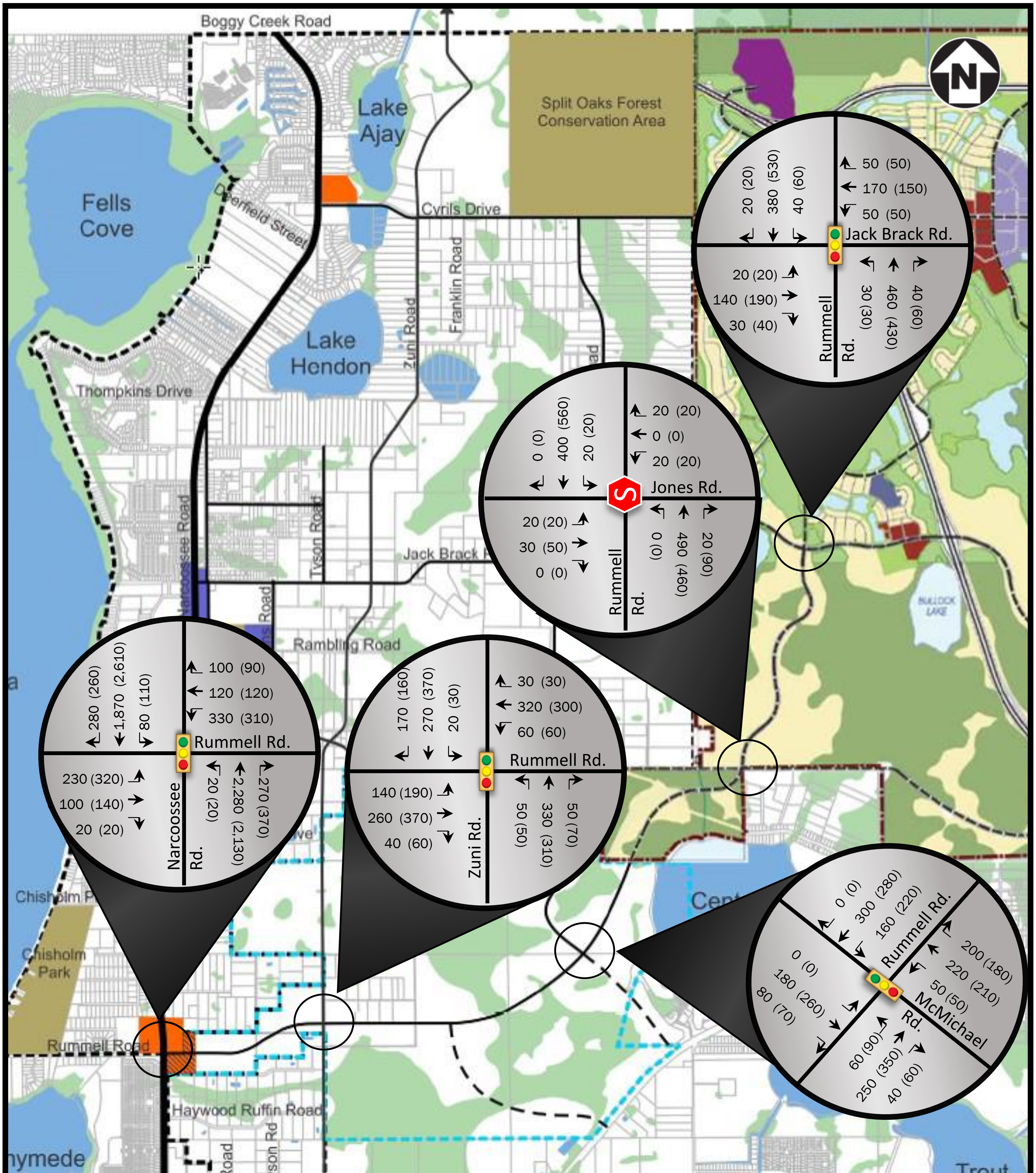
In 2040, the signalized intersections along Rummell Road Extension are expected to operate with V/C ratios less than 1.0 during the AM and PM peak hours. The Rummell Road Extension and Jones Road intersection is not expected to warrant signalization.



LEGEND	
A	*Year 2020 AADT*
B	*Year 2030 AADT*
C	*Year 2040 AADT*

Rummell Road Future Year AADT Volumes

Figure 16



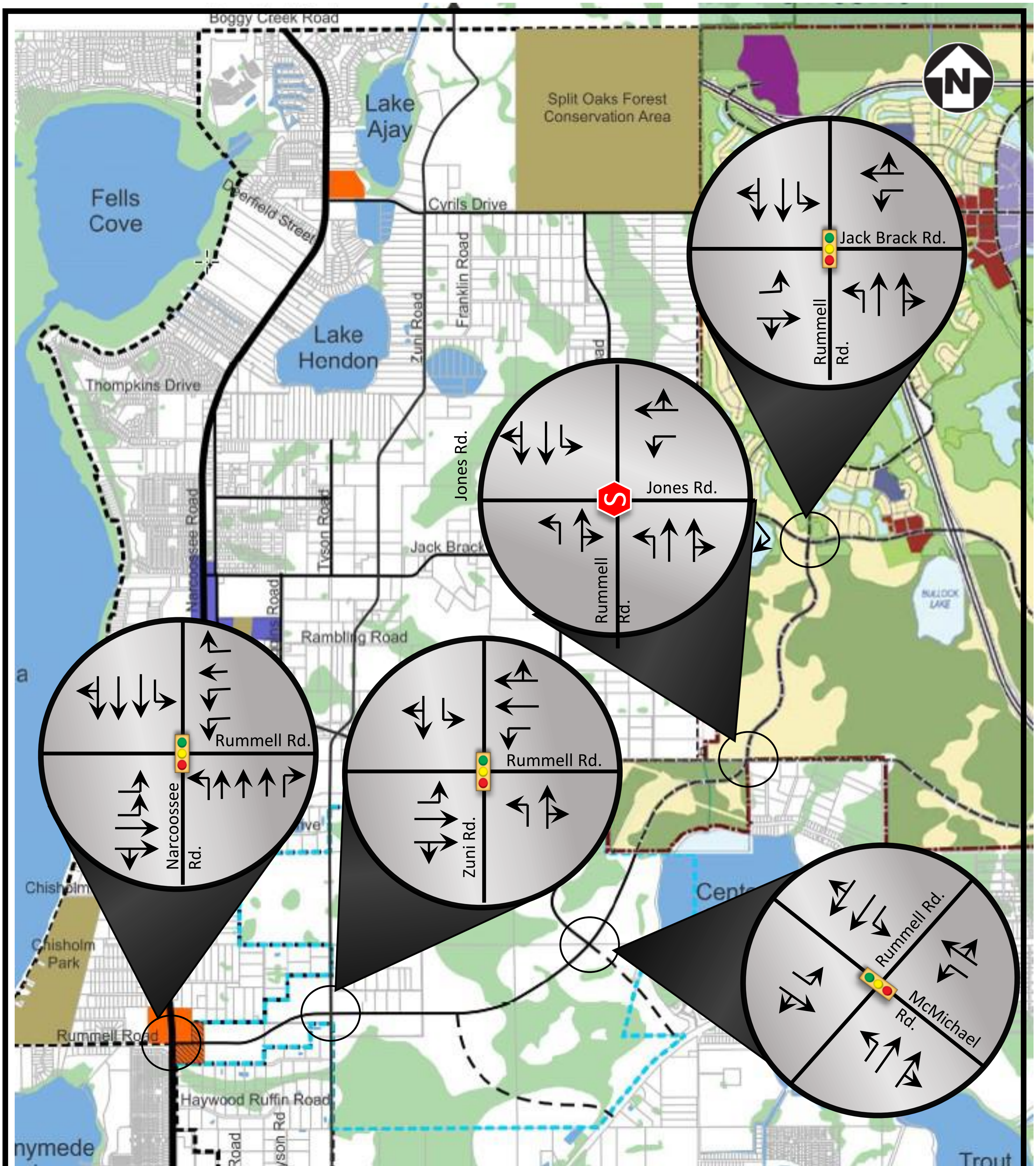
LEGEND

Signalized Intersection

Stop Controlled Intersection

AM (PM) Turn Movements

Rummell Road Extension
2040 Peak Hour Turning Movements
Figure 17



LEGEND

Signalized Intersection

Stop Controlled Intersection

Rummell Road Extension 2040 Geometry

Figure 18

Table 14: Rummell Road Extension 2040 Intersection Summary

Rummell Rd. at	Traffic Control	V/C
PM Peak Hour		
Narcoossee Rd.	Signal	0.930
Zuni Rd.	Signal	0.690
McMichael Rd.	Signal	0.740
Jones Rd.	Stop (EB/WB)	0.295
Jack Brack Rd.	Signal	0.500
AM Peak Hour		
Narcoossee Rd.	Signal	0.830
Zuni Rd.	Signal	0.550
McMichael Rd.	Signal	0.560
Jones Rd.	Stop (EB/WB)	0.225
Jack Brack Rd.	Signal	0.490

Recommended queue lengths for the storage area of each turn lane were developed based on the recommended intersection geometry. Queue lengths were derived based on the 2040 Synchro outputs for both the AM and PM peak hours (the longer queue length needed was used). Recommended queue lengths for Rummell Road intersections are provided in **Table 12**.

Table 15: Recommended Rummell Road Extension Queue Lengths

Rummell Rd. at	Turn Lane Queue Length (feet)							
	EBL	EBR	WBL	WBR	NBL	NBR	SBL	SBR
Narcoossee Rd.	300*	n/a	325*	n/a	75	n/a	200	n/a
Zuni Rd.	100	n/a	50	n/a	50	n/a	25	n/a
McMichael Rd.	50	n/a	150	n/a	50	n/a	Std.	n/a
Jones Rd.	Std.	n/a	Std.	n/a	Std.	n/a	Std.	n/a
Jack Brack Rd.	25	n/a	50	n/a	25	n/a	50	n/a

** Denotes dual left turn lanes. Queue length reported is recommended for each turn lane.*

Note: Shaded cells represent Rummell Rd.

Lengths provided in the table do not include the deceleration distance needed for turn lanes. When designing the overall turn lane lengths, the designer should use the most recent FDOT Design Standards, and reference Index No. 301.

6.0 APPENDIX

Appendix A: Model Socio-Economic Adjustments

Appendix B: Cyrils Drive Turning Movement Worksheets

Appendix C: Cyrils Drive Synchro Analysis

Appendix D: Jack Brack Road Turning Movement Worksheets

Appendix E: Jack Brack Road Synchro Analysis

Appendix F: Jones Road Turning Movement Worksheets

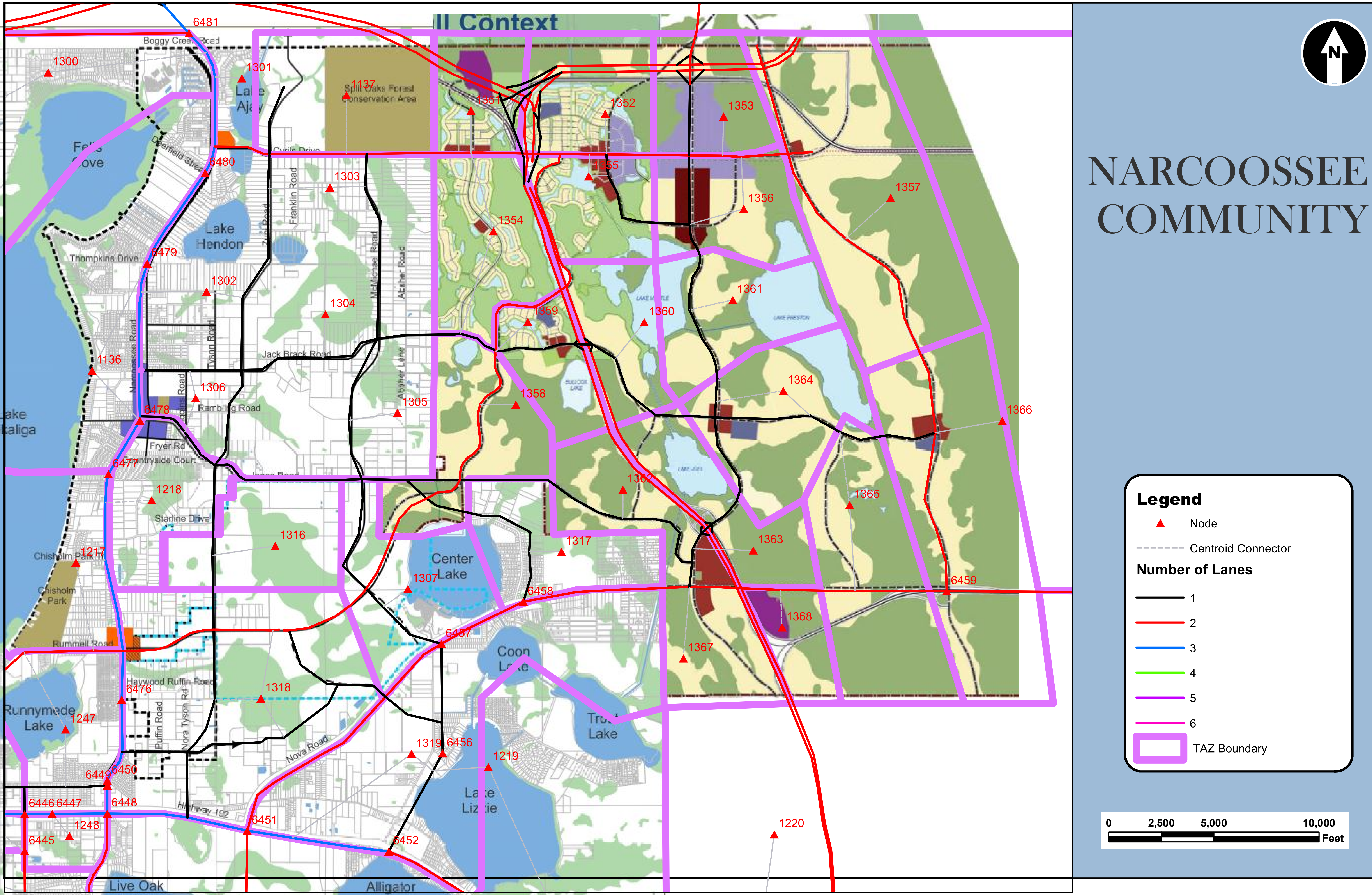
Appendix G: Jones Road Synchro Analysis

Appendix H: Rummell Road Turning Movement Worksheets

Appendix I: Rummell Road Synchro Analysis

Appendix A:

Model Socio-Economic Adjustments


NARCOOSSEE COMMUNITY
N
Legend
Node
Centroid Connector
Number of Lanes
1
2
3
4
5
6
TAZ Boundary
0
2,500
5,000
10,000
Feet
Spill Oaks Forest Conservation Area
Boggy Creek Road
Curtis Drive
Thompkins Drive
Jack Brack Road
Rambling Road
Fryer Rd
Countryside Court
Starline Drive
Rummell Road
Haywood Ruffin Road
Nova Road
Highway 192
Franklin Road
Atsher Road
Lake Hendon
Center Lake
Coon Lake
Lake Lizzie
Runnymede Lake
Live Oak Lake
Alligator Lake
Chisholm Park
1300
1301
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2040 Socio-Economic Data by TAZ

TAZ	DUS_ALL	POPS_ALL	DUM_ALL	POPM_ALL	DU_ALL	DUH_ALL	POPH_ALL	IND_ALL	COM_ALL	SVC_ALL	TOEMP_ALL	SCHENR
OUATS TAZ Assignment 9.8.16	**Total Single Family DU**	**Total Population in SF DUs**	**Total Multi-Family DU**	**Total Population in MF DUs**	**Total DUs**	**Total # Hotel Rooms**	**Total Population in Hotel Rooms [1]**	**Total Industrial Employment**	**Total Commercial Employment**	**Total Service Employment**	**Total Employment**	**Total School Enrollment**
1137	777	2,020	0	0	777	0	0	0	0	0	0	0
1218	257	735	46	149	303	0	0	48	109	137	294	0
1301	115	318	19	61	134	0	0	62	415	779	1,256	0
1302	300	830	22	70	322	0	0	407	591	1,201	2,199	0
1303	324	929	0	0	324	0	0	0	0	0	0	584
1304	257	735	0	0	257	0	0	0	0	0	0	0
1305	391	1,124	0	0	391	0	0	0	0	0	0	0
1306	122	348	0	0	122	0	0	0	109	0	109	0
1307	261	652	99	321	360	0	0	6	7	20	33	260
1316	208	518	366	1,191	574	0	0	134	303	216	653	410
1317	262	653	99	322	361	0	0	0	7	20	27	0
1318	2,330	5,814	331	1,078	2,661	0	0	470	194	951	1,615	1,492
	5,604	**14,676**	**982**	**3,192**	**6,586**	**0**	**0**	**1,127**	**1,735**	**3,324**	**6,186**	**2,746**
1351	359	876	0	0	359	0	0	805	255	320	1,380	0
1352	704	1,718	630	1,172	1,334	150	71	20	150	3,920	4,090	600
1353	514	1,254	2,110	3,925	2,624	750	353	0	351	4,722	5,073	0
1354	1,470	3,587	0	0	1,470	0	0	30	0	0	30	0
1355	403	983	765	1,423	1,168	300	141	30	435	3,580	4,045	0
1356	390	952	4,052	6,571	4,442	1,400	658	0	2,319	9,058	11,377	3,600
1357	2,980	7,748	691	1,002	3,671	0	0	0	270	200	470	1,200
1358	990	2,574	167	242	1,157	0	0	0	0	0	0	0
1359	520	1,352	410	595	930	0	0	0	360	280	640	600
1360	790	2,054	94	136	884	0	0	0	0	0	0	0
1361	1,500	3,660	0	0	1,500	2,100	987	0	570	240	810	0
1362	890	2,314	40	58	930	0	0	0	0	0	0	600
1363	410	1,066	654	1,216	1,064	0	0	0	0	0	0	0
1364	920	2,245	437	634	1,357	300	141	0	0	0	0	2,300
1365	980	2,548	284	412	1,264	0	0	0	0	0	0	0
1366	1,780	4,628	1,181	2,197	2,961	0	0	0	390	280	670	3,600
1367	140	364	40	58	180	0	0	0	0	0	0	0
1368	1,240	3,224	787	1,141	2,027	0	0	1,115	360	280	1,755	600
	16,980	**43,146**	**12,342**	**20,781**	**29,322**	**5,000**	**2,351**	**2,000**	**5,460**	**22,880**	**30,340**	**13,100**

Appendix B:

Cyrils Drive Turning Movement Worksheets

1 Intersection: Narcoossee Rd. at Cyrils Dr.
Condition: 2040 Buildout NED
Count Date: n/a
MOCF: 0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*0*	*55*	*45*	*45*	*45*	*0*	*0*	*0*	0	*55*	*0*	*55*
Seed %	*PM*	*0*	*45*	*55*	*55*	*55*	*0*	*0*	*0*	0	*45*	*0*	*45*

Model Raw AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
79,762	0	0	27,768	0	1,918

107,530
0 29,686
81,680

AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
78,200	0	0	27,200	0	1,900

105,400
0 29,100
80,100

Movement D Factors

	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	78,200		0		0		27,200		0		1,900	
		Northbound			Southbound			Eastbound			Westbound		
		Left*	Through	Right	Left	Through	Right*	Left*	Through*	Right*	Left	Through*	Right
	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	2	3,010	60	860	2,460	7	20	1	7	70	1	1,050
Turns	PM	11	2,820	80	1,200	3,440	6	3	1	6	70	1	980

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.697		0.60		0.60		0.60		0.60		0.60	
	AADT	54,500		0		0		16,300		0		1,100	
		Northbound			Southbound			Eastbound			Westbound		
		Left*	Through	Right	Left	Through	Right*	Left*	Through*	Right*	Left	Through*	Right
	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	1	2,100	30	510	1,720	5	14	1	5	40	1	630
Turns	PM	8	1,960	50	720	2,400	4	2	1	4	40	1	590

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.375		0.20		0.20		0.20		0.20		0.20	
	AADT	29,300		0		0		5,400		0		400	
		Northbound			Southbound			Eastbound			Westbound		
		Left*	Through	Right	Left	Through	Right*	Left*	Through*	Right*	Left	Through*	Right
	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	1,130	10	170	920	2	5	0	2	20	0	210
Turns	PM	3	1,050	20	240	1,290	2	1	0	2	10	0	190

**Turning movements calculated from trip generation of anticipated build out scenario.*

2	Intersection:	Cyrils Dr. at Zuni Rd. with Relocated Centroid Connector and Adjustments
	Condition:	2040 Buildout NED See notes at bottom of page
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	2,400	15,400	5,200	900	8,500	2,100
				8,500		
			29,100	18,400		
				13,000		

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	2,400	15,100	5,100	900	8,300	2,100
				8,400		
			28,500	18,100		
				12,800		

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	2,400		15,100		5,100		900		8,300		2,100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	320	90	70	30	80	200	160	480	260	80	580	30
Turns	PM	300	90	90	40	110	180	220	660	370	80	540	30

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	1,400		9,100		3,100		500		5,000		1,300	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	190	50	40	20	40	120	100	290	160	50	350	20
Turns	PM	180	50	60	20	60	110	140	400	220	50	330	20

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	500		3,000		1,000		200		1,700		400	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	70	20	10	10	20	40	30	90	50	20	120	10
Turns	PM	60	20	20	10	20	40	40	130	70	10	110	10

3 Intersection:	McMichael at Cyrils Dr.
Condition:	2040 Buildout NED
Count Date:	n/a
MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*0*	*45*	*0*	*0*	*0*	*0*	*45*	45	*55*	*55*	*0*
Seed %	*PM*	*45*	*0*	*55*	*0*	*0*	*0*	*0*	*55*	55	*45*	*45*	*0*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	0	10,153	0	0	8,562	4,259

0

18,715 14,412

12,821

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	0	9,900	0	0	8,400	4,200

0

18,300 14,100

12,600

Movement D Factors

	AM D	55.0%	0.0%	45.0%	0.0%	0.0%	0.0%	0.0%	45.0%	45.0%	55.0%	55.0%	0.0%
	PM D	45.0%	0.0%	55.0%	0.0%	0.0%	0.0%	0.0%	55.0%	55.0%	45.0%	45.0%	0.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	0		9,900		0		0		8,400		4,200	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	0.0%	45.0%	0.0%	0.0%	0.0%	0.0%	45.0%	45.0%	55.0%	55.0%	0.0%
	PM D	45.0%	0.0%	55.0%	0.0%	0.0%	0.0%	0.0%	55.0%	55.0%	45.0%	45.0%	0.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	320	0	130	0	0	0	0	310	260	160	380	0
Turns	PM	300	0	180	0	0	0	0	440	370	150	360	0

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.697		0.60		0.60		0.60		0.60		0.60	
	AADT	0		5,900		0		0		5,000		2,500	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	0.0%	45.0%	0.0%	0.0%	0.0%	0.0%	45.0%	45.0%	55.0%	55.0%	0.0%
	PM D	45.0%	0.0%	55.0%	0.0%	0.0%	0.0%	0.0%	55.0%	55.0%	45.0%	45.0%	0.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	190	0	80	0	0	0	0	190	160	100	230	0
Turns	PM	180	0	110	0	0	0	0	260	220	90	210	0

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.375		0.20		0.20		0.20		0.20		0.20	
	AADT	0		2,000		0		0		1,700		800	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	0.0%	45.0%	0.0%	0.0%	0.0%	0.0%	45.0%	45.0%	55.0%	55.0%	0.0%
	PM D	45.0%	0.0%	55.0%	0.0%	0.0%	0.0%	0.0%	55.0%	55.0%	45.0%	45.0%	0.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	70	0	30	0	0	0	0	60	50	30	80	0
Turns	PM	60	0	40	0	0	0	0	90	70	30	70	0

4 Intersection: Planned Road at Cyrils Dr.
Condition: 2040 Buildout NED
Count Date: n/a
MOCF: 0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	45	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	55	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
236	8,664	5,104	4,989	643	855

10,329
14,411
14,508
1,734

AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
200	8,500	5,000	4,900	600	800

10,100
14,100
14,200
1,600

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	200		8,500		5,000		4,900		600		800	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	20	10	30	150	10	190	160	270	20	30	330	190
Turns	PM	20	10	40	220	10	180	220	370	30	30	310	180

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.697		0.60		0.60		0.60		0.60		0.60	
	AADT	100		5,100		3,000		2,900		400		500	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	20	0	20	90	0	120	90	160	10	20	200	110
Turns	PM	10	0	20	130	0	110	130	220	20	20	180	100

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.375		0.20		0.20		0.20		0.20		0.20	
	AADT	100		1,700		1,000		1,000		100		200	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	0	10	30	0	40	30	50	0	10	70	40
Turns	PM	0	0	10	40	0	40	40	70	0	10	60	40

Appendix C:

Cyrils Drive Synchro Analysis

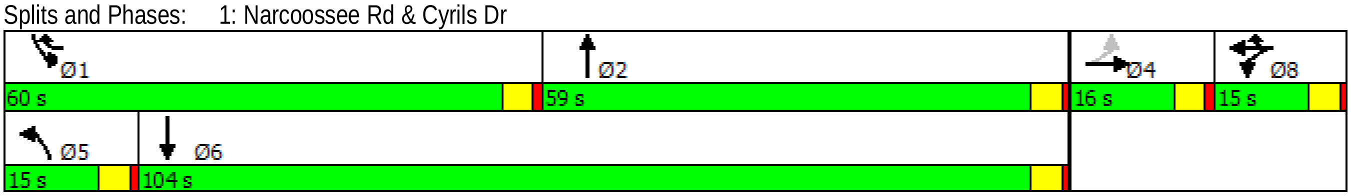
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	1	7	70	1	1050	2	3010	60	860	2460	7
Future Volume (vph)	20	1	7	70	1	1050	2	3010	60	860	2460	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	325		545	145		0	715		0
Storage Lanes	0		0	0		2	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.91	0.91	0.97	0.91	0.91
Frt		0.965				0.850		0.997				
Flt Protected		0.966			0.953		0.950			0.950		
Satd. Flow (prot)	0	1736	0	0	1775	2787	1770	5070	0	3433	5085	0
Flt Permitted		0.407			0.953		0.950			0.950		
Satd. Flow (perm)	0	732	0	0	1775	2787	1770	5070	0	3433	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				232		2			1	
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1120			1150			1078			1024	
Travel Time (s)		21.8			22.4			18.4			17.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	1	8	76	1	1141	2	3272	65	935	2674	8
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	31	0	0	77	1141	2	3337	0	935	2682	0
Turn Type	Perm	NA		Split	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4		8	8	8 1	5	2		1	6	
Permitted Phases	4											
Detector Phase	4	4		8	8	8 1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	16.0	16.0		15.0	15.0		15.0	59.0		60.0	104.0	
Total Split (%)	10.7%	10.7%		10.0%	10.0%		10.0%	39.3%		40.0%	69.3%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)		10.0			10.6	62.6	5.8	56.5		47.5	106.5	
Actuated g/C Ratio		0.07			0.08	0.45	0.04	0.40		0.34	0.76	
v/c Ratio		0.53			0.57	0.83	0.03	1.63		0.80	0.69	
Control Delay		82.7			83.0	32.8	69.5	315.9		48.0	10.9	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		82.7			83.0	32.8	69.5	315.9		48.0	10.9	
LOS		F			F	C	E	F		D	B	
Approach Delay		82.7			36.0			315.8			20.4	
Approach LOS		F			D			F			C	
Queue Length 50th (ft)		21			72	437	2	~1729		407	426	
Queue Length 95th (ft)		#66			#144	544	12	#1873		488	635	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1040			1070			998			944	
Turn Bay Length (ft)						545	145			715		
Base Capacity (vph)		67			134	1527	133	2046		1370	3866	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.46			0.57	0.75	0.02	1.63		0.68	0.69	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 140.1
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.63
Intersection Signal Delay: 143.2 Intersection LOS: F
Intersection Capacity Utilization 111.6% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Narcoossee Rd & Cyrils Dr



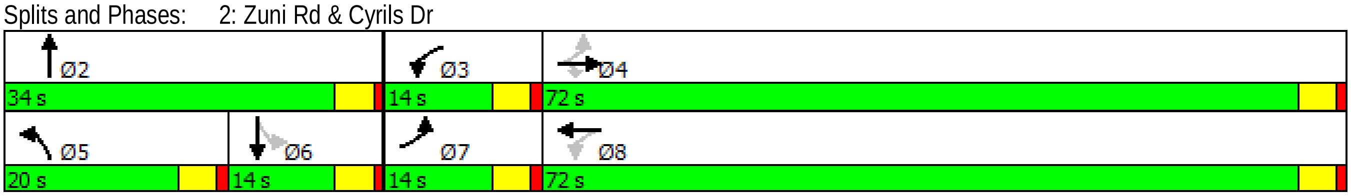
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	480	260	80	580	30	320	90	70	30	80	200
Future Volume (vph)	160	480	260	80	580	30	320	90	70	30	80	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		200	200		0	255		150	145		0
Storage Lanes	1		1	1		0	2		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.993			0.934			0.893	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3514	0	3433	1740	0	1770	1663	0
Flt Permitted	0.202			0.405			0.950			0.647		
Satd. Flow (perm)	376	3539	1583	754	3514	0	3433	1740	0	1205	1663	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			283		7			31			81	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		926			971			1035			1035	
Travel Time (s)		18.0			18.9			20.2			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	522	283	87	630	33	348	98	76	33	87	217
Shared Lane Traffic (%)												
Lane Group Flow (vph)	174	522	283	87	663	0	348	174	0	33	304	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA		Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4		4	8						6		
Detector Phase	7	4	4	3	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5		9.5	22.5		22.5	22.5	
Total Split (s)	14.0	72.0	72.0	14.0	72.0		20.0	34.0		14.0	14.0	
Total Split (%)	11.7%	60.0%	60.0%	11.7%	60.0%		16.7%	28.3%		11.7%	11.7%	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Recall Mode	None	None	None	None	None		None	Max		Max	Max	
Act Effct Green (s)	32.6	25.2	25.2	29.0	21.2		13.1	35.7		18.1	18.1	
Actuated g/C Ratio	0.41	0.32	0.32	0.36	0.27		0.16	0.45		0.23	0.23	
v/c Ratio	0.55	0.47	0.41	0.23	0.71		0.62	0.22		0.12	0.69	
Control Delay	21.2	24.8	5.0	15.1	30.8		37.1	12.8		28.9	31.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.2	24.8	5.0	15.1	30.8		37.1	12.8		28.9	31.7	
LOS	C	C	A	B	C		D	B		C	C	
Approach Delay		18.4			29.0			29.0			31.5	
Approach LOS		B			C			C			C	
Queue Length 50th (ft)	52	114	0	25	156		84	41		13	102	
Queue Length 95th (ft)	95	170	54	52	219		138	93		41	#242	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		846			891			955			955	
Turn Bay Length (ft)	145		200	200			255			145		
Base Capacity (vph)	320	3014	1390	412	2994		671	795		273	440	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.54	0.17	0.20	0.21	0.22		0.52	0.22		0.12	0.69	

Intersection Summary	
Area Type: Other	
Cycle Length: 120	
Actuated Cycle Length: 79.9	
Natural Cycle: 70	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 25.3	Intersection LOS: C
Intersection Capacity Utilization 66.5%	ICU Level of Service C
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Zuni Rd & Cyrils Dr

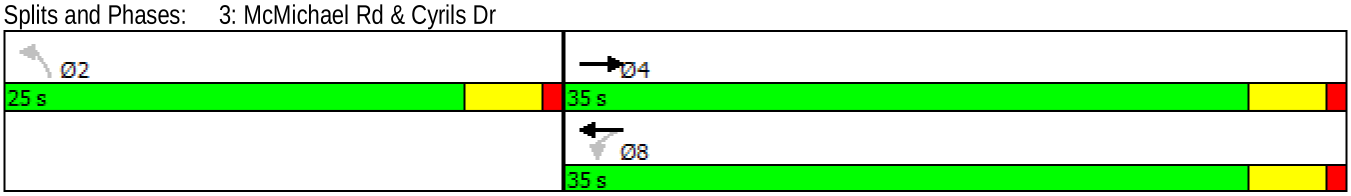


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	310	260	160	380	320	130
Future Volume (vph)	310	260	160	380	320	130
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	230		145	0
Storage Lanes		0	1		0	0
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.932				0.961	
Flt Protected			0.950		0.966	
Satd. Flow (prot)	3299	0	1770	3539	1729	0
Flt Permitted			0.390		0.966	
Satd. Flow (perm)	3299	0	726	3539	1729	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	283				37	
Link Speed (mph)	30			30	30	
Link Distance (ft)	1136			1447	1210	
Travel Time (s)	25.8			32.9	27.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	337	283	174	413	348	141
Shared Lane Traffic (%)						
Lane Group Flow (vph)	620	0	174	413	489	0
Turn Type	NA		Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases			8		2	
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	
Minimum Split (s)	22.5		22.5	22.5	22.5	
Total Split (s)	35.0		35.0	35.0	25.0	
Total Split (%)	58.3%		58.3%	58.3%	41.7%	
Yellow Time (s)	3.5		3.5	3.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	4.5		4.5	4.5	4.5	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		None	None	Min	
Act Effct Green (s)	16.5		16.5	16.5	16.1	
Actuated g/C Ratio	0.39		0.39	0.39	0.38	
v/c Ratio	0.43		0.62	0.30	0.72	
Control Delay	5.7		21.1	9.3	20.4	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	5.7		21.1	9.3	20.4	
LOS	A		C	A	C	
Approach Delay	5.7			12.8	20.4	
Approach LOS	A			B	C	
Queue Length 50th (ft)	27		32	33	84	
Queue Length 95th (ft)	57		88	62	#293	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Internal Link Dist (ft)	1056			1367	1130	
Turn Bay Length (ft)			230		145	
Base Capacity (vph)	2537		542	2645	932	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.24		0.32	0.16	0.52	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 42.5	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 62.7%	ICU Level of Service B
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 3: McMichael Rd & Cyrils Dr



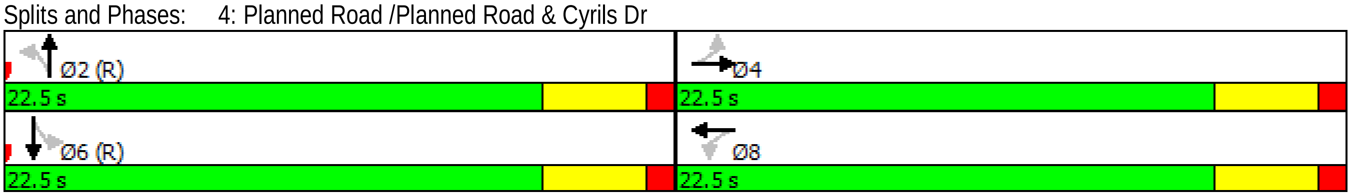
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	160	270	20	30	330	190	20	10	30	150	10	190
Future Volume (vph)	160	270	20	30	330	190	20	10	30	150	10	190
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	230		0	230		0	145		0	145		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	50			50			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.990			0.945			0.887			0.858	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3504	0	1770	3345	0	1770	1652	0	1770	1598	0
Flt Permitted	0.419			0.561			0.622			0.728		
Satd. Flow (perm)	780	3504	0	1045	3345	0	1159	1652	0	1356	1598	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20			207			33			207	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1501			1595			1464			1164	
Travel Time (s)		34.1			36.3			33.3			26.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	174	293	22	33	359	207	22	11	33	163	11	207
Shared Lane Traffic (%)												
Lane Group Flow (vph)	174	315	0	33	566	0	22	44	0	163	218	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)	18.0	18.0		18.0	18.0		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40		0.40	0.40	
v/c Ratio	0.56	0.22		0.08	0.39		0.05	0.06		0.30	0.29	
Control Delay	19.4	8.8		9.1	6.8		8.7	4.9		11.2	3.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	19.4	8.8		9.1	6.8		8.7	4.9		11.2	3.2	
LOS	B	A		A	A		A	A		B	A	
Approach Delay		12.6			6.9			6.1			6.6	
Approach LOS		B			A			A			A	
Queue Length 50th (ft)	33	24		5	31		3	2		27	2	
Queue Length 95th (ft)	#100	44		17	57		13	15		60	31	
Internal Link Dist (ft)		1421			1515			1384			1084	
Turn Bay Length (ft)	230			230			145			145		
Base Capacity (vph)	312	1413		418	1462		463	680		542	763	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.56	0.22		0.08	0.39		0.05	0.06		0.30	0.29	

Intersection Summary

Area Type: Other
Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 45
Control Type: Pretimed
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 8.6 Intersection LOS: A
Intersection Capacity Utilization 51.9% ICU Level of Service A
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Planned Road /Planned Road & Cyrils Dr



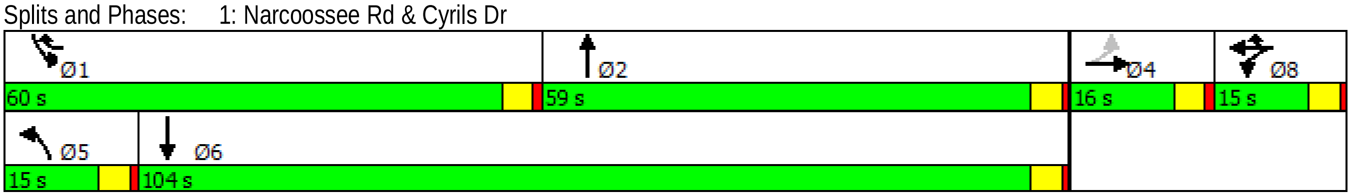
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	3	1	6	70	1	980	11	2820	80	1200	3440	6
Future Volume (vph)	3	1	6	70	1	980	11	2820	80	1200	3440	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	325		545	145		0	715		0
Storage Lanes	0		0	0		2	1		0	2		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	0.88	1.00	0.91	0.91	0.97	0.91	0.91
Frt		0.914				0.850		0.996				
Flt Protected		0.987			0.953		0.950					
Satd. Flow (prot)	0	1680	0	0	1775	2787	1770	5065	0	3614	5085	0
Flt Permitted		0.707			0.953		0.950					
Satd. Flow (perm)	0	1204	0	0	1775	2787	1770	5065	0	3614	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7				318		3				
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1120			1150			1078			1024	
Travel Time (s)		21.8			22.4			18.4			17.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	3	1	7	76	1	1065	12	3065	87	1304	3739	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	11	0	0	77	1065	12	3152	0	1304	3746	0
Turn Type	Perm	NA		Split	NA	pt+ov	Prot	NA		Prot	NA	
Protected Phases		4		8	8	8 1	5	2		1	6	
Permitted Phases	4											
Detector Phase	4	4		8	8	8 1	5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	16.0	16.0		15.0	15.0		15.0	59.0		60.0	104.0	
Total Split (%)	10.7%	10.7%		10.0%	10.0%		10.0%	39.3%		40.0%	69.3%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)		4.5			4.5		4.5	4.5		4.5	4.5	
Lead/Lag							Lead	Lag		Lead	Lag	
Lead-Lag Optimize?							Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)		7.2			10.5	70.2	6.6	54.6		55.2	109.8	
Actuated g/C Ratio		0.05			0.08	0.50	0.05	0.39		0.40	0.79	
v/c Ratio		0.16			0.57	0.68	0.14	1.58		0.91	0.93	
Control Delay		47.2			81.1	20.7	69.9	296.1		50.5	20.0	
Queue Delay		0.0			0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay		47.2			81.1	20.7	69.9	296.1		50.5	20.0	
LOS		D			F	C	E	F		D	B	
Approach Delay		47.2			24.8			295.2			27.9	
Approach LOS		D			C			F			C	
Queue Length 50th (ft)		3			66	261	10	~1413		529	490	
Queue Length 95th (ft)		25			#143	429	35	#1730		#796	#1543	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1040			1070			998			944	
Turn Bay Length (ft)						545	145			715		
Base Capacity (vph)		106			134	1571	133	1990		1444	4009	
Starvation Cap Reductn		0			0	0	0	0		0	0	
Spillback Cap Reductn		0			0	0	0	0		0	0	
Storage Cap Reductn		0			0	0	0	0		0	0	
Reduced v/c Ratio		0.10			0.57	0.68	0.09	1.58		0.90	0.93	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 139.2
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.58
Intersection Signal Delay: 117.8 Intersection LOS: F
Intersection Capacity Utilization 112.3% ICU Level of Service H
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Narcoossee Rd & Cyrils Dr



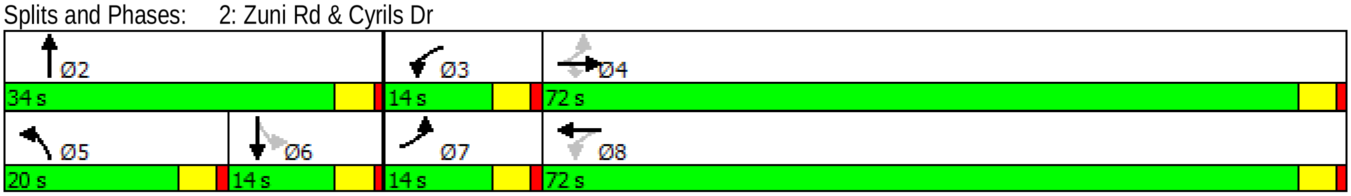
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	220	660	370	80	540	30	300	90	90	40	110	180
Future Volume (vph)	220	660	370	80	540	30	300	90	90	40	110	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		200	200		0	255		150	145		0
Storage Lanes	1		1	1		0	2		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	0.95	0.97	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.992			0.925			0.907	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3539	1583	1770	3511	0	3433	1723	0	1770	1690	0
Flt Permitted	0.245			0.276			0.950			0.634		
Satd. Flow (perm)	456	3539	1583	514	3511	0	3433	1723	0	1181	1690	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			402		8			40			53	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		926			971			1035			1035	
Travel Time (s)		18.0			18.9			20.2			20.2	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	239	717	402	87	587	33	326	98	98	43	120	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	239	717	402	87	620	0	326	196	0	43	316	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		Prot	NA		Perm	NA	
Protected Phases	7	4		3	8		5	2			6	
Permitted Phases	4		4	8						6		
Detector Phase	7	4	4	3	8		5	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5	22.5	9.5	22.5		9.5	22.5		22.5	22.5	
Total Split (s)	14.0	72.0	72.0	14.0	72.0		20.0	34.0		14.0	14.0	
Total Split (%)	11.7%	60.0%	60.0%	11.7%	60.0%		16.7%	28.3%		11.7%	11.7%	
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag	Lag	Lead	Lag		Lead			Lag	Lag	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes		Yes			Yes	Yes	
Recall Mode	None	None	None	None	None		None	Max		Max	Max	
Act Effct Green (s)	35.9	28.6	28.6	31.9	24.2		12.7	35.5		18.2	18.2	
Actuated g/C Ratio	0.43	0.34	0.34	0.38	0.29		0.15	0.43		0.22	0.22	
v/c Ratio	0.68	0.59	0.50	0.28	0.60		0.62	0.26		0.17	0.77	
Control Delay	25.8	25.6	4.6	15.0	27.2		39.8	14.5		32.2	41.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	25.8	25.6	4.6	15.0	27.2		39.8	14.5		32.2	41.4	
LOS	C	C	A	B	C		D	B		C	D	
Approach Delay		19.4			25.7			30.3			40.3	
Approach LOS		B			C			C			D	
Queue Length 50th (ft)	74	166	0	25	142		82	50		18	130	
Queue Length 95th (ft)	#135	237	59	51	200		142	116		54	#320	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		846			891			955			955	
Turn Bay Length (ft)	145		200	200			255			145		
Base Capacity (vph)	349	2918	1375	354	2895		649	760		259	412	
Starvation Cap Reductn	0	0	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.68	0.25	0.29	0.25	0.21		0.50	0.26		0.17	0.77	

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 83
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 25.4 — Intersection LOS: C
Intersection Capacity Utilization 68.5% — ICU Level of Service C
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: Zuni Rd & Cyrils Dr

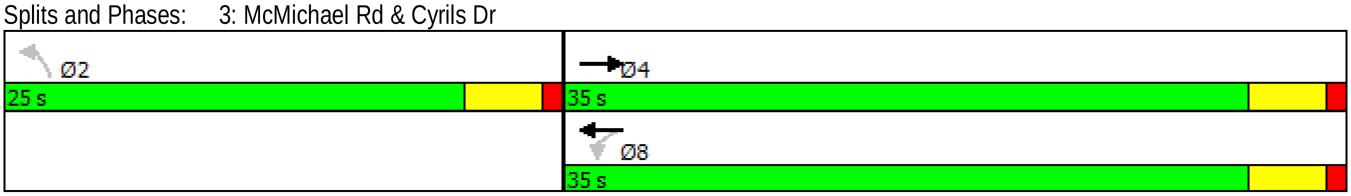


Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	440	370	150	360	300	180
Future Volume (vph)	440	370	150	360	300	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		0	230		145	0
Storage Lanes		0	1		0	0
Taper Length (ft)			25		25	
Lane Util. Factor	0.95	0.95	1.00	0.95	1.00	1.00
Frt	0.931				0.949	
Flt Protected			0.950		0.970	
Satd. Flow (prot)	3295	0	1770	3539	1715	0
Flt Permitted			0.250		0.970	
Satd. Flow (perm)	3295	0	466	3539	1715	0
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)	402				55	
Link Speed (mph)	30			30	30	
Link Distance (ft)	1136			1447	1210	
Travel Time (s)	25.8			32.9	27.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	478	402	163	391	326	196
Shared Lane Traffic (%)						
Lane Group Flow (vph)	880	0	163	391	522	0
Turn Type	NA		Perm	NA	Perm	
Protected Phases	4			8		
Permitted Phases			8		2	
Detector Phase	4		8	8	2	
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	
Minimum Split (s)	22.5		22.5	22.5	22.5	
Total Split (s)	35.0		35.0	35.0	25.0	
Total Split (%)	58.3%		58.3%	58.3%	41.7%	
Yellow Time (s)	3.5		3.5	3.5	3.5	
All-Red Time (s)	1.0		1.0	1.0	1.0	
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	
Total Lost Time (s)	4.5		4.5	4.5	4.5	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None		None	None	Min	
Act Effct Green (s)	21.2		21.2	21.2	17.7	
Actuated g/C Ratio	0.44		0.44	0.44	0.36	
v/c Ratio	0.53		0.81	0.25	0.79	
Control Delay	6.2		44.1	8.8	25.7	
Queue Delay	0.0		0.0	0.0	0.0	
Total Delay	6.2		44.1	8.8	25.7	
LOS	A		D	A	C	
Approach Delay	6.2			19.2	25.7	
Approach LOS	A			B	C	
Queue Length 50th (ft)	47		41	37	124	
Queue Length 95th (ft)	82		#136	59	#316	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Internal Link Dist (ft)	1056			1367	1130	
Turn Bay Length (ft)			230		145	
Base Capacity (vph)	2329		310	2358	813	
Starvation Cap Reductn	0		0	0	0	
Spillback Cap Reductn	0		0	0	0	
Storage Cap Reductn	0		0	0	0	
Reduced v/c Ratio	0.38		0.53	0.17	0.64	

Intersection Summary	
Area Type: Other	
Cycle Length: 60	
Actuated Cycle Length: 48.6	
Natural Cycle: 50	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 15.1	Intersection LOS: B
Intersection Capacity Utilization 71.2%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

Splits and Phases: 3: McMichael Rd & Cyrils Dr



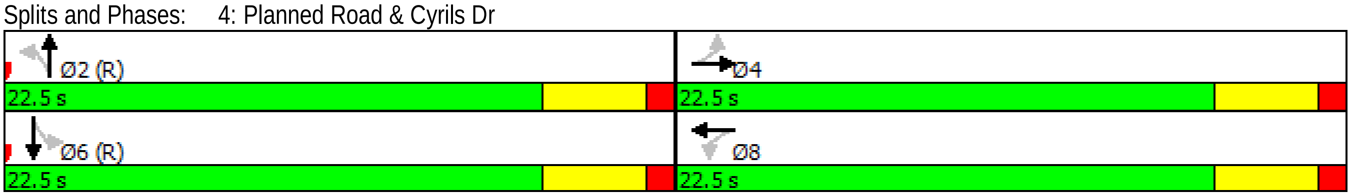
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	220	370	30	30	310	180	20	10	40	220	10	180
Future Volume (vph)	220	370	30	30	310	180	20	10	40	220	10	180
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	230		0	230		0	145		0	145		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	50			50			50			50		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.989			0.945			0.881			0.858	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3500	0	1770	3345	0	1770	1641	0	1770	1598	0
Flt Permitted	0.442			0.499			0.628			0.722		
Satd. Flow (perm)	823	3500	0	930	3345	0	1170	1641	0	1345	1598	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		22			196			43			196	
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		1501			1595			1464			1164	
Travel Time (s)		34.1			36.3			33.3			26.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	239	402	33	33	337	196	22	11	43	239	11	196
Shared Lane Traffic (%)												
Lane Group Flow (vph)	239	435	0	33	533	0	22	54	0	239	207	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Act Effct Green (s)	18.0	18.0		18.0	18.0		18.0	18.0		18.0	18.0	
Actuated g/C Ratio	0.40	0.40		0.40	0.40		0.40	0.40		0.40	0.40	
v/c Ratio	0.73	0.31		0.09	0.37		0.05	0.08		0.44	0.27	
Control Delay	28.7	9.5		9.3	6.7		8.7	4.5		13.2	3.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	28.7	9.5		9.3	6.7		8.7	4.5		13.2	3.2	
LOS	C	A		A	A		A	A		B	A	
Approach Delay		16.3			6.8			5.7			8.5	
Approach LOS		B			A			A			A	
Queue Length 50th (ft)	49	35		5	28		3	2		42	2	
Queue Length 95th (ft)	#145	61		18	55		13	16		89	30	
Internal Link Dist (ft)		1421			1515			1384			1084	
Turn Bay Length (ft)	230			230			145			145		
Base Capacity (vph)	329	1413		372	1455		468	682		538	756	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.73	0.31		0.09	0.37		0.05	0.08		0.44	0.27	

Intersection Summary	
Area Type:	Other
Cycle Length: 45	
Actuated Cycle Length: 45	
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 60	
Control Type: Pretimed	
Maximum v/c Ratio: 0.73	
Intersection Signal Delay: 10.8	Intersection LOS: B
Intersection Capacity Utilization 56.6%	ICU Level of Service B
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Planned Road & Cyrils Dr



Appendix D:

Jack Brack Road Turning Movement Worksheets

5	Intersection:	Narcoossee Rd. at Jack Brack Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*0*	*55*	*45*	*45*	*45*	*0*	*0*	*0*	*0*	*55*	*0*	*55*
Seed %	*PM*	*0*	*45*	*55*	*55*	*55*	*0*	*0*	*0*	*0*	*45*	*0*	*45*

Model Raw AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
71,824	0	0	4,090	0	2,374

75,914
0 6,464
74,198

AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
70,400	0	0	4,000	0	2,300

74,400
0 6,300
72,700

Movement D Factors

	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	70,400		0		0		4,000		0		2,300	
		Northbound			Southbound			Eastbound			Westbound		
		Left*	Through	Right	Left	Through	Right*	Left*	Through*	Right*	Left	Through*	Right
	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	9	2,710	70	130	2,220	18	54	5	27	90	2	150
Turns	PM	43	2,530	100	180	3,100	17	10	2	26	80	4	140

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.697		0.60		0.60		0.60		0.60		0.60	
	AADT	49,100		0		0		2,400		0		1,400	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	1,890	40	80	1,550	0	0	0	0	50	0	90
Turns	PM	0	1,770	60	110	2,160	0	0	0	0	50	0	90

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.396		0.20		0.20		0.20		0.20		0.20	
	AADT	27,900		0		0		800		0		500	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	1,070	20	30	880	0	0	0	0	20	0	30
Turns	PM	0	1,000	20	40	1,230	0	0	0	0	20	0	30

*Turning movements calculated from trip generation of anticipated build out scenario.

6	Intersection:	Jack Brack at Zuni Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	4,619	4,999	1,345	6,564	0	3,209

12,528

6,344 | 14,772

7,828

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	4,500	4,900	1,300	6,400	0	3,100

12,200

6,200 | 14,400

7,600

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	4,500		4,900		1,300		6,400		0		3,100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	170	100	200	140	50	40	150	0	120	190	250
Turns	PM	0	160	140	280	200	50	60	220	0	110	180	230

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	2,700		2,900		800		3,800		0		1,900	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	100	60	120	90	30	30	90	0	70	110	150
Turns	PM	0	100	80	170	120	30	40	130	0	70	100	140

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	900		1,000		300		1,300		0		600	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	30	20	40	30	10	10	30	0	20	40	50
Turns	PM	0	30	30	60	40	10	10	40	0	20	40	50

7	Intersection:	Jack Brack at McMichael Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
7,191	1,820	1,933	3,410	2,214	141

12,534

5,967 5,371

9,546

AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
7,000	1,800	1,900	3,300	2,200	500

12,200

Minimal Volume

5,900 5,600

9,700

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	7,000		1,800		1,900		3,300		2,200		500	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	80	270	20	100	220	70	60	60	70	20	70	130
Turns	PM	80	250	20	150	310	70	80	80	100	20	60	120

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	4,200		1,100		1,100		2,000		1,300		300	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	50	160	10	60	130	40	30	30	40	10	40	80
Turns	PM	50	150	10	90	180	40	50	50	60	10	40	70

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	1,400		400		400		700		400		100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	20	50	0	20	40	20	10	10	10	0	20	30
Turns	PM	10	50	0	30	60	10	20	20	20	0	10	30

8	Intersection:	Planned Road at Jack Brack Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*0*	*0*	*0*	*45*	*0*	*55*	*45*	*45*	*0*	*0*	*55*	*55*
Seed %	*PM*	*0*	*0*	*0*	*55*	*0*	*45*	*55*	*55*	*0*	*0*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	0	5,284	87	420	0	0

507

5,371 5,704

0

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	0	5,200	100	400	0	0

500

5,300 5,600

0

Movement D Factors

	AM D	0.0%	0.0%	0.0%	45.0%	0.0%	55.0%	45.0%	45.0%	0.0%	0.0%	55.0%	55.0%
	PM D	0.0%	0.0%	0.0%	55.0%	0.0%	45.0%	55.0%	55.0%	0.0%	0.0%	45.0%	45.0%

2040	Quadrant	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	Factor	1.00	1.00	1.00	1.00	1.00	1.00
	AADT	0	5,200	100	400	0	0

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	0.0%	0.0%	0.0%	45.0%	0.0%	55.0%	45.0%	45.0%	0.0%	0.0%	55.0%	55.0%
	PM D	0.0%	0.0%	0.0%	55.0%	0.0%	45.0%	55.0%	55.0%	0.0%	0.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	0	0	10	0	0	0	160	0	0	200	20
Turns	PM	0	0	0	20	0	0	0	230	0	0	190	10

2030	Quadrant	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	Factor	0.697	0.60	0.60	0.60	0.60	0.60
	AADT	0	3,100	100	200	0	0

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	0.0%	0.0%	0.0%	45.0%	0.0%	55.0%	45.0%	45.0%	0.0%	0.0%	55.0%	55.0%
	PM D	0.0%	0.0%	0.0%	55.0%	0.0%	45.0%	55.0%	55.0%	0.0%	0.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	0	0	10	0	0	0	100	0	0	120	10
Turns	PM	0	0	0	10	0	0	0	140	0	0	110	10

2020	Quadrant	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	Factor	0.375	0.20	0.20	0.20	0.20	0.20
	AADT	0	1,000	0	100	0	0

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	0.0%	0.0%	0.0%	45.0%	0.0%	55.0%	45.0%	45.0%	0.0%	0.0%	55.0%	55.0%
	PM D	0.0%	0.0%	0.0%	55.0%	0.0%	45.0%	55.0%	55.0%	0.0%	0.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	0	0	0	0	0	0	30	0	0	40	0
Turns	PM	0	0	0	0	0	0	0	40	0	0	40	0

9	Intersection:	Jack Brack at Rummell Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	12,276	4,417	367	1,476	919	1,322

14,119

5,703 7,215

14,517

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	12,000	4,300	500	1,400	900	1,300

Minimal Volume

13,900

5,700 7,000

14,200

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	12,000		4,300		500		1,400		900		1,300	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	30	460	40	40	380	20	20	140	30	50	170	50
Turns	PM	30	430	60	60	530	20	20	190	40	50	150	50

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	7,200		2,600		300		800		500		800	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	20	280	30	30	230	10	10	80	20	30	100	30
Turns	PM	20	260	40	40	320	10	10	110	20	30	90	30

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	2,400		900		100		300		200		300	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	10	90	10	10	80	0	0	30	10	10	30	10
Turns	PM	10	90	10	10	110	0	0	40	10	10	30	10

Appendix E:

Jack Brack Road Synchro Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	54	5	27	90	2	150	9	2710	70	130	2220	18
Future Volume (vph)	54	5	27	90	2	150	9	2710	70	130	2220	18
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	425		0	145		0	535		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.872			0.852			0.996			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1624	0	1770	1587	0	1770	5065	0	1770	5080	0
Flt Permitted	0.597			0.469			0.950			0.950		
Satd. Flow (perm)	1112	1624	0	874	1587	0	1770	5065	0	1770	5080	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			163			3			1	
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		673			766			971			987	
Travel Time (s)		13.1			14.9			16.6			16.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	59	5	29	98	2	163	10	2946	76	141	2413	20
Shared Lane Traffic (%)												
Lane Group Flow (vph)	59	34	0	98	165	0	10	3022	0	141	2433	0
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	18.5	22.5		18.5	22.5		25.0	113.0		34.0	122.0	
Total Split (%)	9.8%	12.0%		9.8%	12.0%		13.3%	60.1%		18.1%	64.9%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	17.2	7.9		22.6	9.5		20.5	108.6		29.5	117.6	
Actuated g/C Ratio	0.10	0.04		0.13	0.05		0.12	0.62		0.17	0.67	
v/c Ratio	0.40	0.34		0.53	0.69		0.05	0.97		0.48	0.72	
Control Delay	75.4	38.8		79.5	26.0		72.3	42.3		73.4	20.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	75.4	38.8		79.5	26.0		72.3	42.3		73.4	20.8	
LOS	E	D		E	C		E	D		E	C	
Approach Delay		62.0			45.9			42.4			23.6	
Approach LOS		E			D			D			C	
Queue Length 50th (ft)	62	6		105	2		11	1171		150	623	
Queue Length 95th (ft)	112	46		169	84		34	#1466		239	776	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		593			686			891			907	
Turn Bay Length (ft)	145			425			145			535		
Base Capacity (vph)	183	192		187	308		206	3123		296	3391	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.32	0.18		0.52	0.54		0.05	0.97		0.48	0.72	

Intersection Summary

Area Type: Other
Cycle Length: 188
Actuated Cycle Length: 176.2
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 34.8 Intersection LOS: C
Intersection Capacity Utilization 89.7% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Narcoossee Rd & Jack Brack Rd

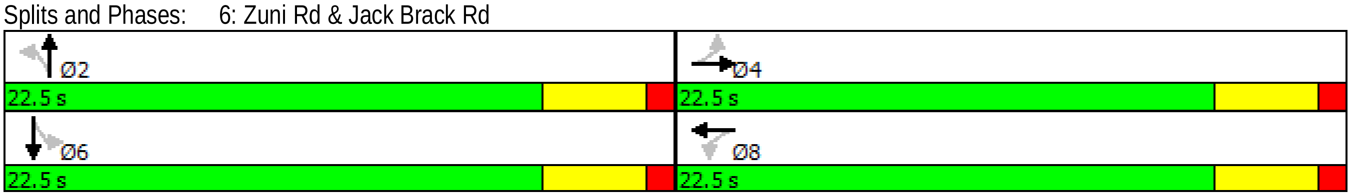
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	150	0	120	190	250	0	170	100	200	140	50
Future Volume (vph)	40	150	0	120	190	250	0	170	100	200	140	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190		0	175		0	160		0	160		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.915			0.944			0.961	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1770	1863	0	1770	1704	0	1863	1758	0	1770	1790	0
Flt Permitted	0.310			0.654						0.580		
Satd. Flow (perm)	577	1863	0	1218	1704	0	1863	1758	0	1080	1790	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					175			79			47	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1601			1731			1199			1084	
Travel Time (s)		31.2			33.7			23.4			21.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	43	163	0	130	207	272	0	185	109	217	152	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	43	163	0	130	479	0	0	294	0	217	206	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	12.9	12.9		12.9	12.9			18.2		18.2	18.2	
Actuated g/C Ratio	0.32	0.32		0.32	0.32			0.45		0.45	0.45	
v/c Ratio	0.23	0.27		0.33	0.72			0.35		0.44	0.25	
Control Delay	12.8	10.8		12.3	14.1			7.7		12.9	7.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	12.8	10.8		12.3	14.1			7.7		12.9	7.5	
LOS	B	B		B	B			A		B	A	
Approach Delay		11.2			13.7			7.7			10.2	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)	7	26		21	54			29		32	20	
Queue Length 95th (ft)	23	56		50	126			79		90	59	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1521			1651			1119			1004	
Turn Bay Length (ft)	190			175						160		
Base Capacity (vph)	261	844		552	867			840		489	837	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.16	0.19		0.24	0.55			0.35		0.44	0.25	

Intersection Summary

Area Type: Other
Cycle Length: 45
Actuated Cycle Length: 40.2
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 11.3 Intersection LOS: B
Intersection Capacity Utilization 70.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 6: Zuni Rd & Jack Brack Rd



Intersection	
Int Delay, s/veh	19

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	60	60	70	20	70	130	80	270	20	100	220	70
Future Vol, veh/h	60	60	70	20	70	130	80	270	20	100	220	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	165	-	-	145	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	65	65	76	22	76	141	87	293	22	109	239	76

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	217	0	0	141	0	0	582	495	103	581	462	147
Stage 1	-	-	-	-	-	-	234	234	-	190	190	-
Stage 2	-	-	-	-	-	-	348	261	-	391	272	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1353	-	-	1442	-	-	424	476	952	425	497	900
Stage 1	-	-	-	-	-	-	769	711	-	812	743	-
Stage 2	-	-	-	-	-	-	668	692	-	633	685	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1353	-	-	1442	-	-	221	446	952	188	466	900
Mov Cap-2 Maneuver	-	-	-	-	-	-	221	446	-	188	466	-
Stage 1	-	-	-	-	-	-	732	677	-	773	732	-
Stage 2	-	-	-	-	-	-	405	681	-	334	652	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.5	0.7	28.6	28.2
HCM LOS			D	D

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	221	463	1353	-	-	1442	-	-	188	527
HCM Lane V/C Ratio	0.393	0.681	0.048	-	-	0.015	-	-	0.578	0.598
HCM Control Delay (s)	31.5	27.8	7.8	-	-	7.5	-	-	47.5	21.5
HCM Lane LOS	D	D	A	-	-	A	-	-	E	C
HCM 95th %tile Q(veh)	1.8	5	0.2	-	-	0	-	-	3.1	3.9

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	160	200	20	10	0
Future Vol, veh/h	0	160	200	20	10	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	145	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	174	217	22	11	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	239	0	-	0	402	228
Stage 1	-	-	-	-	228	-
Stage 2	-	-	-	-	174	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1328	-	-	-	604	811
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	856	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1328	-	-	-	604	811
Mov Cap-2 Maneuver	-	-	-	-	604	-
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	856	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.1
HCM LOS			B

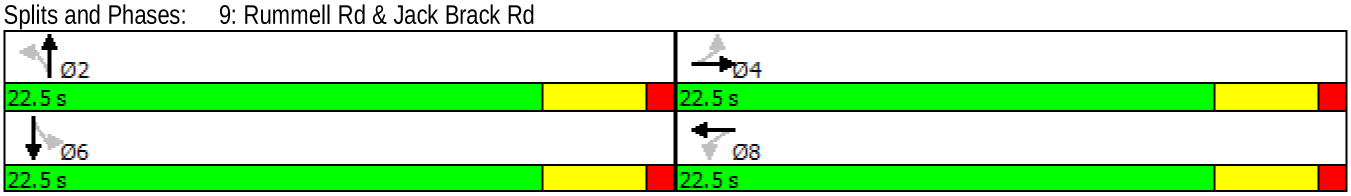
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1328	-	-	-	604
HCM Lane V/C Ratio	-	-	-	-	0.018
HCM Control Delay (s)	0	-	-	-	11.1
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	140	30	50	170	50	30	460	40	40	380	20
Future Volume (vph)	20	140	30	50	170	50	30	460	40	40	380	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	165		0	170		0	400		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.973			0.966			0.988			0.992	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1812	0	1770	1799	0	1770	3497	0	1770	3511	0
Flt Permitted	0.602			0.641			0.499			0.449		
Satd. Flow (perm)	1121	1812	0	1194	1799	0	930	3497	0	836	3511	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		29			39			24			14	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1115			835			773			757	
Travel Time (s)		21.7			16.3			15.1			14.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	152	33	54	185	54	33	500	43	43	413	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	185	0	54	239	0	33	543	0	43	435	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	9.5	9.5		9.6	9.6		22.0	22.0		22.0	22.0	
Actuated g/C Ratio	0.25	0.25		0.26	0.26		0.59	0.59		0.59	0.59	
v/c Ratio	0.08	0.39		0.18	0.49		0.06	0.26		0.09	0.21	
Control Delay	10.3	11.6		11.5	13.0		6.6	6.0		6.8	5.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.3	11.6		11.5	13.0		6.6	6.0		6.8	5.9	
LOS	B	B		B	B		A	A		A	A	
Approach Delay		11.5			12.7			6.1			6.0	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	3	25		8	33		3	27		4	21	
Queue Length 95th (ft)	13	58		25	73		15	64		19	52	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1035			755			693			677	
Turn Bay Length (ft)	165			165			170			400		
Base Capacity (vph)	539	886		574	885		544	2055		489	2059	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.21		0.09	0.27		0.06	0.26		0.09	0.21	

Intersection Summary	
Area Type: Other	
Cycle Length: 45	
Actuated Cycle Length: 37.6	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 8.0	Intersection LOS: A
Intersection Capacity Utilization 49.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 9: Rummell Rd & Jack Brack Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	2	26	80	4	140	43	2530	100	180	3100	17
Future Volume (vph)	10	2	26	80	4	140	43	2530	100	180	3100	17
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	425		0	145		0	535		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.860			0.854			0.994			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1602	0	1770	1591	0	1770	5055	0	1770	5080	0
Flt Permitted	0.563			0.451			0.950			0.950		
Satd. Flow (perm)	1049	1602	0	840	1591	0	1770	5055	0	1770	5080	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28			152			5			1	
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		673			766			971			987	
Travel Time (s)		13.1			14.9			16.6			16.8	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	11	2	28	87	4	152	47	2750	109	196	3370	18
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	30	0	87	156	0	47	2859	0	196	3388	0
Turn Type	pm+pt	NA		pm+pt	NA		Prot	NA		Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8								
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	18.5	22.5		18.5	22.5		25.0	113.0		34.0	122.0	
Total Split (%)	9.8%	12.0%		9.8%	12.0%		13.3%	60.1%		18.1%	64.9%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	11.9	6.6		21.1	16.4		20.5	108.7		29.5	117.7	
Actuated g/C Ratio	0.07	0.04		0.12	0.09		0.12	0.63		0.17	0.68	
v/c Ratio	0.11	0.34		0.52	0.54		0.22	0.90		0.65	0.98	
Control Delay	68.1	37.7		80.5	18.6		73.9	33.0		78.9	38.0	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	68.1	37.7		80.5	18.6		73.9	33.0		78.9	38.0	
LOS	E	D		F	B		E	C		E	D	
Approach Delay		45.8			40.8			33.7			40.2	
Approach LOS		D			D			C			D	
Queue Length 50th (ft)	11	2		92	4		50	1010		214	1333	
Queue Length 95th (ft)	33	41		154	83		98	1142		316	#1576	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		593			686			891			907	
Turn Bay Length (ft)	145			425			145			535		
Base Capacity (vph)	175	192		183	316		210	3180		302	3460	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.06	0.16		0.48	0.49		0.22	0.90		0.65	0.98	

Intersection Summary

Area Type: Other
Cycle Length: 188
Actuated Cycle Length: 172.8
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.98
Intersection Signal Delay: 37.5 Intersection LOS: D
Intersection Capacity Utilization 86.8% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 5: Narcoossee Rd & Jack Brack Rd

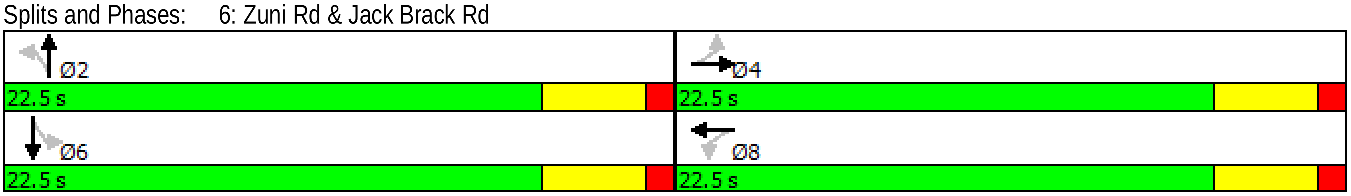
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	220	0	110	180	230	0	160	140	280	200	50
Future Volume (vph)	60	220	0	110	180	230	0	160	140	280	200	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	190		0	175		0	160		0	160		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt					0.916			0.930			0.970	
Flt Protected	0.950			0.950						0.950		
Satd. Flow (prot)	1770	1863	0	1770	1706	0	1863	1732	0	1770	1807	0
Flt Permitted	0.323			0.610						0.556		
Satd. Flow (perm)	602	1863	0	1136	1706	0	1863	1732	0	1036	1807	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					170			116			33	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1601			1731			1199			1084	
Travel Time (s)		31.2			33.7			23.4			21.1	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	239	0	120	196	250	0	174	152	304	217	54
Shared Lane Traffic (%)												
Lane Group Flow (vph)	65	239	0	120	446	0	0	326	0	304	271	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	12.4	12.4		12.4	12.4			18.2		18.2	18.2	
Actuated g/C Ratio	0.31	0.31		0.31	0.31			0.46		0.46	0.46	
v/c Ratio	0.35	0.41		0.34	0.69			0.38		0.64	0.32	
Control Delay	15.5	12.6		12.8	12.9			7.1		19.7	8.5	
Queue Delay	0.0	0.0		0.0	0.0			0.0		0.0	0.0	
Total Delay	15.5	12.6		12.8	12.9			7.1		19.7	8.5	
LOS	B	B		B	B			A		B	A	
Approach Delay		13.2			12.9			7.1			14.5	
Approach LOS		B			B			A			B	
Queue Length 50th (ft)	11	40		20	48			26		48	30	
Queue Length 95th (ft)	34	79		48	113			81		#170	83	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1521			1651			1119			1004	
Turn Bay Length (ft)	190			175						160		
Base Capacity (vph)	276	854		521	874			857		475	846	
Starvation Cap Reductn	0	0		0	0			0		0	0	
Spillback Cap Reductn	0	0		0	0			0		0	0	
Storage Cap Reductn	0	0		0	0			0		0	0	
Reduced v/c Ratio	0.24	0.28		0.23	0.51			0.38		0.64	0.32	

Intersection Summary	
Area Type: Other	
Cycle Length: 45	
Actuated Cycle Length: 39.7	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.69	
Intersection Signal Delay: 12.4	Intersection LOS: B
Intersection Capacity Utilization 75.2%	ICU Level of Service D
Analysis Period (min) 15	

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Zuni Rd & Jack Brack Rd



Intersection	
Int Delay, s/veh	43

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	80	80	100	20	60	120	80	250	20	150	310	70
Future Vol, veh/h	80	80	100	20	60	120	80	250	20	150	310	70
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	165	-	-	145	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	87	87	109	22	65	130	87	272	22	163	337	76

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	196	0	0	196	0	0	695	554	141	636	544	130
Stage 1	-	-	-	-	-	-	315	315	-	174	174	-
Stage 2	-	-	-	-	-	-	380	239	-	462	370	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1377	-	-	1377	-	-	357	440	907	391	446	920
Stage 1	-	-	-	-	-	-	696	656	-	828	755	-
Stage 2	-	-	-	-	-	-	642	708	-	580	620	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1377	-	-	1377	-	-	98	406	907	167	411	920
Mov Cap-2 Maneuver	-	-	-	-	-	-	98	406	-	167	411	-
Stage 1	-	-	-	-	-	-	652	615	-	776	743	-
Stage 2	-	-	-	-	-	-	317	697	-	296	581	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.4	0.8	55.7	70.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	98	423	1377	-	-	1377	-	-	167	458
HCM Lane V/C Ratio	0.887	0.694	0.063	-	-	0.016	-	-	0.976	0.902
HCM Control Delay (s)	140.1	30.7	7.8	-	-	7.7	-	-	118.7	51.4
HCM Lane LOS	F	D	A	-	-	A	-	-	F	F
HCM 95th %tile Q(veh)	5.1	5.2	0.2	-	-	0	-	-	7.6	9.9

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	0	230	190	10	20	0
Future Vol, veh/h	0	230	190	10	20	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	145	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	250	207	11	22	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	217	0	-	0	462	212
Stage 1	-	-	-	-	212	-
Stage 2	-	-	-	-	250	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1353	-	-	-	558	828
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	792	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1353	-	-	-	558	828
Mov Cap-2 Maneuver	-	-	-	-	558	-
Stage 1	-	-	-	-	823	-
Stage 2	-	-	-	-	792	-

Approach	EB	WB	SB
HCM Control Delay, s	0	0	11.7
HCM LOS			B

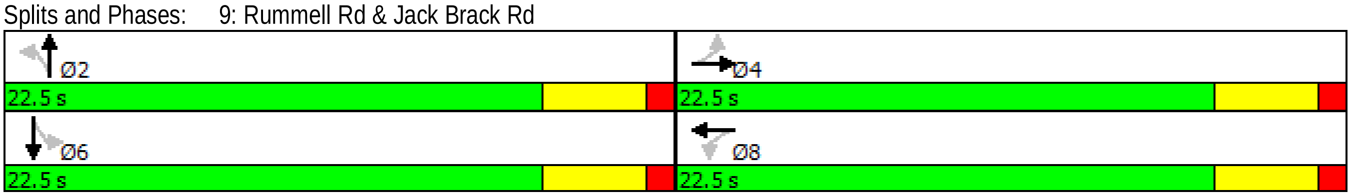
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1353	-	-	-	558
HCM Lane V/C Ratio	-	-	-	-	0.039
HCM Control Delay (s)	0	-	-	-	11.7
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	190	40	50	150	50	30	430	60	60	530	20
Future Volume (vph)	20	190	40	50	150	50	30	430	60	60	530	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	165		0	165		0	170		0	400		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.974			0.963			0.982			0.994	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1814	0	1770	1794	0	1770	3476	0	1770	3518	0
Flt Permitted	0.622			0.584			0.426			0.454		
Satd. Flow (perm)	1159	1814	0	1088	1794	0	794	3476	0	846	3518	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		28			44			40			10	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1115			835			773			757	
Travel Time (s)		21.7			16.3			15.1			14.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	207	43	54	163	54	33	467	65	65	576	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	250	0	54	217	0	33	532	0	65	598	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	9.9	9.9		9.7	9.7		21.7	21.7		21.7	21.7	
Actuated g/C Ratio	0.26	0.26		0.26	0.26		0.58	0.58		0.58	0.58	
v/c Ratio	0.07	0.50		0.19	0.43		0.07	0.26		0.13	0.29	
Control Delay	10.1	13.6		11.7	11.5		7.0	6.0		7.4	6.5	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.1	13.6		11.7	11.5		7.0	6.0		7.4	6.5	
LOS	B	B		B	B		A	A		A	A	
Approach Delay		13.3			11.6			6.1			6.6	
Approach LOS		B			B			A			A	
Queue Length 50th (ft)	3	37		8	28		3	26		6	32	
Queue Length 95th (ft)	13	78		25	64		16	63		26	75	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1035			755			693			677	
Turn Bay Length (ft)	165			165			170			400		
Base Capacity (vph)	561	892		526	891		461	2035		491	2046	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.04	0.28		0.10	0.24		0.07	0.26		0.13	0.29	

Intersection Summary	
Area Type: Other	
Cycle Length: 45	
Actuated Cycle Length: 37.4	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.50	
Intersection Signal Delay: 8.2	Intersection LOS: A
Intersection Capacity Utilization 51.0%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 9: Rummell Rd & Jack Brack Rd



Appendix F:

Jones Road Turning Movement Worksheets

10	Intersection:	Narcoossee Rd. at Jones Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*0*	*55*	*45*	*45*	*45*	*0*	*0*	*0*	0	*55*	*0*	*55*
Seed %	*PM*	*0*	*45*	*55*	*55*	*55*	*0*	*0*	*0*	0	*45*	*0*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	70,051	0	0	4,146	0	3,672
				74,197		
			0	7,818		
				73,723		

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	68,600	0	0	4,100	0	3,600
				72,700		
			0	7,700		
				72,200		

Movement D Factors

	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	68,600		0		0		4,100		0		3,600	
		Northbound			Southbound			Eastbound			Westbound		
		Left*	Through	Right	Left	Through	Right*	Left*	Through*	Right*	Left	Through*	Right
	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	6	2,640	110	130	2,160	6	32	2	19	140	1	160
Turns	PM	19	2,470	160	180	3,020	10	9	1	11	130	2	150

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.702		0.60		0.60		0.60		0.60		0.60	
	AADT	48,200		0		0		2,500		0		2,200	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	1,860	70	80	1,520	0	0	0	0	80	0	100
Turns	PM	0	1,740	100	110	2,120	0	0	0	0	80	0	90

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.405		0.20		0.20		0.20		0.20		0.20	
	AADT	27,800		0		0		800		0		700	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	0.0%	55.0%	45.0%	45.0%	45.0%	0.0%	0.0%	0.0%	0.0%	55.0%	0.0%	55.0%
	PM D	0.0%	45.0%	55.0%	55.0%	55.0%	0.0%	0.0%	0.0%	0.0%	45.0%	0.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	1,070	20	30	880	0	0	0	0	30	0	30
Turns	PM	0	1,000	30	40	1,220	0	0	0	0	30	0	30

*Turning movements calculated from trip generation of anticipated build out scenario.

11	Intersection:	Jones Rd. at Zuni Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	7,602	1,189	2	224	6,200	226

7,828

7,391 1,639

14,028

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	7,400	1,200	500	500	6,100	500
			Minimal Volume	Minimal Volume		Minimal Volume

8,400

7,800 2,200

14,000

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	7,400		1,200		500		500		6,100		500	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	230	280	20	20	230	20	20	40	190	20	50	20
Turns	PM	220	270	20	20	330	20	20	50	270	20	40	20

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	4,400		700		300		300		3,700		300	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	140	170	10	10	140	10	10	20	120	10	30	10
Turns	PM	130	160	10	10	190	10	10	30	160	10	30	10

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	1,500		200		100		100		1,200		100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	50	60	0	0	50	0	0	10	40	0	10	0
Turns	PM	40	50	0	0	70	0	0	10	50	0	10	0

12 Intersection: Jones Rd. at McMichael Rd.
Condition: 2040 Buildout NED
Count Date: n/a
MOCF: 0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	7,472	884	235	1,534	522	5

9,241
1,641 2,423
7,999

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	7,300	900	500	1,500	500	500
			Minimal Volume			Minimal Volume

9,300
1,900 2,900
8,300

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	7,300		900		500		1,500		500		500	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	20	280	20	50	230	20	20	30	20	20	30	60
Turns	PM	20	260	20	70	320	20	20	40	20	20	30	50

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	4,400		500		300		900		300		300	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	10	170	10	30	140	10	10	20	10	10	20	30
Turns	PM	10	160	10	40	190	10	10	20	10	10	20	30

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	1,500		200		100		300		100		100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	60	0	10	50	0	0	10	0	0	10	10
Turns	PM	0	50	0	10	70	0	0	10	0	0	10	10

13	Intersection:	Rummell Rd. at Jones Rd. East
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	13,051	1,086	243	286	0	388
				13,580		
			1,329	1,760		
				13,439		

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	12,800	1,100	500	500	0	500
			Minimal Volume	13,800 Minimal Volume		Minimal Volume
			1,600	2,100		
				13,300		

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	12,800		1,100		500		500		0		500	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	490	20	20	400	20	20	30	0	20	40	20
Turns	PM	0	460	20	20	560	20	20	50	0	20	40	20

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	7,700		700		300		300		0		300	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	300	10	10	240	10	10	20	0	10	30	10
Turns	PM	0	280	10	10	340	10	10	30	0	10	30	10

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	2,600		200		100		100		0		100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	100	0	0	80	0	0	10	0	0	10	0
Turns	PM	0	90	0	0	110	0	0	10	0	0	10	0

Appendix G:

Jones Road Synchro Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	32	2	19	140	1	160	6	2640	110	130	2160	6
Future Volume (vph)	32	2	19	140	1	160	6	2640	110	130	2160	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	400		0	145		0	425		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.863			0.851			0.994				
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1608	0	1770	1585	0	1770	5055	0	1770	5085	0
Flt Permitted	0.950			0.950			0.048			0.045		
Satd. Flow (perm)	1770	1608	0	1770	1585	0	89	5055	0	84	5085	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		21			101			7			1	
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		812			1036			1120			1260	
Travel Time (s)		15.8			20.2			19.1			21.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	2	21	152	1	174	7	2870	120	141	2348	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	35	23	0	152	175	0	7	2990	0	141	2355	0
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	9.5	22.5		17.4	30.4		9.5	84.1		16.0	90.6	
Total Split (%)	6.8%	16.1%		12.4%	21.7%		6.8%	60.1%		11.4%	64.7%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)	5.0	6.9		14.0	13.7		84.9	79.9		94.3	92.5	
Actuated g/C Ratio	0.04	0.06		0.11	0.11		0.68	0.64		0.76	0.74	
v/c Ratio	0.49	0.21		0.76	0.66		0.05	0.92		0.72	0.62	
Control Delay	84.1	28.2		79.4	36.3		6.3	26.7		48.2	9.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	84.1	28.2		79.4	36.3		6.3	26.7		48.2	9.7	
LOS	F	C		E	D		A	C		D	A	
Approach Delay		61.9			56.3			26.6			11.9	
Approach LOS		E			E			C			B	
Queue Length 50th (ft)	29	2		125	58		1	778		64	290	
Queue Length 95th (ft)	#79	31		#262	137		6	#1057		#159	516	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		732			956			1040			1180	
Turn Bay Length (ft)	145			400			145			425		
Base Capacity (vph)	71	251		199	410		128	3246		219	3778	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.49	0.09		0.76	0.43		0.05	0.92		0.64	0.62	

Intersection Summary	
Area Type: Other	
Cycle Length: 140	
Actuated Cycle Length: 124.5	
Natural Cycle: 140	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.92	
Intersection Signal Delay: 22.4	Intersection LOS: C
Intersection Capacity Utilization 89.8%	ICU Level of Service E
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	

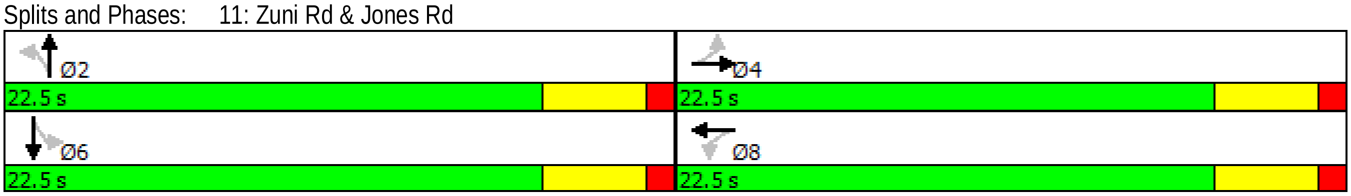
Splits and Phases: 10: Narcoossee Rd & Jones Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	40	190	20	50	20	230	280	20	20	230	20
Future Volume (vph)	20	40	190	20	50	20	230	280	20	20	230	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		0	265		0	170		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.876			0.957			0.990			0.988	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1632	0	1770	1783	0	1770	1844	0	1770	1840	0
Flt Permitted	0.708			0.625			0.592			0.563		
Satd. Flow (perm)	1319	1632	0	1164	1783	0	1103	1844	0	1049	1840	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		207			22			10			12	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1271			1529			1344			1317	
Travel Time (s)		24.8			29.8			26.2			25.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	43	207	22	54	22	250	304	22	22	250	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	250	0	22	76	0	250	326	0	22	272	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	7.5	7.5		7.5	7.5		21.8	21.8		21.8	21.8	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.61	0.61		0.61	0.61	
v/c Ratio	0.08	0.49		0.09	0.19		0.37	0.29		0.03	0.24	
Control Delay	10.9	7.0		11.2	9.5		7.9	5.9		5.3	5.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.9	7.0		11.2	9.5		7.9	5.9		5.3	5.6	
LOS	B	A		B	A		A	A		A	A	
Approach Delay		7.3			9.8			6.8			5.6	
Approach LOS		A			A			A			A	
Queue Length 50th (ft)	3	6		3	8		21	25		1	20	
Queue Length 95th (ft)	13	41		14	27		79	79		10	65	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1191			1449			1264			1237	
Turn Bay Length (ft)	160			160			265			170		
Base Capacity (vph)	671	931		592	918		676	1133		642	1132	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.03	0.27		0.04	0.08		0.37	0.29		0.03	0.24	

Intersection Summary	
Area Type: Other	
Cycle Length: 45	
Actuated Cycle Length: 35.5	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 6.9	Intersection LOS: A
Intersection Capacity Utilization 53.9%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 11: Zuni Rd & Jones Rd



Intersection	
Int Delay, s/veh	11.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	30	20	20	30	60	20	280	20	50	230	20
Future Vol, veh/h	20	30	20	20	30	60	20	280	20	50	230	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	185	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	33	22	22	33	65	22	304	22	54	250	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	98	0	0	54	0	0	332	228	43	359	207	65
Stage 1	-	-	-	-	-	-	87	87	-	109	109	-
Stage 2	-	-	-	-	-	-	245	141	-	250	98	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1495	-	-	1551	-	-	621	671	1027	596	690	999
Stage 1	-	-	-	-	-	-	921	823	-	896	805	-
Stage 2	-	-	-	-	-	-	759	780	-	754	814	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1495	-	-	1551	-	-	422	652	1027	362	670	999
Mov Cap-2 Maneuver	-	-	-	-	-	-	422	652	-	362	670	-
Stage 1	-	-	-	-	-	-	907	811	-	883	794	-
Stage 2	-	-	-	-	-	-	501	769	-	454	802	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	2.1	1.3	15.3	14.1
HCM LOS			C	B

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	422	668	1495	-	-	1551	-	-	362	688
HCM Lane V/C Ratio	0.052	0.488	0.015	-	-	0.014	-	-	0.15	0.395
HCM Control Delay (s)	14	15.4	7.4	-	-	7.4	-	-	16.7	13.6
HCM Lane LOS	B	C	A	-	-	A	-	-	C	B
HCM 95th %tile Q(veh)	0.2	2.7	0	-	-	0	-	-	0.5	1.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	9	1	11	130	2	150	19	2470	160	180	3020	10
Future Volume (vph)	9	1	11	130	2	150	19	2470	160	180	3020	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	145		0	400		0	145		0	425		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.91	1.00	0.91	0.91
Frt		0.862			0.852			0.991			0.999	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1606	0	1770	1587	0	1770	5040	0	1770	5080	0
Flt Permitted	0.950			0.950			0.048			0.046		
Satd. Flow (perm)	1770	1606	0	1770	1587	0	89	5040	0	86	5080	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12			126			12			1	
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		812			1036			1120			1260	
Travel Time (s)		15.8			20.2			19.1			21.5	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	10	1	12	141	2	163	21	2685	174	196	3283	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	10	13	0	141	165	0	21	2859	0	196	3294	0
Turn Type	Prot	NA		Prot	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases							2			6		
Detector Phase	7	4		3	8		5	2		1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5		9.5	22.5		9.5	22.5	
Total Split (s)	9.5	22.5		17.4	30.4		9.5	84.1		16.0	90.6	
Total Split (%)	6.8%	16.1%		12.4%	21.7%		6.8%	60.1%		11.4%	64.7%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes		Yes	Yes	
Recall Mode	None	None		None	None		None	Max		None	Max	
Act Effct Green (s)	5.0	6.2		12.6	15.2		84.8	79.8		95.9	92.3	
Actuated g/C Ratio	0.04	0.05		0.10	0.12		0.70	0.65		0.79	0.76	
v/c Ratio	0.14	0.14		0.77	0.54		0.16	0.87		0.87	0.86	
Control Delay	63.6	31.4		81.4	21.4		7.4	21.4		66.2	15.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	63.6	31.4		81.4	21.4		7.4	21.4		66.2	15.8	
LOS	E	C		F	C		A	C		E	B	
Approach Delay		45.4			49.1			21.3			18.6	
Approach LOS		D			D			C			B	
Queue Length 50th (ft)	8	1		105	27		2	533		97	379	
Queue Length 95th (ft)	28	23		#232	102		11	832		#266	#1113	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		732			956			1040			1180	
Turn Bay Length (ft)	145			400			145			425		
Base Capacity (vph)	72	248		187	437		131	3304		226	3845	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.14	0.05		0.75	0.38		0.16	0.87		0.87	0.86	

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 121.9
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 21.2 Intersection LOS: C
Intersection Capacity Utilization 87.9% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

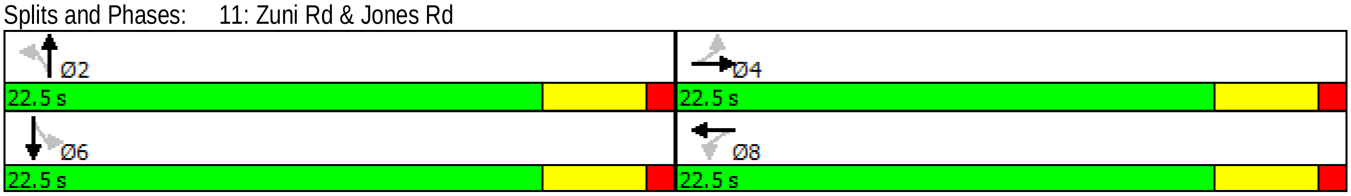
Splits and Phases: 10: Narcoossee Rd & Jones Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	50	270	20	40	20	220	270	20	20	330	20
Future Volume (vph)	20	50	270	20	40	20	220	270	20	20	330	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	160		0	160		0	265		0	170		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.873			0.949			0.990			0.991	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1626	0	1770	1768	0	1770	1844	0	1770	1846	0
Flt Permitted	0.715			0.500			0.534			0.569		
Satd. Flow (perm)	1332	1626	0	931	1768	0	995	1844	0	1060	1846	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		293			22			10			8	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1271			1529			1344			1317	
Travel Time (s)		24.8			29.8			26.2			25.7	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	54	293	22	43	22	239	293	22	22	359	22
Shared Lane Traffic (%)												
Lane Group Flow (vph)	22	347	0	22	65	0	239	315	0	22	381	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	8.0	8.0		8.0	8.0		19.1	19.1		19.1	19.1	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.53	0.53		0.53	0.53	
v/c Ratio	0.08	0.59		0.11	0.16		0.45	0.32		0.04	0.39	
Control Delay	10.5	7.5		11.2	8.5		10.1	6.7		5.8	7.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	10.5	7.5		11.2	8.5		10.1	6.7		5.8	7.4	
LOS	B	A		B	A		B	A		A	A	
Approach Delay		7.7			9.2			8.2			7.3	
Approach LOS		A			A			A			A	
Queue Length 50th (ft)	3	8		3	6		21	25		2	32	
Queue Length 95th (ft)	13	49		14	24		89	85		11	106	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1191			1449			1264			1237	
Turn Bay Length (ft)	160			160			265			170		
Base Capacity (vph)	667	961		466	897		526	980		560	980	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.03	0.36		0.05	0.07		0.45	0.32		0.04	0.39	

Intersection Summary	
Area Type: Other	
Cycle Length: 45	
Actuated Cycle Length: 36.1	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.59	
Intersection Signal Delay: 7.9	Intersection LOS: A
Intersection Capacity Utilization 61.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 11: Zuni Rd & Jones Rd



Intersection	
Int Delay, s/veh	13

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	40	20	20	30	50	20	260	20	70	320	20
Future Vol, veh/h	20	40	20	20	30	50	20	260	20	70	320	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	185	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	43	22	22	33	54	22	283	22	76	348	22

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	87	0	0	65	0	0	386	228	54	353	212	60
Stage 1	-	-	-	-	-	-	98	98	-	103	103	-
Stage 2	-	-	-	-	-	-	288	130	-	250	109	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1509	-	-	1537	-	-	573	671	1013	602	685	1005
Stage 1	-	-	-	-	-	-	908	814	-	903	810	-
Stage 2	-	-	-	-	-	-	720	789	-	754	805	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1509	-	-	1537	-	-	323	652	1013	382	665	1005
Mov Cap-2 Maneuver	-	-	-	-	-	-	323	652	-	382	665	-
Stage 1	-	-	-	-	-	-	895	802	-	890	798	-
Stage 2	-	-	-	-	-	-	392	778	-	471	793	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.9	1.5	14.9	16.6
HCM LOS			B	C

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	323	669	1509	-	-	1537	-	-	382	679
HCM Lane V/C Ratio	0.067	0.455	0.014	-	-	0.014	-	-	0.199	0.544
HCM Control Delay (s)	16.9	14.8	7.4	-	-	7.4	-	-	16.8	16.5
HCM Lane LOS	C	B	A	-	-	A	-	-	C	C
HCM 95th %tile Q(veh)	0.2	2.4	0	-	-	0	-	-	0.7	3.3

14 Intersection: Narcoossee Rd. at Rummell Rd.
Condition: 2040 Buildout NED
Count Date: n/a
MOCF: 0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	60,549	3,277	7,318	2,553	43	8,674

70,420
10,638 14,504
69,266

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	59,300	3,200	7,200	2,500	500	8,500

69,000 Minimal Volume
10,900 14,200
68,300

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	59,300		3,200		7,200		2,500		500		8,500	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	20	2,280	270	80	1,870	280	230	100	20	330	120	100
Turns	PM	20	2,130	370	110	2,610	260	320	140	20	310	120	90

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.697		0.60		0.60		0.60		0.60		0.60	
	AADT	41,300		1,900		4,300		1,500		300		5,100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	10	1,590	160	50	1,300	170	140	60	10	200	70	60
Turns	PM	10	1,490	220	70	1,820	150	190	80	10	180	70	50

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.396		0.20		0.20		0.20		0.20		0.20	
	AADT	23,500		600		1,400		500		100		1,700	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	900	50	20	740	50	40	20	0	70	20	20
Turns	PM	0	850	70	20	1,030	50	60	30	0	60	20	20

15	Intersection:	Rummell Rd. at Zuni Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
8,684	8,580	4,474	668	1,452	1,665

13,826
14,506
10,913
11,801

AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
8,500	8,400	4,400	700	1,400	1,600

13,600
14,200
10,700
11,500

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	8,500		8,400		4,400		700		1,400		1,600	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	50	330	50	20	270	170	140	260	40	60	320	30
Turns	PM	50	310	70	30	370	160	190	370	60	60	300	30

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	5,100		5,000		2,600		400		800		1,000	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	30	200	30	10	160	100	80	160	30	40	190	20
Turns	PM	30	180	40	20	220	90	110	220	40	40	180	10

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	1,700		1,700		900		100		300		300	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	10	70	10	0	50	30	30	50	10	10	70	0
Turns	PM	10	60	10	0	70	30	40	70	10	10	60	0

16 Intersection: Rummell Rd. at McMichael Rd.
Condition: 2040 Buildout NED
Count Date: n/a
MOCF: 0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*55*	*45*	*45*	*55*	*45*	*45*	*45*	*45*	*55*	*55*
Seed %	*PM*	*45*	*45*	*45*	*55*	*55*	*45*	*55*	*55*	*55*	*55*	*45*	*45*

Model Raw AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
5,908	8,056	2,090	0	1,300	5,251

7,998
11,446 13,307
12,459

AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
5,800	7,900	2,000	0	1,300	5,100

7,800
11,200 13,000
12,200

Movement D Factors

	AM D	55.0%	55.0%	55.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	45.0%	55.0%	55.0%
	PM D	45.0%	45.0%	45.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	55.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	5,800		7,900		2,000		0		1,300		5,100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	55.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	45.0%	55.0%	55.0%
	PM D	45.0%	45.0%	45.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	55.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	50	220	200	0	180	80	60	250	40	160	300	0
Turns	PM	50	210	180	0	260	70	90	350	60	220	280	0

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	3,500		4,700		1,200		0		800		3,100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	55.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	45.0%	55.0%	55.0%
	PM D	45.0%	45.0%	45.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	55.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	30	130	120	0	110	50	40	150	30	100	180	0
Turns	PM	30	130	110	0	150	40	50	210	40	140	170	0

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	1,200		1,600		400		0		300		1,000	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	55.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	45.0%	55.0%	55.0%
	PM D	45.0%	45.0%	45.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	55.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	10	50	40	0	40	20	10	50	10	30	60	0
Turns	PM	10	40	40	0	50	10	20	70	10	40	60	0

Appendix H:

Rummell Road Turning Movement Worksheets

14	Intersection:	Narcoossee Rd. at Rummell Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
60,549	3,277	7,318	2,553	43	8,674

70,420

10,638 14,504

69,266

AADT Quadrant Movements

North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
59,300	3,200	7,200	2,500	500	8,500

69,000 Minimal Volume

10,900 14,200

68,300

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	59,300		3,200		7,200		2,500		500		8,500	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	20	2,280	270	80	1,870	280	230	100	20	330	120	100
Turns	PM	20	2,130	370	110	2,610	260	320	140	20	310	120	90

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.697		0.60		0.60		0.60		0.60		0.60	
	AADT	41,300		1,900		4,300		1,500		300		5,100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	10	1,590	160	50	1,300	170	140	60	10	200	70	60
Turns	PM	10	1,490	220	70	1,820	150	190	80	10	180	70	50

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.396		0.20		0.20		0.20		0.20		0.20	
	AADT	23,500		600		1,400		500		100		1,700	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	0	900	50	20	740	50	40	20	0	70	20	20
Turns	PM	0	850	70	20	1,030	50	60	30	0	60	20	20

15	Intersection:	Rummell Rd. at Zuni Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*45*	*45*	*45*	*55*	*45*	*45*	*45*	*55*	*55*	*55*
Seed %	*PM*	*45*	*45*	*55*	*55*	*55*	*45*	*55*	*55*	*55*	*45*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	8,684	8,580	4,474	668	1,452	1,665

13,826
14,506 10,913
11,801

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	8,500	8,400	4,400	700	1,400	1,600

13,600
14,200 10,700
11,500

Movement D Factors

	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	8,500		8,400		4,400		700		1,400		1,600	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	50	330	50	20	270	170	140	260	40	60	320	30
Turns	PM	50	310	70	30	370	160	190	370	60	60	300	30

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	5,100		5,000		2,600		400		800		1,000	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	30	200	30	10	160	100	80	160	30	40	190	20
Turns	PM	30	180	40	20	220	90	110	220	40	40	180	10

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	1,700		1,700		900		100		300		300	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	45.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	55.0%	55.0%	55.0%
	PM D	45.0%	45.0%	55.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	45.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	10	70	10	0	50	30	30	50	10	10	70	0
Turns	PM	10	60	10	0	70	30	40	70	10	10	60	0

16	Intersection:	Rummell Rd. at McMichael Rd.
	Condition:	2040 Buildout NED
	Count Date:	n/a
	MOCF:	0.98

		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Seed %	*AM*	*55*	*55*	*55*	*45*	*45*	*55*	*45*	*45*	*45*	*45*	*55*	*55*
Seed %	*PM*	*45*	*45*	*45*	*55*	*55*	*45*	*55*	*55*	*55*	*55*	*45*	*45*

Model Raw AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	5,908	8,056	2,090	0	1,300	5,251

7,998

11,446

13,307

12,459

AADT Quadrant Movements

	North - South	East - West	NW Quadrant	NE Quadrant	SW Quadrant	SE Quadrant
	5,800	7,900	2,000	0	1,300	5,100

7,800

11,200

13,000

12,200

Movement D Factors

	AM D	55.0%	55.0%	55.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	45.0%	55.0%	55.0%
	PM D	45.0%	45.0%	45.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	55.0%	45.0%	45.0%

2040	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	1.00		1.00		1.00		1.00		1.00		1.00	
	AADT	5,800		7,900		2,000		0		1,300		5,100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	55.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	45.0%	55.0%	55.0%
	PM D	45.0%	45.0%	45.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	55.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	50	220	200	0	180	80	60	250	40	160	300	0
Turns	PM	50	210	180	0	260	70	90	350	60	220	280	0

2030	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.60		0.60		0.60		0.60		0.60		0.60	
	AADT	3,500		4,700		1,200		0		800		3,100	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	55.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	45.0%	55.0%	55.0%
	PM D	45.0%	45.0%	45.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	55.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	30	130	120	0	110	50	40	150	30	100	180	0
Turns	PM	30	130	110	0	150	40	50	210	40	140	170	0

2020	Quadrant	North - South		East - West		NW Quadrant		NE Quadrant		SW Quadrant		SE Quadrant	
	Factor	0.20		0.20		0.20		0.20		0.20		0.20	
	AADT	1,200		1,600		400		0		300		1,000	
		Northbound			Southbound			Eastbound			Westbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
	AM D	55.0%	55.0%	55.0%	45.0%	45.0%	55.0%	45.0%	45.0%	45.0%	45.0%	55.0%	55.0%
	PM D	45.0%	45.0%	45.0%	55.0%	55.0%	45.0%	55.0%	55.0%	55.0%	55.0%	45.0%	45.0%
7.0%	AM K	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
8.0%	PM K	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Turns	AM	10	50	40	0	40	20	10	50	10	30	60	0
Turns	PM	10	40	40	0	50	10	20	70	10	40	60	0

Appendix I:

Rummell Road Synchro Analysis

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	30	0	20	40	20	0	490	20	20	400	20
Future Vol, veh/h	20	30	0	20	40	20	0	490	20	20	400	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	160	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	33	0	22	43	22	0	533	22	22	435	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	777	1043	228	820	1043	277	457	0	0	554	0	0
Stage 1	489	489	-	543	543	-	-	-	-	-	-	-
Stage 2	288	554	-	277	500	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	287	228	775	267	228	720	1100	-	-	1012	-	-
Stage 1	529	548	-	492	518	-	-	-	-	-	-	-
Stage 2	695	512	-	706	541	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	233	223	775	233	223	720	1100	-	-	1012	-	-
Mov Cap-2 Maneuver	233	223	-	233	223	-	-	-	-	-	-	-
Stage 1	529	536	-	492	518	-	-	-	-	-	-	-
Stage 2	617	512	-	649	529	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	23.1	21.3	0	0.4
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1100	-	-	233	223	233	290	1012	-	-
HCM Lane V/C Ratio	-	-	-	0.093	0.146	0.093	0.225	0.021	-	-
HCM Control Delay (s)	0	-	-	22	23.9	22	21	8.6	-	-
HCM Lane LOS	A	-	-	C	C	C	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.5	0.3	0.8	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	230	100	20	330	120	100	20	2280	270	80	1870	280
Future Volume (vph)	230	100	20	330	120	100	20	2280	270	80	1870	280
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	490		0	485		0	220		0	440		0
Storage Lanes	2		0	2		1	1		1	1		0
Taper Length (ft)	100			100			50			50		
Lane Util. Factor	0.97	0.95	0.95	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Frt		0.975				0.850			0.850		0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3451	0	3433	1863	1583	1770	5085	1583	1770	4984	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3451	0	3433	1863	1583	1770	5085	1583	1770	4984	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		12				109			176		34	
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1001			1029			1225			1211	
Travel Time (s)		19.5			20.0			20.9			20.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	250	109	22	359	130	109	22	2478	293	87	2033	304
Shared Lane Traffic (%)												
Lane Group Flow (vph)	250	131	0	359	130	109	22	2478	293	87	2337	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Detector Phase	7	4		3	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5	
Total Split (s)	22.0	23.0		21.6	22.6	22.6	9.6	92.0	92.0	23.4	105.8	
Total Split (%)	13.8%	14.4%		13.5%	14.1%	14.1%	6.0%	57.5%	57.5%	14.6%	66.1%	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	
Act Effct Green (s)	15.4	13.9		17.2	15.6	15.6	5.1	90.1	90.1	12.8	101.9	
Actuated g/C Ratio	0.10	0.09		0.11	0.10	0.10	0.03	0.59	0.59	0.08	0.67	
v/c Ratio	0.72	0.40		0.93	0.68	0.42	0.37	0.82	0.29	0.58	0.70	
Control Delay	79.4	63.0		97.2	85.1	15.7	92.7	28.7	7.2	83.6	17.7	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	79.4	63.0		97.2	85.1	15.7	92.7	28.7	7.2	83.6	17.7	
LOS	E	E		F	F	B	F	C	A	F	B	
Approach Delay		73.7			79.7			27.0			20.1	
Approach LOS		E			E			C			C	
Queue Length 50th (ft)	129	61		192	131	0	23	713	51	88	550	
Queue Length 95th (ft)	181	97		#304	208	61	57	876	116	148	632	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		921			949			1145			1131	
Turn Bay Length (ft)	490			485			220			440		
Base Capacity (vph)	396	431		387	222	285	59	3013	1009	221	3353	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.63	0.30		0.93	0.59	0.38	0.37	0.82	0.29	0.39	0.70	

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 152
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 32.2 Intersection LOS: C
Intersection Capacity Utilization 75.8% ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

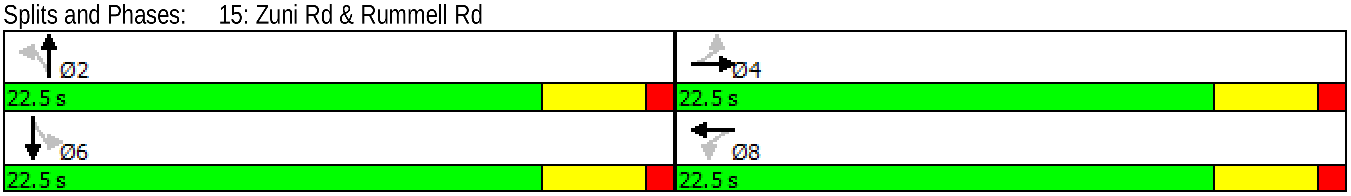
Splits and Phases: 14: Narcoossee Rd & Rummell Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	260	40	60	320	30	50	330	50	20	270	170
Future Volume (vph)	140	260	40	60	320	30	50	330	50	20	270	170
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	235		0	160		0	185		0	160		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.980			0.987			0.980			0.942	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3468	0	1770	3493	0	1770	1825	0	1770	1755	0
Flt Permitted	0.526			0.555			0.413			0.475		
Satd. Flow (perm)	980	3468	0	1034	3493	0	769	1825	0	885	1755	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		43			26			20			84	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1288			1036			1288			1232	
Travel Time (s)		25.1			20.2			25.1			24.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	283	43	65	348	33	54	359	54	22	293	185
Shared Lane Traffic (%)												
Lane Group Flow (vph)	152	326	0	65	381	0	54	413	0	22	478	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	11.4	11.4		11.4	11.4		18.2	18.2		18.2	18.2	
Actuated g/C Ratio	0.29	0.29		0.29	0.29		0.47	0.47		0.47	0.47	
v/c Ratio	0.53	0.31		0.21	0.36		0.15	0.48		0.05	0.55	
Control Delay	18.1	9.4		11.4	10.6		9.0	10.1		8.0	10.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.1	9.4		11.4	10.6		9.0	10.1		8.0	10.1	
LOS	B	A		B	B		A	B		A	B	
Approach Delay		12.2			10.7			10.0			10.0	
Approach LOS		B			B			B			A	
Queue Length 50th (ft)	26	23		10	30		6	48		2	49	
Queue Length 95th (ft)	63	44		29	52		26	139		13	152	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1208			956			1208			1152	
Turn Bay Length (ft)	235			160			185			160		
Base Capacity (vph)	460	1652		485	1655		361	868		416	869	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.33	0.20		0.13	0.23		0.15	0.48		0.05	0.55	

Intersection Summary	
Area Type: Other	
Cycle Length: 45	
Actuated Cycle Length: 38.7	
Natural Cycle: 45	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.55	
Intersection Signal Delay: 10.7	Intersection LOS: B
Intersection Capacity Utilization 61.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 15: Zuni Rd & Rummell Rd



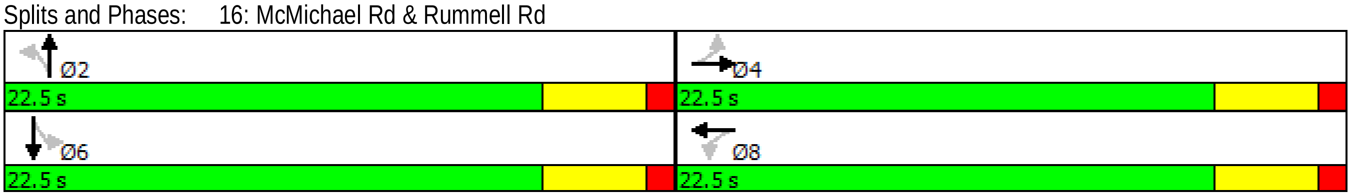
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	250	40	160	300	0	50	220	200	0	180	80
Future Volume (vph)	60	250	40	160	300	0	50	220	200	0	180	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	295		0	160		0	160		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.980						0.929			0.954	
Flt Protected	0.950			0.950			0.950					
Satd. Flow (prot)	1770	3468	0	1770	3539	0	1770	1730	0	1863	1777	0
Flt Permitted	0.555			0.561			0.586					
Satd. Flow (perm)	1034	3468	0	1045	3539	0	1092	1730	0	1863	1777	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		43						121			59	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1428			1568			1288			1316	
Travel Time (s)		27.8			30.5			25.1			25.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	65	272	43	174	326	0	54	239	217	0	196	87
Shared Lane Traffic (%)												
Lane Group Flow (vph)	65	315	0	174	326	0	54	456	0	0	283	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	11.7	11.7		11.7	11.7		18.2	18.2			18.2	
Actuated g/C Ratio	0.30	0.30		0.30	0.30		0.47	0.47			0.47	
v/c Ratio	0.21	0.29		0.56	0.31		0.11	0.52			0.33	
Control Delay	11.3	9.2		18.4	10.8		8.2	9.0			7.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	11.3	9.2		18.4	10.8		8.2	9.0			7.6	
LOS	B	A		B	B		A	A			A	
Approach Delay		9.6			13.5			8.9			7.6	
Approach LOS		A			B			A			A	
Queue Length 50th (ft)	10	22		30	27		6	41			25	
Queue Length 95th (ft)	29	42		71	48		25	131			80	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1348			1488			1208			1236	
Turn Bay Length (ft)	170			295			160					
Base Capacity (vph)	482	1642		488	1652		509	872			861	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.13	0.19		0.36	0.20		0.11	0.52			0.33	

Intersection Summary

Area Type: Other
Cycle Length: 45
Actuated Cycle Length: 39
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 10.2 Intersection LOS: B
Intersection Capacity Utilization 60.0% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 16: McMichael Rd & Rummell Rd



Intersection	
Int Delay, s/veh	3.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	20	50	0	20	40	20	0	460	20	20	560	20
Future Vol, veh/h	20	50	0	20	40	20	0	460	20	20	560	20
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	145	-	-	145	-	-	160	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	22	54	0	22	43	22	0	500	22	22	609	22

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	935	1185	315	886	1185	261	630	0	0	522	0	0
Stage 1	663	663	-	511	511	-	-	-	-	-	-	-
Stage 2	272	522	-	375	674	-	-	-	-	-	-	-
Critical Hdwy	7.54	6.54	6.94	7.54	6.54	6.94	4.14	-	-	4.14	-	-
Critical Hdwy Stg 1	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.54	5.54	-	6.54	5.54	-	-	-	-	-	-	-
Follow-up Hdwy	3.52	4.02	3.32	3.52	4.02	3.32	2.22	-	-	2.22	-	-
Pot Cap-1 Maneuver	220	188	681	239	188	738	948	-	-	1041	-	-
Stage 1	417	457	-	514	535	-	-	-	-	-	-	-
Stage 2	711	529	-	618	452	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	172	184	681	182	184	738	948	-	-	1041	-	-
Mov Cap-2 Maneuver	172	184	-	182	184	-	-	-	-	-	-	-
Stage 1	417	447	-	514	535	-	-	-	-	-	-	-
Stage 2	634	529	-	531	442	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	31.5	25.5	0	0.3
HCM LOS	D	D		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	948	-	-	172	184	182	245	1041	-	-
HCM Lane V/C Ratio	-	-	-	0.126	0.295	0.119	0.266	0.021	-	-
HCM Control Delay (s)	0	-	-	28.9	32.6	27.4	24.9	8.5	-	-
HCM Lane LOS	A	-	-	D	D	D	C	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.4	1.2	0.4	1	0.1	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	320	140	20	310	120	90	20	2130	370	110	2610	260
Future Volume (vph)	320	140	20	310	120	90	20	2130	370	110	2610	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	490		0	485		0	220		0	440		0
Storage Lanes	2		0	2		1	1		1	1		0
Taper Length (ft)	100			100			50			50		
Lane Util. Factor	0.97	0.95	0.95	0.97	1.00	1.00	1.00	0.91	1.00	1.00	0.91	0.91
Frt		0.981				0.850			0.850		0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	3472	0	3433	1863	1583	1770	5085	1583	1770	5014	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	3472	0	3433	1863	1583	1770	5085	1583	1770	5014	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8				102			259		20	
Link Speed (mph)		35			35			40			40	
Link Distance (ft)		1001			1029			1225			1211	
Travel Time (s)		19.5			20.0			20.9			20.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	348	152	22	337	130	98	22	2315	402	120	2837	283
Shared Lane Traffic (%)												
Lane Group Flow (vph)	348	174	0	337	130	98	22	2315	402	120	3120	0
Turn Type	Prot	NA		Prot	NA	Perm	Prot	NA	Perm	Prot	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			
Detector Phase	7	4		3	8	8	5	2	2	1	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Minimum Split (s)	9.5	22.5		9.5	22.5	22.5	9.5	22.5	22.5	9.5	22.5	
Total Split (s)	22.0	23.0		21.6	22.6	22.6	9.6	92.0	92.0	23.4	105.8	
Total Split (%)	13.8%	14.4%		13.5%	14.1%	14.1%	6.0%	57.5%	57.5%	14.6%	66.1%	
Yellow Time (s)	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Recall Mode	None	None		None	None	None	None	Max	Max	None	Max	
Act Effct Green (s)	17.4	15.5		16.9	15.1	15.1	5.1	88.4	88.4	15.1	102.4	
Actuated g/C Ratio	0.11	0.10		0.11	0.10	0.10	0.03	0.57	0.57	0.10	0.66	
v/c Ratio	0.90	0.49		0.89	0.71	0.40	0.38	0.79	0.39	0.69	0.93	
Control Delay	93.5	67.5		93.5	89.4	15.0	93.5	29.1	7.6	88.2	30.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	93.5	67.5		93.5	89.4	15.0	93.5	29.1	7.6	88.2	30.2	
LOS	F	E		F	F	B	F	C	A	F	C	
Approach Delay		84.9			79.0			26.5			32.4	
Approach LOS		F			E			C			C	
Queue Length 50th (ft)	186	86		180	132	0	23	668	68	122	1062	
Queue Length 95th (ft)	#287	128		#277	208	55	57	781	149	194	#1198	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		921			949			1145			1131	
Turn Bay Length (ft)	490			485			220			440		
Base Capacity (vph)	391	425		382	219	276	58	2917	1018	217	3341	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.89	0.41		0.88	0.59	0.36	0.38	0.79	0.39	0.55	0.93	

Intersection Summary

Area Type: Other

Cycle Length: 160

Actuated Cycle Length: 154

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.93

Intersection Signal Delay: 37.7 Intersection LOS: D

Intersection Capacity Utilization 90.8% ICU Level of Service E

Analysis Period (min) 15

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 14: Narcoossee Rd & Rummell Rd

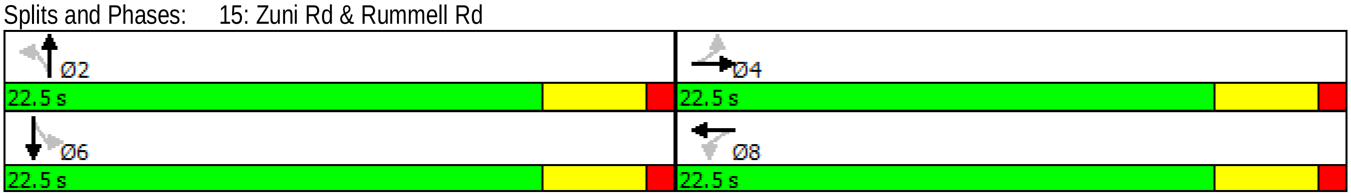
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	190	370	60	60	300	30	50	310	70	30	370	160
Future Volume (vph)	190	370	60	60	300	30	50	310	70	30	370	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	235		0	160		0	185		0	160		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.979			0.986			0.972			0.955	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	3465	0	1770	3490	0	1770	1811	0	1770	1779	0
Flt Permitted	0.537			0.484			0.301			0.460		
Satd. Flow (perm)	1000	3465	0	902	3490	0	561	1811	0	857	1779	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		48			28			30			58	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1288			1036			1288			1232	
Travel Time (s)		25.1			20.2			25.1			24.0	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	402	65	65	326	33	54	337	76	33	402	174
Shared Lane Traffic (%)												
Lane Group Flow (vph)	207	467	0	65	359	0	54	413	0	33	576	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	13.2	13.2		13.2	13.2		18.2	18.2		18.2	18.2	
Actuated g/C Ratio	0.33	0.33		0.33	0.33		0.45	0.45		0.45	0.45	
v/c Ratio	0.64	0.40		0.22	0.31		0.21	0.50		0.09	0.69	
Control Delay	21.0	10.1		11.3	9.7		11.4	11.1		9.0	15.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	21.0	10.1		11.3	9.7		11.4	11.1		9.0	15.9	
LOS	C	B		B	A		B	B		A	B	
Approach Delay		13.5			9.9			11.1			15.5	
Approach LOS		B			A			B			B	
Queue Length 50th (ft)	38	36		10	27		7	58		4	88	
Queue Length 95th (ft)	88	62		30	50		29	136		18	#255	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1208			956			1208			1152	
Turn Bay Length (ft)	235			160			185			160		
Base Capacity (vph)	450	1585		405	1585		252	831		385	832	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.46	0.29		0.16	0.23		0.21	0.50		0.09	0.69	

Intersection Summary

Area Type: Other
Cycle Length: 45
Actuated Cycle Length: 40.5
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.69
Intersection Signal Delay: 12.9 Intersection LOS: B
Intersection Capacity Utilization 68.2% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 15: Zuni Rd & Rummell Rd



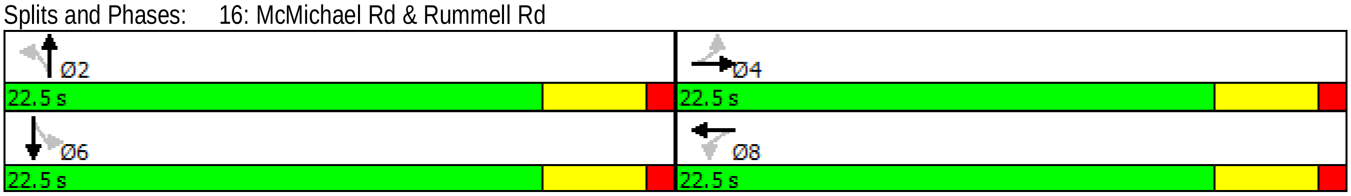
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	350	60	220	280	0	50	210	180	0	260	70
Future Volume (vph)	90	350	60	220	280	0	50	210	180	0	260	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	170		0	295		0	160		0	160		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978						0.931			0.968	
Flt Protected	0.950			0.950			0.950					
Satd. Flow (prot)	1770	3461	0	1770	3539	0	1770	1734	0	1863	1803	0
Flt Permitted	0.567			0.494			0.505					
Satd. Flow (perm)	1056	3461	0	920	3539	0	941	1734	0	1863	1803	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		51						115			36	
Link Speed (mph)		35			35			35			35	
Link Distance (ft)		1428			1568			1288			1316	
Travel Time (s)		27.8			30.5			25.1			25.6	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	98	380	65	239	304	0	54	228	196	0	283	76
Shared Lane Traffic (%)												
Lane Group Flow (vph)	98	445	0	239	304	0	54	424	0	0	359	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	5.0	5.0		5.0	5.0		5.0	5.0		5.0	5.0	
Minimum Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (s)	22.5	22.5		22.5	22.5		22.5	22.5		22.5	22.5	
Total Split (%)	50.0%	50.0%		50.0%	50.0%		50.0%	50.0%		50.0%	50.0%	
Yellow Time (s)	3.5	3.5		3.5	3.5		3.5	3.5		3.5	3.5	
All-Red Time (s)	1.0	1.0		1.0	1.0		1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effct Green (s)	14.6	14.6		14.6	14.6		18.2	18.2			18.2	
Actuated g/C Ratio	0.35	0.35		0.35	0.35		0.43	0.43			0.43	
v/c Ratio	0.27	0.36		0.74	0.25		0.13	0.52			0.45	
Control Delay	11.4	9.4		28.6	9.8		9.6	9.8			10.7	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	11.4	9.4		28.6	9.8		9.6	9.8			10.7	
LOS	B	A		C	A		A	A			B	
Approach Delay		9.8			18.1			9.8			10.7	
Approach LOS		A			B			A			B	
Queue Length 50th (ft)	16	34		47	25		8	54			56	
Queue Length 95th (ft)	41	59		#134	45		25	119			113	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		1348			1488			1208			1236	
Turn Bay Length (ft)	170			295			160					
Base Capacity (vph)	458	1530		399	1534		408	817			802	
Starvation Cap Reductn	0	0		0	0		0	0			0	
Spillback Cap Reductn	0	0		0	0		0	0			0	
Storage Cap Reductn	0	0		0	0		0	0			0	
Reduced v/c Ratio	0.21	0.29		0.60	0.20		0.13	0.52			0.45	

Intersection Summary

Area Type: Other
Cycle Length: 45
Actuated Cycle Length: 41.9
Natural Cycle: 45
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 12.3 Intersection LOS: B
Intersection Capacity Utilization 65.0% ICU Level of Service C
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 16: McMichael Rd & Rummell Rd



APPENDIX B
ESAL CALCULATION

18 kip EQUIVALENT SINGLE AXLE LOAD ANALYSIS

PROJECT TRAFFIC FOR PD&E and DESIGN ANALYSIS INFO / FACTORS

SECTION #: 0
SEGMENT #: 1
ITEM #: 0
PROJECT DESCRIPTION: Cyrils Road Widening

LOCATION #: Osceola
LOCATION DESCRIPTION: From Narcoossee Road to Absher Road

GROWTH RATE FORMULA

A: Interpolation
B: Enter Growth Rate
C: Enter All AADTs
D: New Facility

If "A" select an interpolation function
If "B" enter rate as decimals (1%=1.01)
If ""C", or "D" continue to next section

Choose A, B, C, or D here: C

Linear Growth Rate ______ %
Compounded Growth Rate ______ %
Decaying Growth Rate ______ %
(select one)

DESIGN INFORMATION

	Year	AADT
Existing Year	2021	4700
Opening Year	2022	6600
Mid-Design Year	2032	16100
Design Year	2042	25600

Note: AADT values have been rounded to the nearest 100

Daily Direction Split (50% or 100%)	50%
Lanes in One Direction	2
T24 values	
Existing to Opening Year	6.00%
Opening to Mid-Year	6.00%
Mid-Year to Design-Year	6.00%

1995 EQUIVALENCY FACTORS |u(1)|

(selected with an X)

	FLEXIBLE PAVEMENT SN = 5/THICK		RIGID PAVEMENT SN = 12/THICK	
RURAL FREEWAY:	1.050	____	1.600	____
URBAN FREEWAY:	0.900	____	1.270	____
RURAL HIGHWAY:	0.960	____	1.350	____
URBAN HIGHWAY:	0.890	X	1.220	____
OTHER (Enter Factor and X):		____		____

(1) Equivalency Factors are based on Updated Pavement Damage Factors Memorandum, dated July 2, 1998.

Lane Factors developed by Copes equation

I have reviewed the 18 kip Equivalent Single Axle Loads (ESAL's) to be used for pavement design on this project. I hereby attest that these have been developed in accordance with the FDOT Project Traffic Forecasting Procedure using historical traffic data and other available information.

Prepared by: ______________________________
Name | Title | Org. Unit or Firm | Date

____
Signature

Reviewed by: Name | Title | Org. Unit or Firm | Date

____
Signature

18 kip EQUIVALENT SINGLE AXLE LOAD ANALYSIS - LOCATION Osceola

PROJECT TRAFFIC FOR PD&E and DESIGN ANALYSIS INFO / FACTORS

YEARS: *2021 to 2042*

SECTION #: 0 **Location #:** 1 **FIN #:** 0

FLEXIBLE PAVEMENT URBAN HIGHWAY 0.890

SN=5/THICK Cyrils Road Widening C

YEAR	AADT	ESAL (1000S)	ACCUM (1000s)	D	T	LF	EF
2021	4700	43	0	0.5	6.00%	0.926	0.890
2022	6600	58	58	0.5	6.00%	0.898	0.890
2023	7500	65	123	0.5	6.00%	0.887	0.890
2024	8500	73	196	0.5	6.00%	0.877	0.890
2025	9400	80	276	0.5	6.00%	0.869	0.890
2026	10400	88	364	0.5	6.00%	0.860	0.890
2027	11300	94	458	0.5	6.00%	0.853	0.890
2028	12300	102	560	0.5	6.00%	0.846	0.890
2029	13200	109	669	0.5	6.00%	0.841	0.890
2030	14200	116	785	0.5	6.00%	0.835	0.890
2031	15100	123	908	0.5	6.00%	0.829	0.890
2032	16100	130	1038	0.5	6.00%	0.824	0.890
2033	17000	136	1174	0.5	6.00%	0.820	0.890
2034	18000	143	1317	0.5	6.00%	0.815	0.890
2035	18900	150	1467	0.5	6.00%	0.811	0.890
2036	19900	157	1624	0.5	6.00%	0.807	0.890
2037	20800	163	1787	0.5	6.00%	0.803	0.890
2038	21800	170	1957	0.5	6.00%	0.799	0.890
2039	22700	177	2134	0.5	6.00%	0.796	0.890
2040	23700	183	2317	0.5	6.00%	0.792	0.890
2041	24600	190	2507	0.5	6.00%	0.789	0.890
2042	25600	197	2704	0.5	6.00%	0.786	0.890

Opening to Mid-Design Year ESAL Accumulation (1000s): 980

Opening to Design Year ESAL Accumulation (1000s): 2646

I have reviewed the 18 kip Equivalent Single Axle Loads (ESAL's) to be used for pavement design on this project. I hereby attest that these have been developed in accordance with the FDOT Project Traffic Forecasting Procedure using historical traffic data and other available information.

Prepared by: ______________________________

Name Title Org.Unit or F Date

____

Signature

____

Name Title Org.Unit or F Date

____

Signature

APPENDIX C
UNDERDRAIN LETTER

September 14, 2021

Poulos and Bennett
2602 E. Livingston Street
Orlando, Florida 32803

Attention: Mr. Richard Bobletz, P.E.
rbobletz@poulosandbennett.com

Reference: **Roadway Underdrain Evaluation**
Cyrils Drive Roadway Widening
Osceola County, Florida
UES Project No. 0130.1700290.0013
UES Report No. 1898849

Dear Mr. Bobletz:

At your request, Universal Engineering Sciences (UES) has completed the roadway underdrain evaluation for the above-referenced project based on the provided plan and profile sheets for the site located in Osceola County, Florida. Our findings, together with our assumptions and conclusions, are presented in the following paragraphs.

1.0 PROJECT DESCRIPTION

The proposed project consists of improvements to the Cyrils Drive and Narcoossee Road intersection in Osceola County, Florida. UES has previously issued a Geotechnical Report for this project (UES Report No. 1765631.V3, dated February 1, 2021). The results of the previous exploration were used for this analysis.

2.0 ROADWAY UNDERDRAIN EVALUATION

In accordance with Osceola County Engineering Standards, the required separation between the estimated seasonal high water table and the bottom of the base course (limerock) is 24 inches. If this separation criterion is not met by grading, roadway underdrains are required. Where the estimated seasonal high water table will be greater than 24 inches below the bottom of the base course, underdrains will not be required.

Based on the Roadway Plan and Profile sheets provided to us by Poulos & Bennett, LLC (Cyrils Drive / Narcoossee Road to Asher Road – Road Widening, Sheet No. 15 through 33, dated August 31, 2021) a comparison was made between the finished pavement grades and the plot of the estimated seasonal high groundwater elevation contours in order to determine those areas of the proposed pavements where the estimated seasonal high groundwater elevation will be within 24 inches of the estimated bottom of the base course elevation. Accounting for the thickness of the proposed roadway base course and surface course, the required seasonal high water table separation, and the approximate roadway cross-slope, underdrains will be required where the estimated seasonal high water table occurs within approximately 3.2 feet (3'-2") of the finished pavement surface grades, based on the roadway sections provided by Poulos & Bennett.

3.0 RECOMMENDATIONS

For all areas where the estimated seasonal high water table is expected to form within 24 inches of the bottom of the base course, underdrains will be required. The following table presents the pavement sections where underdrains are recommended along both sides of the roadway.

TABLE I
RECOMMENDED MINIMUM UNDERDRAIN LOCATIONS

Roadway	From Station	To Station
Cyrils Drive	12+60	18+60
Approximate Total Length of Roadway Underdrain, linear feet (includes both sides of roadways)		1200

The remaining proposed pavement grades shown on the provided plan and profile sheets were found to be at least 3.2 feet above the estimated seasonal high water table.

However, UES typically recommends that the minimum separation between the estimated seasonal high groundwater table and the bottom of the base course be 12 inches for Soil Cement or RCA (Recycled Concrete Aggregate); or 18 inches for Limerock. Therefore, if RCA base course were to be used in lieu of limerock, the required separation would occur when the groundwater is at least 2.2 feet from the surface of the pavement.

All of the proposed pavement grades shown on the provided plan and profile sheets were found to be at least 2.2 feet above the estimated seasonal high water table.

Please note that <u>if</u> Osceola County accepts reducing the separation from 24-inches to 12-inches, then based on our analysis (assuming RCA base course), underdrains will not be required for the Cyrils Drive improvements.

4.0 UNDERDRAIN RECOMMENDATIONS

If Osceola County deems underdrains to be necessary then, we recommend the following underdrain design guidelines to provide adequate separation between the pavement grades and the estimated seasonal high groundwater levels. Underdrain and cleanout details have been attached for your use.

1. Roadway underdrains should be constructed with a minimum 6-inch diameter underdrain pipe, wrapped with filter fabric (ADS “Drainguard,” or equivalent) or smooth wall HDPE pipe without filter sock.

2. Underdrains should be constructed along both sides of the roadways for the portions requiring underdrains to provide separation between the bottom of the base course and the seasonal high groundwater level. UES notes that constructing beneath curbing is acceptable and will not impact the performance of the roadway or curbing.

3. The bottom of the underdrain piping should be placed a minimum of 24-inches below the bottom of base course.

4. The underdrains should be constructed in a trench a minimum of 18-inches wide, with the underdrain centered in the trench. Further, the underdrain trench should extend 6-inches below the invert of the underdrain piping.

5. Backfill placed in the underdrain trench should consist of “clean” filter sand meeting FDOT specifications for filter sand (FDOT Specification 902-4). Filter sand backfill should extend to 12 inches above the top of the underdrain pipe. Backfill above the FDOT filter sand may consist of clean native material, provided these materials contain less than 10 percent soil fines.

6. Prior to the placement of underdrain piping or filter sand backfill, the perimeter of the underdrain trench should be lined with filter fabric (Mirafi 140N, or equivalent) to minimize the potential for intrusion of soil fines from the surrounding subgrade. The filter fabric should completely line the perimeter of the underdrain trench and overlap a minimum of 12 inches at the top of the filter sand backfill. In addition, the top of the filter sand shall be covered with 10-mil polyethylene or 70 lb. felt prior to placing the compacted backfill and topsoil, as shown in the attached underdrain detail.

7. Underdrains should be routed to a positive outfall.

8. Underdrains should include capped and sealed inspection and clean-out ports extending to the ground surface at spacing no greater than 300 feet, at every bend or 45 degrees or greater, and at the terminus of each underdrain segment. We also recommend that a maintenance program be established to flush and inspect the underdrains on a periodic basis. Please note that without a proper maintenance program, the intended performance of the underdrains may be compromised.

9. We recommend installing landscape drains along all medians, landscape areas and along all roadways where irrigation is present to protect the underdrains from excess fines deposits. Please understand that landscape drains are functionally different than roadside underdrains, in that it is intended mostly to handle or capture excess irrigation that could migrate laterally onto the pavement components and eventually compromise the roadway underdrain.

10. We further recommend that all underdrains be installed under the full-time observation of a representative of UES.

5.0 CLOSURE

We appreciate the opportunity to be working with you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully Submitted,
UNIVERSAL ENGINEERING SCIENCES, LLC
Certificate of Authorization No. 549

This item has been digitally signed and sealed by Ricardo C. Kiriakidis L. on the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies

Megan deArrigoitia

Megan deArrigoitia, E.I.
Geotechnical Project Manager

Ricardo C. Kiriakidis L., Ph.D., P.E.
Geotechnical Department Manager
Florida Registration No. 70602

APPENDIX F
DESIGN VARIATION

Project Design Variation Memorandum

To: ______________________________ Date: ______________________________

Osceola County Design Engineer

Financial Project ID: N/A New Const. ☒ RRR ☐

Federal Aid Number: N/A

Project Name: Cyrils Drive widening from Narcoossee Rd to Absher Rd

State Road Number: N/A Co./Sec./Sub. Osceola

Begin Project MP: N/A End Project MP: N/A

Request for: Design Variation

	Design Element	MP: Beg-End	Existing	Proposed	Required	Attr. Crashes	Approved	Denied	Addl. Docum.
1.	Trail Offset	26+91 LT to 27+43 LT	N/A	4.5	5.0	☐	☐	☐	☐

Justification: The requirement for the trail offset is 5.0 feet from the face of curb. The trail is moved in to stay within the proposed RW and minimize wetland impacts. The typical trail offset is 5.5 feet from the face of curb and in this area the trail moved in by 1 ft. Therefore, the trail is 0.5 feet substandard for the required offset. With the addition of the 4-ft bicycle lane, the reduced offset from the face of curb does not present a hazard to pedestrians or vehicular traffic.

2.						☐	☐	☐	☐

Justification: ______________________________

3.						☐	☐	☐	☐

Justification: ______________________________

4.						☐	☐	☐	☐

Justification: ______________________________

Design Element	MP: Beg-End	Existing	Proposed	Required	Attr. Crashes	Approved	Denied	Addl. Docum.
5.					☐	☐	☐	☐

Justification: ____________________

Design Element	MP: Beg-End	Existing	Proposed	Required	Attr. Crashes	Approved	Denied	Addl. Docum.
6.					☐	☐	☐	☐

Justification: ____________________

Appendices: Yes ☐ No ☒

Recommended by:

Richard Bobletz, PE Date January 14, 2022
Name:
Responsible Professional Engineer or Landscape Architect (Landscape-Only Projects) (Seal)

Approvals:

____________________ Date ____________
Name:
Osceola County Traffic Operations Engineer

____________________ Date ____________
Name:
Osceola County Design Engineer

APPENDIX G
GEOTECHNICAL REPORTS

April 22, 2020
Revised February 1, 2021

Poulos & Bennett, LLC
2602 E. Livingston Street
Orlando, Florida 32803

Attention: Mr. R. Lance Bennett, P. E.
lbennett@poulosandbennett.com

Reference: **Limited Geotechnical Exploration**
Cyrils Drive Roadway Widening
Osceola County, Florida
UES Project No. 0130.1700290.0013
UES Report No. ***1765631.V3***

Dear Mr. Bennett:

Universal Engineering Sciences, LLC (UES) has completed a limited geotechnical exploration at the above referenced site in Osceola County. The scope of our exploration was planned in conjunction with and authorized by you. This exploration was performed in accordance with UES Proposal No. 1493717.V2 revised on April 15, 2019 and with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. The following sections present the results of our field exploration program.

Note that based on conversations with Tavistock and Poulos and Bennett (P&B) in March 2020, the scope of work was limited to borings at the mast arm locations and roadway cores within the southbound turn lane on Narcoossee Road. Further, due to the presence of various utility easements and overhead electric lines at the proposed mast arm locations, UES was approved to perform Advanced Continuous Surface Wave (ACSW) test at the four locations and provide Stiffness parameters (E) for the design of mast arm foundations.

PROJECT DESCRIPTION

UES was requested to perform two (2) roadway cores the southbound turn lane of Narcoossee Road to obtain asphalt, base and stabilized subgrade thicknesses. We were also requested to provide the Structural Number according to FDOT standards at the core locations. UES engineering technicians visited the site to visually observe any distress and to perform the field work.

ACSW testing was performed at the four corners of the intersection between Narcoossee Road and Cyrils Drive. The results of this exploration are presented in the attached ACSW Report.

UES performed twenty (20) SPT borings, designated CD-01 through CD-20, along Cyrils Drive as shown on the attached Boring Location Plan.

In December 2020 and January 2021, we were requested to perform additional SPT borings along the entire stretch of Cyrils Drive. We were also requested to perform muck probes within the wetland areas that bound the existing Cyrils Drive alignment.

FIELD EXPLORATION

PAVEMENT CORES

Our road core field exploration was performed on April 8, 2020 (along Narcoossee Road) and January 18, 2021 (along Cyrils Drive). Pavement cores were performed and measured in the field to determine the pavement component thicknesses and general condition of the pavement cores. The locations of the pavement cores are presented in the appendix as a Pavement Core Location Plan.

The pavement core locations were selected during our visual survey of the roadways, and marked in the field using paint. The core locations were patched with cold patch upon completion of the field work. The pavement cores were also returned to our Orlando laboratory for inspection.

SPT BORINGS

The SPT soil borings were performed on May 6, 2020 and January 13-18, 2021 with a truck mounted drilling rig. Horizontal and vertical survey control was not provided for the test locations prior to our field exploration program. UES located the test borings by using the provided site plan, measuring from existing on-site landmarks shown on an aerial photograph, and by using handheld GPS devices. The indicated test locations should be considered accurate to the degree of the methodologies used. The approximate boring locations are shown on the attached Boring Location Plan.

The SPT borings, designated CD-01 through CD-20 on the attached Boring Location Plan in Appendix B, were performed in general accordance with the procedures of ASTM D 1586 “Standard Method for Penetration Test and Split-Barrel Sampling of Soils”. SPT sampling was performed continuously to 10 feet to detect variations in the near surface soil profile and on approximate 5 feet centers thereafter.

MUCK PROBE SURVEY

As part of this limited assessment, a series of muck probes were performed within the three wetland areas outlined within the subject site as identified on the attached Figure A-3. The muck probes were performed at a spacing of about 100 feet on-center. The muck probes were performed in general accordance with ASTM D 4544 procedures (Standard Practice for Estimating Peat Deposit Thickness). During these procedures, a cylindrical steel rod is inserted into the near surface soils and the approximate depth of soft/organic soils is estimated by the amount of resistance to penetration. The approximate thicknesses of standing water and surficial muck soils, at the sampled locations, are shown on the attached Figure A-3.

The muck probe locations were determined in the field by measuring on-site landmarks shown on aerial photographs. The transect lines and muck probe locations were not surveyed or horizontal and vertical control prior to our field exploration and therefore should be considered accurate to the degree of the methods employed.

FINDINGS OF FIELD EXPLORATION

PAVEMENT CORES

Based upon the findings of our limited pavement evaluation, the pavement sections found at the core locations consisted of asphalt concrete over a limerock base material, and underlain by composite stabilized subgrade. The pavement section components and corresponding thickness at each core location are summarized in Table I.

Table I – Summary of Pavement Section and Structural Numbers

Core	Existing Pavement Condition	Measured Asphalt Structural Course Thickness (in)	Measured Base Course Thickness (in)	Measured Stabilized Subgrade Course Thickness (in)	Current Structural Number (SN)
NR-01	Good	4.8	10.8	12.0	4.5
NR-02	Good	5.0	11.0	12.0	4.6
CD-05	Fair	2.0	2.5	12.0	1.5
CD-06	Fair	2.0	2.5	12.0	1.5
CD-08	Fair	2.0	2.0	12.0	1.5
CD-12	Fair	2.0	2.0	12.0	1.5
CD-14	Fair	2.0	2.0	12.0	1.5
CD-15	Fair	2.0	1.5	12.0	1.5
CD-17	Fair	2.5	2.0	12.0	1.6
CD-18	Fair	2.0	2.0	12.0	1.5
CD-20	Fair	2.0	2.0	12.0	1.5

Notes: Structural number calculations
Per the FDOT 2020 Flexible Pavement Design Manual:
Asphalt Type SP = 0.44 (new), 0.34 (good), 0.25 (fair), 0.15 (poor), Sand Clay Base = 0.12, LR Base = 0.18, Stabilized Subgrade = 0.08

Based upon the findings of our pavement cores and the observed condition of the roadway along the limits explored, it is our opinion that based on the criteria of Good, Fair and Poor, the existing pavement section is in "Good to Fair" condition per the guidelines outlined with the FDOT Flexible Pavement Design Manual. Using the reduced structural coefficients of asphalt materials presented within Table 7.1 of the FDOT Flexible Pavement Design Manual, we estimate the existing pavement section currently has an estimated Structural Number (SN) ranging from 4.5 to 4.6 at the two (2) core locations on Narcoossee Road. The SN values along Cyrils Drive varied between 1.5 and 1.6. A new pavement section for the "Light Duty" classification would require a minimum Structural Number of 2.7 and a "Heavy Duty" classification would require a minimum Structural Number of 3.5.

SPT Borings

The results of our field exploration and laboratory analysis, together with pertinent information obtained from the SPT borings, such as soil profiles, penetration resistance and groundwater levels are shown on the boring logs included in Appendix B. The Key to Boring Logs, Soil Classification Chart is also included in Appendix B. The soil profiles were prepared from field logs after the recovered soil samples were examined by a Geotechnical Engineer. The stratification lines shown on the boring logs represent the approximate boundaries between soil types, and may not depict exact subsurface soil conditions. The actual soil boundaries may be more transitional than depicted.

Please note that the borings were staggered along Cyrils Drive, that is, some of them were performed on the existing roadway and some were performed on the grass shoulder.

The borings encountered very loose to very dense fine sand with varying fines content [SP, SP-SM] to the maximum termination depth of 20 feet below grade. SPT "N-values" ranged from 2 blows per foot (bpf) to 63 bpf.

Based on the results of our exploration, the soils encountered at some of our borings were medium dense to very dense fine sands [SP, SP-SM] between the depths of approximately 5 and 15 feet below existing grade. The SPT "N" blow count values within the dense soils ranged from 25 blows per foot (bpf) to 63 bpf. It has been our experience that excavations through soils with SPT "N" blow counts in excess of about 25 +/- blows per foot may prove difficult with smaller sized excavation equipment. The site contractor should select their excavation equipment for this site with this in mind.

Groundwater Conditions

Groundwater was encountered between 2½ feet and 12 feet below grade at the time of our exploration. Groundwater was typically shallower near the wetland areas and when they were performed on the grass shoulder. The encountered groundwater level at each of the boring locations is shown on the attached boring logs. Fluctuations in groundwater levels should be anticipated throughout the year, primarily due to seasonal variations in rainfall, surface runoff, and other factors that may vary from the time the borings were conducted.

Based on the results of our field exploration and the factors listed above, we estimate that the seasonal high groundwater level the boring locations will form at about the existing ground surface (standing water) to 10 feet and deeper below existing grades for a normal rainfall year. The estimated stabilized seasonal high groundwater level at each of the boring locations is shown on the attached boring logs. The estimated seasonal high groundwater level at each of the boring locations is shown on the individual boring logs in Appendix B.

<u>It should be noted that the estimated seasonal high water levels provided should be considered accurate to about ½ foot +/- and do not provide any assurance that groundwater levels will not exceed these estimated levels during any given year in the future.</u> Should the impediments to surface water drainage be present, or should rainfall intensity and duration, or total rainfall quantities, exceed the normally anticipated rainfall quantities, groundwater levels might exceed our seasonal high estimates. Further, it should be understood that changes in the surface hydrology and subsurface drainage from on-site and/or off-site improvements could have significant effects on the normal and seasonal high groundwater levels.

MUCK PROBE

Based on the results of our limited muck probe assessment, surficial organic soils were encountered at the probe locations performed within the subject site. At the muck probe locations performed the estimated depth of the surficial muck soils ranged from about the <u>existing ground surface to about 10 feet below existing grade</u>. We note that deeper and/or thicker zones of organic soils than those shown on the attached muck probe plans may exist between widely spaced probe locations and within unexplored areas. The contractor should be prepared to over-excavate localized deeper pockets of organic soils to their full depth and width. Due the potential variable nature of subsurface conditions, we recommend that adequate contingency be allowed in the budget for any unforeseen deeper pockets of organic soils.

Standing water on the order of few inches up to about 2 feet deep was found within the subject site along the muck probe transects at the time of our field work (January 2021).

Recommendations

Based upon our surficial visual classification of the soils and the amount of resistance to the probe penetration, it is our professional opinion that the organic soils present on-site will necessitate complete removal and/or some form of remediation/improvement within the limits of construction (i.e. up to the construction boundary and 5 feet beyond) and replacement with compacted structural fill material beneath the impacted portions of the development. <u>*Failure to properly remove and replace highly organic materials (or partial demucking with Geogrid) from beneath the proposed roadways may lead to premature deterioration of the developments.*</u>

We strongly recommend the de-mucking and subsequent backfilling operations be performed under the <u>*full-time*</u> observation of UES representative for the duration of the project. The purpose of the full-time observation is not only to ensure total removal of the organic soils, but also to prevent excess suitable material from being excavated from the site.

It is imperative that dewatering be performed prior to initiating the demucking operations. We strongly recommend that under no circumstances should demucking operations proceed in wet conditions, since this could lead to unnecessary over excavation above and below the anticipated organic soil depths or worse, leaving highly organic soils in-place. Where excavations will extend only a few feet below the groundwater table, a sump pump may be sufficient to control the groundwater table. Deeper excavations will likely require well points and/or horizontal sock drains to adequately control the groundwater table. Regardless of the method(s) used, we recommend drawing down the groundwater level at least 2 feet below the bottom of the deepest anticipated excavation. The actual method(s) of dewatering should be determined by the contractor. The design and discharge of the dewatering system must be performed in accordance with applicable regulatory criteria (i.e. water management district, etc.) and compliance with such criteria is the sole responsibility of the contractor.

Excavations should be sloped as necessary to prevent slope failure and to allow backfilling. As a minimum, temporary excavations below 4-foot depth should be sloped in accordance with OSHA regulations. Where lateral confinement will not permit slopes to be laid back, the excavation should be shored in accordance with OSHA requirements. During excavation, excavated material should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth. Provisions for maintaining workman safety within excavations is the sole responsibility of the contractor.

It is important to note that the sandy soils immediately beneath the organic soils may include traces of organic material. Furthermore, the transition from unsuitable to suitable soils may be gradual and not obvious during the demucking operations. Depending on the excavation and demucking technique adopted for this project, these soils may also become cross-contaminated with organic material during demucking operations and may become unsuitable for reuse.

Once the organic soil deposits are completely removed, the backfill material consisting of clean dry sands (less than 10 percent fines) must be placed in thin lifts of 10 to 12 inches thick, and each lift must be compacted to at least 95 percent of the Modified Proctor maximum dry density (ASTM D-1557). Perform compliance tests within the fill at a frequency of not less than one test per 5,000 square feet per lift, or at a minimum of two test locations, whichever is greater.

Muck Probe Survey Limitations

Please note that our muck probe survey was based upon a limited number of test locations. The information provided in this report is based on data obtained from the probes performed at the approximate locations indicated on the attached Muck Survey Plans. Variations in the surficial muck thicknesses will likely exist between the widely spaced probe locations. The information submitted in this report is based on data obtained from the muck probings performed at the approximate locations indicated on the attached Muck Survey Plan. We caution that there may be deeper zones/pockets of organic (muck) soils than found during this limited exploration within unexplored areas of the wetland feature within the proposed Cyrils Drive extension and between the widely spaced muck probe locations.

Please note the manual muck probe procedure involves pushing a slender metal rod into the surficial organics and evaluating the relative resistance of the soil. The manual muck probe cannot determine the type of material encountered since no soil samples are recovered, only whether or not the material is sufficiently loose or soft to allow penetration of the probe. Generally speaking, it is difficult to penetrate loose sandy soils more than several feet. Therefore, organic soils are likely present at test locations where the probe rod was able to penetrate significant depths.

We also caution that the manual muck probe may not detect organic layers which exist beneath or in-between sandy soil layers, and may penetrate loose sandy soils.

Due to these limitations, the depths shown may be an over-estimation or underestimation of the actual depth of organic soils. **Muck probe data shall not be used to estimate earthwork quantities, except on a preliminary basis.** Backhoe test pits or auger borings with horizontal and vertical survey control are recommended where more definite information is needed. UES will not be responsible for any extrapolation or use of our data by others beyond the purpose(s) for which it is applicable or intended.

PAVEMENT RECOMMENDATIONS

GENERAL

We assume that a combination of flexible asphaltic and rigid concrete pavement sections will be used for the pavement areas on this project. Our recommendations for both pavement types are listed in the following sections. The following recommendations are based on the pavement areas being prepared as recommended in this report.

ASPHALTIC PAVEMENTS

Layer Components

We understand that the proposed roadways and parking areas will consist of a flexible pavement section with typical residential traffic and some commercial traffic. At the time of this exploration, specific traffic loading information was not provided to us. We recommend using a three-layer pavement section for the proposed asphaltic parking/drive areas consisting of stabilized subgrade, base course, and surface course. The Osceola County Road Construction Specifications has divided the pavement requirements for commercial or multi-family residential developments into categories as a function of average daily traffic (ADT). Table II summarizes the minimum pavement component thicknesses for pavement design.

TABLE II
MINIMUM ASPHALTIC PAVEMENT COMPONENT THICKNESSES

Traffic Loading	Layer Component (inches)		
	Surface Course	Base Course	Subgrade**
Light Duty	1½	6	12
Heavy Duty	2	8	12

** The upper six inches of subgrade should be stabilized for limerock (or crushed concrete) base (see Section 11.2.2)

Subgrade

The subgrade immediately beneath the base course (sub-base) should be compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557) value.

For a limerock or crushed concrete base, the upper 6 inches of subgrade should be stabilized to a minimum Florida Bearing Value (FBV) of 50 psi (or LBR of 40 as specified by FDOT).

Compaction testing of the subgrade should be performed to full depth at a frequency of at least one (1) test per 10,000 square feet.

Base Course

Based on review of the Osceola County roadway design standards, the base course may be either limerock or soil-cement. We also understand the Osceola County will also currently allow the use of Recycled Concrete Aggregate (RCA) base course on projects on a case by case basis.

For a limerock base, the base course should be compacted to a minimum density of 98 percent of the Modified Proctor maximum dry density and exhibit a minimum LBR of 100. The limerock material should comply with the latest edition of the Florida Department of Transportation (FDOT) Road and Bridge Construction specifications.

For a soil-cement base, we recommend the contractor perform a soil-cement design with a minimum seven (7)-day strength of 300 pounds per square inch (psi) on the materials he intends to use. Place soil-cement in maximum 6-inch lifts uniform and compact in place to a minimum density of 95 percent of the maximum dry density according to specifications in ASTM D-558," Moisture Density Relations of Soil Cement Mixtures".

Place and finish the soil-cement according to Portland Cement Association requirements. Final review of the soil-cement base course should include manual "chaining" and/or "soundings" seven days after placement. Shrinkage cracks will form in the soil-cement mixture and you should expect reflection cracking on the surface course.

Recycled Concrete Aggregate (RCA) may provide a cost-effective alternative material in lieu of limerock or soil cement base courses. Local availability, along with municipality standards, typically governs the use of RCA use as an alternative base course material. The advantages of using RCA as a pavement base course include its high strength (stronger than limerock), resistance to groundwater related distress, and lack of reflection cracking caused by thermal expansion and contraction.

If a RCA base is used, the base course material should be sourced from an FDOT approved supplier. The base should be compacted to a minimum density of 100 percent of the Modified Proctor maximum dry density and exhibit a minimum LBR of 150. The base material should comply and be placed in accordance with the latest edition of the FDOT Road and Bridge Construction Specifications Supplemental Section 204-2.2 – "Recycled Concrete Aggregate Base Materials". In order to ensure consistency of the crushed concrete material, additional LBR and sieve gradation tests should be performed at a minimum frequency of one test per 15,000 square feet, and for each visual change in material.

Compaction testing of the base course should be performed to full depth at a frequency of at least one (1) test per 10,000 square feet.

Surface Course

For the roadways, we recommend that the surfacing consist of FDOT SuperPave (SP) asphaltic concrete. The surface course should consist of FDOT SP-9.5 fine mix for light-duty areas and

FDOT SP-12.5 topped with SP-9.5 fine mix for heavy duty areas. The asphalt concrete should be placed within the allowable lift thicknesses for fine Type SP mixes per the latest edition of FDOT, Standard Specifications for Road and Bridge Construction.

The asphaltic concrete should be compacted to an average field density of 93 percent of the laboratory maximum density determined from specific gravity (G_{mm}) methods, with an individual test tolerance of **+2 percent and -1.2% of the design G_{mm}**. Specific requirements for the SuperPave asphaltic concrete structural course are outlined in the latest edition of FDOT, Standard Specifications for Road and Bridge Construction.

Note: If the Designer (or Contract Documents) limits compaction to the static mode only or lifts are placed one-inch thick, then the average field density should be 92 percent, with an individual test tolerance of + 3 percent, and -1.2% of the design G_{mm}.

After placement and field compaction, the wearing surface should be cored to evaluate material thickness and density. Cores should be obtained at frequencies of at least one (1) core per 10,000 square feet of placed pavement, or a minimum of two (2) cores per day's production.

Effects of Groundwater

One of the most critical influences on the pavement performance in Central Florida is the relationship between the pavement base course and the seasonal high groundwater level. Sufficient separation will need to be maintained between the bottom of base course and the anticipated seasonal high groundwater (perched) level. **We recommend that the seasonal high groundwater and the bottom of base course be separated by a minimum of 24 inches per Osceola County requirements**. Areas in which the minimum separation between bottom of base course and groundwater cannot be maintained, underdrains may be required.

Landscape Underdrains

All "green" and landscape areas adjacent to the pavements and sidewalks may require underdrains. The poorly draining silty/clayey sands used in the mass grading require that landscape drains may need to be provided to protect the roadway and sidewalk areas against adverse effects from over-irrigation or excess rainfall. Poorly draining silty and clayey material causes the irrigation and rainwater to perch and migrate laterally into the pavement components, which eventually compromises the integrity of the pavement section.

CONCRETE "RIGID" PAVEMENTS

Concrete pavement is a rigid pavement that transfers much lighter wheel loads to the subgrade soils than a flexible asphalt pavement; therefore, requiring less subgrade preparation. Concrete pavement is recommended under the dumpster area, and 10 feet in front of the trash enclosures, at a minimum.

We recommend using the existing surficial sands or approved structural fill densified to at least 98 percent of Modified Proctor test maximum dry density (ASTM D 1557) without additional stabilization under concrete pavement, with the following stipulations:

1. Prior to placement of concrete, the subgrade soils should be prepared as recommended in Section 12.0 of this report.

2. The surface of the subgrade soils must be smooth, and any disturbances or wheel rutting corrected prior to placement of concrete.

3. The subgrade soils must be moistened prior to placement of concrete.

4. Concrete pavement thickness should be uniform throughout, with exception to the thickened edges (curb or footing).

5. The bottom of the pavement should be separated from the seasonal high groundwater level by at least 12 inches.

Based on review of the Osceola County construction standards and the FDOT Rigid Pavement Design Manual, our recommended minimum concrete pavement design is shown in Table III.

TABLE III
MINIMUM CONCRETE PAVEMENT THICKNESSES

Service Level	Minimum Pavement Thickness	Maximum Control Joint Spacing	Recommended Saw Cut Depth
Light Duty	6 inches	12 feet x 12 feet	2 inches
Heavy Duty	7 inches	14 feet x 14 feet	2⅓ inches

We recommend using concrete with a minimum 28-day compressive strength of at least 4,000 pounds per square inch. Layout of the Saw cut control joints should form square panels, and the depth of saw cut joints should be ⅓ of the concrete slab thickness.

We recommend allowing UES to review and comment on the final concrete pavement design, including section and joint details (type of joints, joint spacing, etc.), prior to the start of construction.

For further details on concrete pavement construction, please reference the "Guide to Jointing of Non-Reinforced Concrete Pavements" published by the Florida Concrete and Products Association, Inc., and "Building Quality Concrete Parking Areas", published by the Portland Cement Association.

Specimens to verify the compressive strength of the pavement concrete should be obtained for at least every 50 cubic yards, or at least once for each day's placement, whichever is greater.

SITE PREPARATION

We recommend normal, good practice site preparation procedures for the new construction areas. These procedures include: clearing/stripping of the site to remove vegetation, roots, organic topsoils, debris, **complete removal of surficial organic soils etc.** Following stripping, the exposed subgrade soils should be proof-rolled, and all subgrade and subsequent fill/backfill soils should be properly densified. A more detailed description of this work is as follows:

1. Perform any necessary remedial dewatering prior to any earthwork operations. Dewatering should be performed to a depth of at least 2 feet below the bottom of any excavations or compacted surface.

2. Strip the proposed construction limits of vegetation, topsoil, roots, organics, debris, and other deleterious materials within and 5 feet beyond the perimeter of the proposed building and new pavement areas. We strongly recommend that the stripped surface be observed and probed by representatives of UES. Deeper localized pockets of organic soils may be encountered during construction and should be removed as necessary.

3. Proof-roll the exposed subsurface soils under the observation of UES, to locate any soft areas of unsuitable soils, and to increase the density of the shallow loose fine sand soils. If deemed necessary by UES, in areas that continue to "yield", remove any deleterious materials and replace with a clean, compacted sand backfill.

4. Place fill as necessary. All fill should consist of clean sand with less than 12 percent soil fines and be free of organics, debris and other deleterious materials. Place fill in maximum 12-inch loose, uniform lifts and compact each lift at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557).

5. Within the at-grade (or below grade) foundation areas, subgrade compaction of at least 95 percent of the Modified Proctor should be achieved to a depth of at least 2 feet below bottom of foundation/slab levels.

6. Within the pavement areas, the upper 12 inches of subgrade beneath the base course (sub-base) or concrete slabs should be compacted to at least 98 percent of the Modified Proctor maximum dry density. If required, the upper 6 inches of subgrade should be stabilized as recommended in the pavement section of this report.

7. Test the subgrade and each lift of fill for compaction at a frequency of not less than one test per 2,500 square feet in the building areas and one test per 10,000 square feet in the pavement areas, with a minimum of 4 tests in each area.

8. Prior to the placement of reinforcing steel and concrete, verify compaction within the footing trenches to a depth of 2 feet. We recommend testing every column footing and at least one test every 100 feet of wall footing, with a minimum of 4 tests per building.

Stability of the compacted soils is essential and independent of compaction and density control. If the near surface soils or the structural fill experience “pumping” conditions, terminate all earthwork activities in that area. Pumping conditions occur when there is too much water present in the soil-water matrix. Earthwork activities are actually attempting to compact the water and not the soil. The disturbed soils should be dried in place by scarification and aeration prior to any additional earthwork activities.

Vibrations produced during vibratory compaction operations at the site may be significantly noticeable within 100 feet and may cause distress to adjacent structures if not properly regulated. Provisions should be made to monitor these vibrations so that any necessary modifications in the compaction operations can be made in the field before potential damages occur. UES can provide vibration monitoring services to help document and evaluate the effects of the surface compaction operation on existing structures. It is recommended that large vibratory rollers remain a minimum of 50 feet from existing structures. Within this zone, the use of a static roller or small hand guided plate compactors is recommended.

CLOSURE

We hope this letter addresses your requirements at this time. We appreciate the opportunity to assist Poulos and Bennett and look forward to a continued association. Please contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully Submitted,
UNIVERSAL ENGINEERING SCIENCES
Certificate of Authorization No. 549

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Senior Geotechnical Engineer
Florida Registration No. 82816

Ricardo C. Kiriakidis L., Ph.D., P.E.
Geotechnical Department Manager

Distribution: Client via email
Mr. Richard Bobletz, P.E., P&B
Ms. Christina Baxter, P.E., P&B

Attachments: Site Location Map
Pavement Core Location Plan
Muck Probe Location Plan
Boring Location Plan (2 sheets)
Boring Logs
Key to Boring Logs
ACSW Report

APPENDIX A

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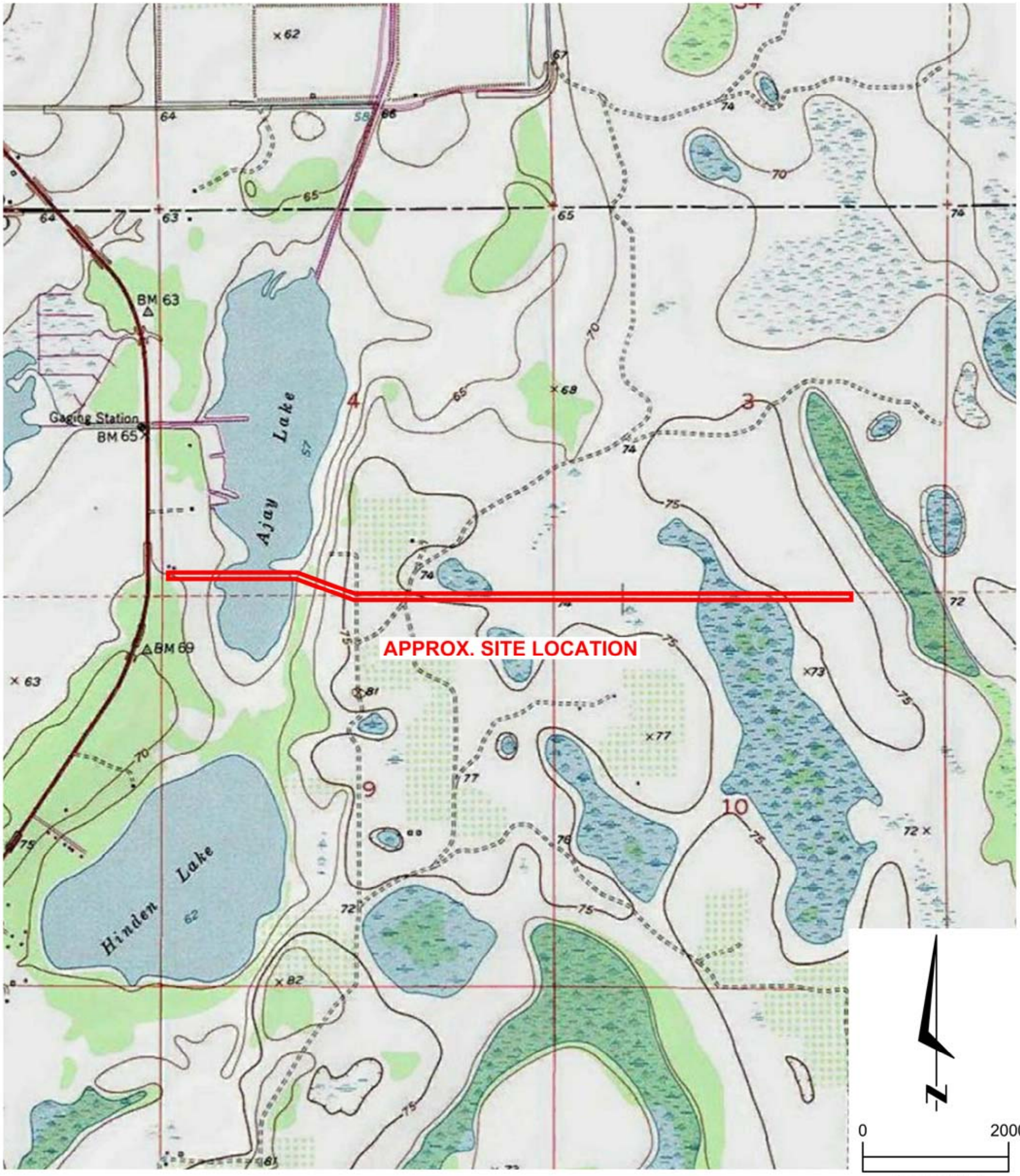

SOURCE: USGS QUADRANGLE MAP OF "NARCOOSSEE, FLORIDA".

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LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

SITE LOCATION MAP

DRAWN BY:	N.F.	DATE:	1 - 22 - 2021	CHECKED BY:	G.P.	DATE:	01.28.2021
SCALE:	AS SHOWN	PROJECT NO:	0130.1700290.0013	REPORT NO:	1765631	PAGE NO:	A-1

20-0279-02

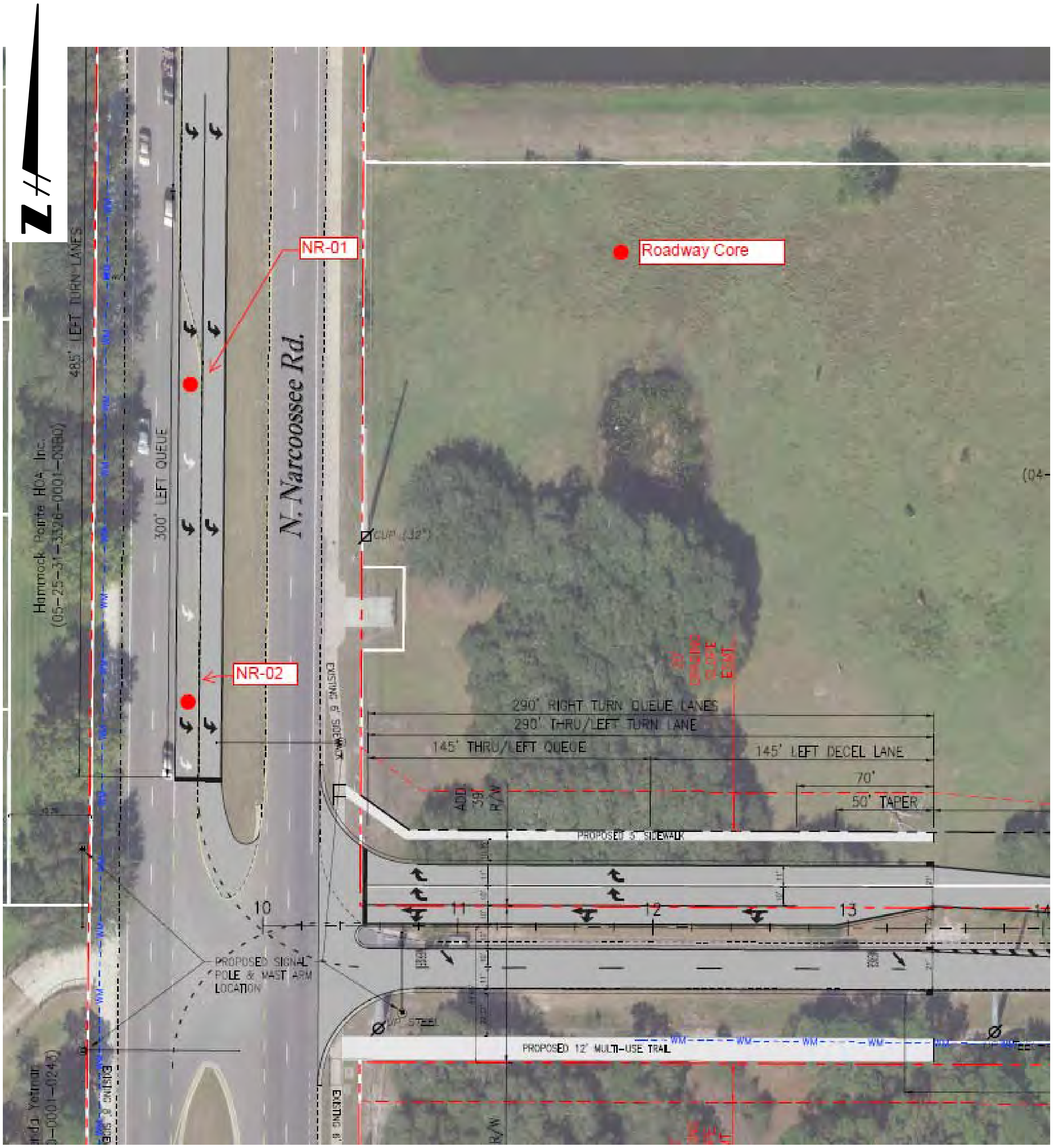

IMAGE SOURCE: Site Plan provided by Client

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ROADWAY CORES – CYRILS DRIVE WIDENING
SUNBRIDGE SUBDIVISION
OSCEOLA COUNTY, FLORIDA

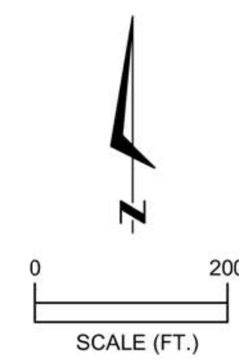
PAVEMENT CORE LOCATION PLAN

DRAWN BY: GSP	DATE: 4.22.2020	CHECKED BY: GSP	DATE: 4.22.2020
SCALE: Not Available	PROJECT NO: 0130.1700290.0013	REPORT NO: 1765631	PAGE NO: **A-2**

LEGEND

- APPROXIMATE PROBE LOCATION SHOWING APPROXIMATE DEPTH OF MUCK (FEET)

W = WATER
M = MUCK
LS = LOOSE SAND (POSSIBLE ORGANICS)



LIMITATIONS OF MUCK PROBE SURVEY

THE MANUAL MUCK PROBE PROCEDURE INVOLVES PUSHING A SLENDER METAL ROD INTO THE SURFICIAL ORGANICS AND EVALUATING THE RELATIVE RESISTANCE OF THE SOIL.

THE MANUAL MUCK PROBE CANNOT DETERMINE THE TYPE OF MATERIAL ENCOUNTERED SINCE NO SOIL SAMPLES ARE RECOVERED, ONLY WHETHER OR NOT THE MATERIAL IS SUFFICIENTLY LOOSE OR SOFT TO ALLOW PENETRATION OF THE PROBE. THE MANUAL PROBE MAY NOT DETECT ORGANIC LAYERS WHICH EXIST BENEATH OR IN-BETWEEN SANDY SOIL LAYERS, AND MAY PENETRATE LOOSE SANDY SOILS.

DUE TO THESE LIMITATIONS, THE DEPTHS SHOWN MAY BE AN OVER-ESTIMATION OR UNDER-ESTIMATION OF THE ACTUAL DEPTH OF ORGANIC SOILS.

MUCK PROBE DATA SHALL NOT BE USED TO ESTIMATE EARTHWORK QUANTITIES, EXCEPT ON A PRELIMINARY BASIS.

BACKHOE TEST PITS OR AUGER BORINGS WITH HORIZONTAL AND VERTICAL SURVEY CONTROL ARE RECOMMENDED WHERE MORE DEFINITE INFORMATION IS NEEDED.

LOOSE SAND MAY CONTAIN VARIABLE AMOUNTS OF ORGANICS AND DEPENDING UPON THE ORGANIC CONTENT MAY BE UNSUITABLE TO REMAIN IN-PLACE BELOW THE PROPOSED SITE IMPROVEMENTS.

20-0279-02

THIS DRAWING CREATED USING PLAN PROVIDED BY CLIENT.

FOR: POULOS & BENNETT

DRAWN BY:	N.F.	DATE:	1 - 22 - 2021
CHECKED BY:	G.P.	DATE:	01.28.2021
REPORT NO:	1765631.V3	SCALE:	AS SHOWN
PROJECT NO:	0130.1700290.0013		

LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

MUCK PROBE LOCATION PLAN

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PAGE NO: A-3

APPENDIX B

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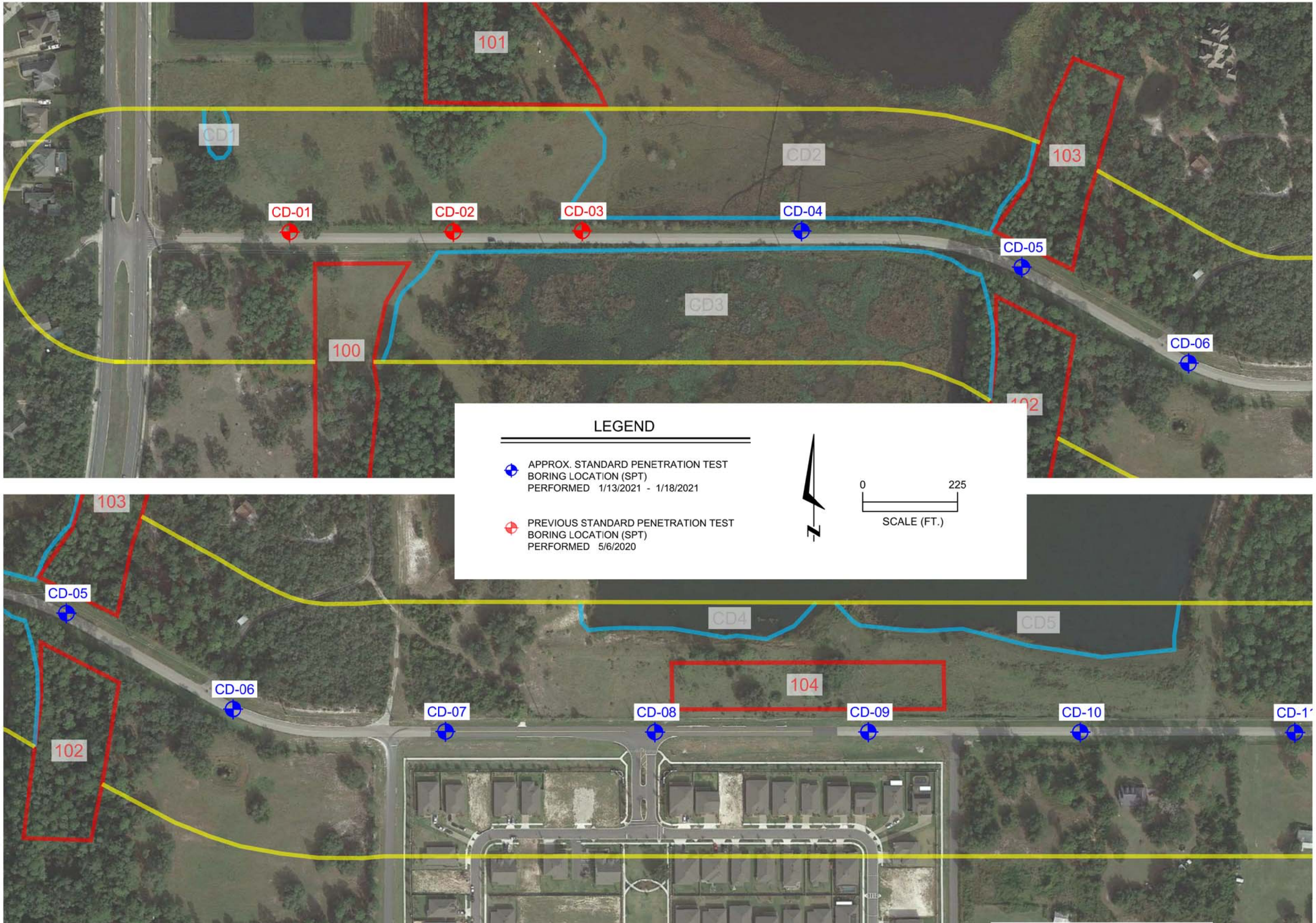

FOR: POULOS & BENNETT

DRAWN BY: N.F.
DATE: 1 - 22 - 2021
CHECKED BY: G.P.
DATE: 01.28.2021
REPORT NO: 1765631.V3
SCALE: AS SHOWN
PROJECT NO: 0130.1700290.0013

LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING LOCATION PLAN

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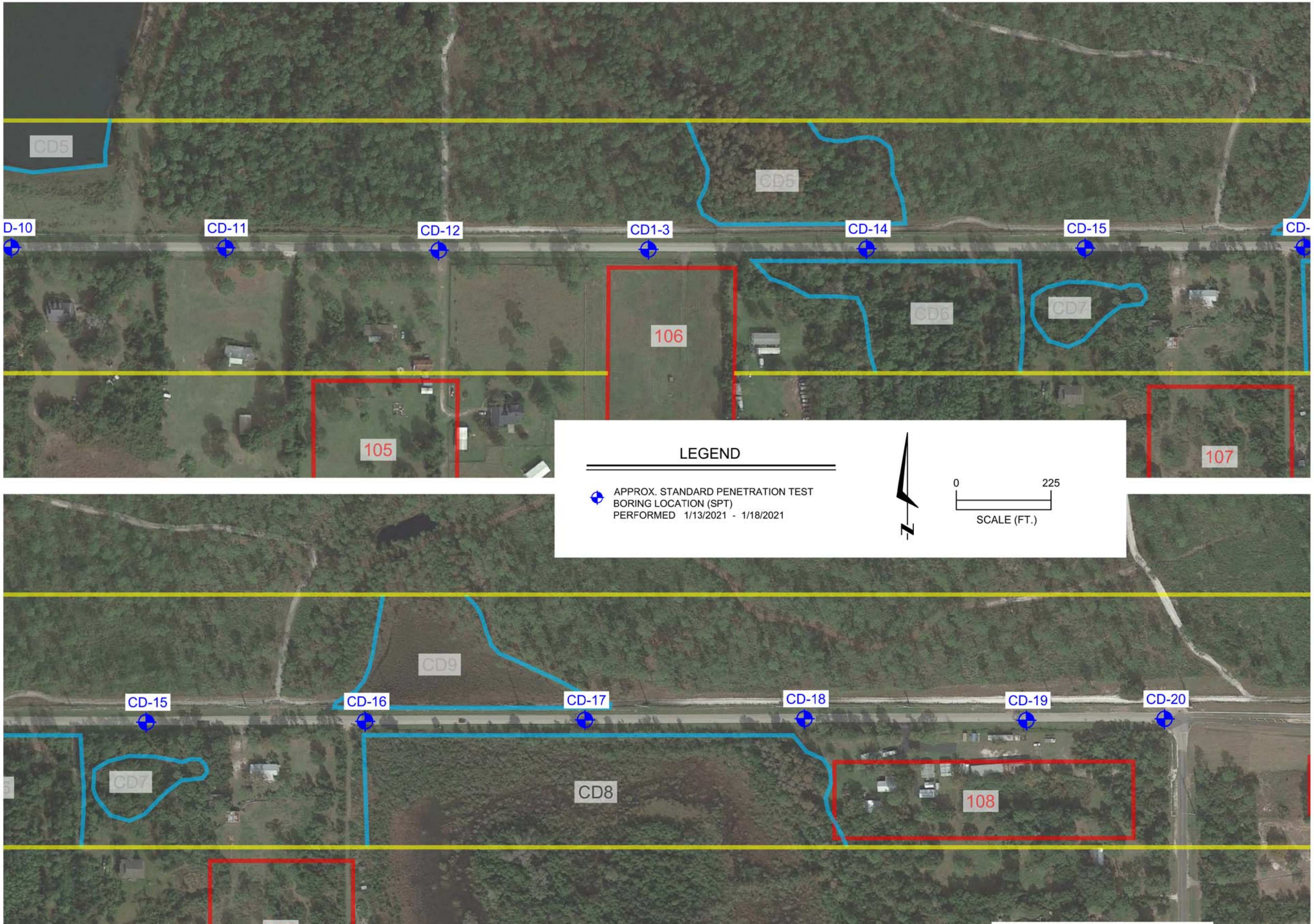
PAGE NO: B-1.1

20-0279-02



FOR: POULOS & BENNETT

DRAWN BY: N.F. DATE: 1 - 22 - 2021
CHECKED BY: G.P. DATE: 01.28.2021
REPORT NO: 1765631.V3 SCALE: AS SHOWN
PROJECT NO: 0130.1700290.0013

LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING LOCATION PLAN

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20-0279-02

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BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
PAGE:	B-2.1

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-01** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S. DATE STARTED: 5/6/20
WATER TABLE (ft): 6.0 DATE FINISHED: 5/6/20
DATE OF READING: 5/6/2020 DRILLED BY: ORL - JB/CM/JM
EST. SHGWT (ft): 3.0 TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT/ DAY)	ORG. CONT. (%)
0						Dark brown fine SAND with silt [SP-SM]						
				▽		-- red brown						
5												
				▼		-- medium dense						
		6-9-8	17									
						Medium dense brown fine SAND [SP]						
		8-9-8	17									
10		4-5-7	12									
15		5-7-9	16									
						BORING TERMINATED AT 15.0 FEET						
20												

W-10998.GPJ

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BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
PAGE:	B-2.2

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-02**
SECTION: TOWNSHIP: RANGE:

SHEET: **1 of 1**

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 3.5
DATE OF READING: 5/6/2020
EST. SHGWT (ft): 0.5

DATE STARTED: 5/6/20
DATE FINISHED: 5/6/20
DRILLED BY: ORL - JB/CM/JM
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0			▽	Mix light grey dark brown fine SAND [SP]						
			▼	-- very light grey						
5										
				-- loose, dark brown						
	3-3-5	8		-- medium dense						
	6-7-9	16								
10	6-6-9	15								
				-- loose, brown						
15	7-5-4	9		BORING TERMINATED AT 15.0 FEET						
20										

W-10998.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
PAGE:	B-2.3

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-03**
SHEET: **1 of 1**
SECTION:
TOWNSHIP:
RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 4.0
DATE OF READING: 5/6/2020
EST. SHGWT (ft): 1.0

DATE STARTED: 5/6/20
DATE FINISHED: 5/6/20
DRILLED BY: ORL - JB/CM/JM
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Dark brown fine SAND with silt [SP-SM]						
						-- loose						
		4-3-2	5			-- very loose						
		1-1-1	2			-- loose						
10		3-3-3	6									
						-- medium dense, brown						
15		4-7-6	13			BORING TERMINATED AT 15.0 FEET						
20												

W-10998.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
PAGE:	B-2.4

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-04** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 2.5
DATE OF READING: 1/14/2021
EST. SHGWT (ft): S.W.

DATE STARTED: 1/14/21
DATE FINISHED: 1/14/21
DRILLED BY: ORL - DW/DM
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Very dark brown silty fine SAND with trace organics [SM]						
				▼				22				3
						Mix brown fine SAND with silt [SP-SM]						
5												
						-- loose, grey						
		2-3-3	6			-- brown grey						
		3-4-4	8									
10		5-3-2	5			Loose brown grey silty fine SAND with trace organics [SM]						
								37				4
						Loose brown fine SAND with silt [SP-SM]						
15		3-3-4	7									
						-- very dark brown						
20		3-2-3	5			BORING TERMINATED AT 20.0 FEET						

W-10998.GPJ

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
PAGE:	B-2.5

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-05** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 2.9
DATE OF READING: 1/18/2021
EST. SHGWT (ft): 0.5

DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0				▽		2" ASPHALT						
						2.5" LIMEROCK BASE						
						Very dense dark grey brown fine SAND with sit [SP-SM]						
	X	16-26-37	63									
				▼		-- medium dense, brown						
	X	9-13-12	25									
5	X	7-5-6	11									
						-- loose						
	X	5-5-4	9									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-06** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): > 7.0
DATE OF READING: 1/18/2021
EST. SHGWT (ft): > 5.0

DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW/CM/TA
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT/ DAY)	ORG. CONT. (%)
0						2" ASPHALT						
						2.5" LIMEROCK BASE						
						Dense dark red brown fine SAND [SP]						
	X	22-16-16	32									
						-- medium dense, light brown						
	X	14-14-11	25									
						-- red brown						
5	X	5-6-6	12									
						-- loose						
	X	7-5-4	9									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
PAGE:	B-2.7

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-07** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 12.0
DATE OF READING: 1/14/2021
EST. SHGWT (ft): > 10.0

DATE STARTED: 1/14/21
DATE FINISHED: 1/14/21
DRILLED BY: ORL - DW/DM
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Mix grey fine SAND [SP]						
						-- very light grey						
5						-- medium dense						
		4-6-5	11									
		5-6-5	11			-- grey						
							2	5				
10		6-8-11	19									
				▼								
						-- dark grey						
15		7-7-9	16									
						-- dark brown						
20		12-13-16	29			BORING TERMINATED AT 20.0 FEET						

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-08** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): > 7.0
DATE OF READING: 1/18/2021
EST. SHGWT (ft): > 5.0

DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW/CM/TA
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						2" ASPHALT						
						2" LIMEROCK BASE						
						Very dense light brown fine SAND [SP]						
		19-24-32	56									
						-- dense, light grey brown						
		18-20-15	35									
						-- medium dense, light brown						
5		6-9-8	17									
						-- loose, very light grey						
		7-5-5	10									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-09** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): > 7.0
DATE OF READING: 1/18/2021
EST. SHGWT (ft): > 5.0

DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Very dense dark grey brown fine SAND [SP]						
	X	19-24-36	60									
	X					-- dense, grey brown						
	X	11-14-17	31									
						-- medium dense						
5	X	11-8-7	15									
						-- brown						
	X	8-7-6	13									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-10** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 8.0
DATE OF READING: 1/14/2021
EST. SHGWT (ft): 5.5

DATE STARTED: 1/14/21
DATE FINISHED: 1/14/21
DRILLED BY: ORL - DW/DM
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Dark grey fine SAND [SP]						
						-- grey						
5						-- loose	5	10				
		3-4-3	7			-- grey brown						
		3-4-4	8									
10		4-3-4	7									
						-- medium dense, mix dark brown grey						
15		6-7-6	13									
						Medium dense dark grey fine SAND with silt [SP-SM]						
20		9-11-16	27			BORING TERMINATED AT 20.0 FEET						

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BORING LOG

PROJECT NO.:	0130.1700290.0013
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-11**
SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 5.0
DATE OF READING: 1/18/2021
EST. SHGWT (ft): 2.5
DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Dense dark grey brown fine SAND [SP]						
	X	10-12-27	39	∇								
						-- medium dense, red brown						
	X	10-13-10	23									
						-- light red brown						
5				▼								
	X	6-7-5	12									
						-- loose, dark red brown	7	24				
	X	4-3-4	7									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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BORING LOG

PROJECT NO.:	0130.1700290.0013
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-12** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): > 7.0
DATE OF READING: 1/18/2021
EST. SHGWT (ft): > 5.0

DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW/CM/TA
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						2" ASPHALT						
						2" LIMEROCK BASE						
						Dense grey brown fine SAND with silt [SP-SM]						
		16-22-19	41									
						-- medium dense, dark red brown						
		7-9-7	16									
5		6-8-10	18									
		11-9-7	16									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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BORING LOG

PROJECT NO.:	0130.1700290.0013
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-13**   SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.   DATE STARTED: 1/13/21
WATER TABLE (ft): 2.5   DATE FINISHED: 1/13/21
DATE OF READING: 1/13/2021   DRILLED BY: ORL - DW/DM
EST. SHGWT (ft): S.W.   TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT/ DAY)	ORG. CONT. (%)
0						Dark grey fine SAND with silt [SP-SM]						
				▼		-- very dark grey						
						-- mix brown						
5						-- medium dense, dark brown	6	21				
		3-4-7	11									
		6-7-11	18			-- loose						
10		5-6-4	10									
15		4-4-6	10									
						-- dense, brown						
20		12-16-16	32			BORING TERMINATED AT 20.0 FEET						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-14** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 5.0
DATE OF READING: 1/18/2021
EST. SHGWT (ft): 2.5
DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW/CM/TA
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT/ DAY)	ORG. CONT. (%)
0						2" ASPHALT						
						2" LIMEROCK BASE						
						Very dense dark grey brown fine SAND with silt [SP-SM]						
	X	22-26-34	60	▽								
						-- dense, light brown						
	X	13-17-16	33									
						-- loose, very light brown						
5	X	8-5-3	8	▼								
						-- dense, brown						
	X	8-15-16	31									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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BORING LOG

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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-15** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 5.0
DATE OF READING: 1/18/2021
EST. SHGWT (ft): 2.5

DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						2" ASPHALT						
						1.5" LIMEROCK BASE						
						Medium dense dark brown fine SAND with silt [SP-SM]						
		7-9-11	20	▽		-- light brown						
		10-13-10	23			-- brown						
5		9-7-9	16	▼		-- dark brown						
		7-9-8	17									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-16** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S. DATE STARTED: 1/18/21
WATER TABLE (ft): 5.0 DATE FINISHED: 1/18/21
DATE OF READING: 1/18/2021 DRILLED BY: ORL - DW/DM
EST. SHGWT (ft): 2.5 TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT/ DAY)	ORG. CONT. (%)
0						Dark grey fine SAND [SP]						
				▽		-- mix grey						
						Mix grey fine SAND with silt [SP-SM]						
5				▼								
						-- medium dense, brown						
		4-5-6	11									
						-- loose						
							6	20				
		4-3-4	7									
						-- medium dense, dark brown, hard pan						
10		7-8-8	16									
						-- dense, very dark brown						
15		9-16-19	35									
						-- medium dense, brown						
20		10-13-16	29			BORING TERMINATED AT 20.0 FEET						

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-17** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 6.0
DATE OF READING: 1/18/2021
EST. SHGWT (ft): 3.5

DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW/CM/TA
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT/ DAY)	ORG. CONT. (%)
0						2.5" ASPHALT						
						2" LIMEROCK BASE						
						Very dense grey brown fine SAND with silt [SP-SM]						
	X	26-29-32	61									
						-- dense, light grey brown						
	X	14-17-14	31									
						-- medium dense, dark red brown						
5	X	6-8-9	17									
						-- loose, grey brown						
	X	6-5-5	10									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-18** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S. DATE STARTED: 1/18/21
WATER TABLE (ft): 5.3 DATE FINISHED: 1/18/21
DATE OF READING: 1/18/2021 DRILLED BY: ORL - DW/CM/TA
EST. SHGWT (ft): 3.0 TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/DAY)	ORG. CONT. (%)
0						2" ASPHALT						
						2" LIMEROCK BASE						
						Medium dense dark grey brown fine SAND [SP]						
	X	10-13-13	26									
				▽		-- dark red brown						
	X	11-13-16	29									
						Medium dense brown fine SAND with silt [SP-SM]						
5	X	10-9-9	18	▼								
	X	5-8-7	15									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

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UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-19** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S. DATE STARTED: 1/13/21
WATER TABLE (ft): 5.0 DATE FINISHED: 1/13/21
DATE OF READING: 1/13/2021 DRILLED BY: ORL - DW/DM
EST. SHGWT (ft): 2.5 TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT/ DAY)	ORG. CONT. (%)
0						Mix grey fine SAND [SP]						
				▽ (2.5)								
						Brown fine SAND with silt [SP-SM]						
5				▼ (5.0)								
						-- medium dense						
		6-6-7	13									
						-- loose						
							6	24				
		3-3-4	7									
10		3-4-4	8									
						-- medium dense, dark brown						
15		9-10-17	27									
						-- dense						
20		20-21-20	41			BORING TERMINATED AT 20.0 FEET						

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1765631.V3
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CD-20** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT, INC.
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED, S.W. = STANDING WATER

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 4.9
DATE OF READING: 1/18/2021
EST. SHGWT (ft): 2.5

DATE STARTED: 1/18/21
DATE FINISHED: 1/18/21
DRILLED BY: ORL - DW/CM/TA
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						2" ASPHALT						
						2" LIMEROCK BASE						
						Medium dense dark grey brown fine SAND [SP]						
	X	14-16-11	27	▽								
						-- light grey brown						
	X	10-11-10	21									
5				▼		-- dark grey brown, trace roots						
	X	5-6-6	12									
	X	6-9-10	19									
						BORING TERMINATED AT 7.0 FEET						
10												
15												
20												

W-10998.GPJ

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KEY TO BORING LOGS

SYMBOLS AND ABBREVIATIONS

SYMBOL	DESCRIPTION
N-Value	No. of Blows of a 140-lb. Weight Falling 30 Inches Required to Drive a Standard Spoon 1 Foot
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
	Sample from Auger Cuttings
	Standard Penetration Test Sample
	Thin-wall Shelby Tube Sample (Undisturbed Sampler Used)
RQD	Rock Quality Designation
	Stabilized Groundwater Level
	Seasonal High Groundwater Level (also referred to as the W.S.W.T.)
NE	Not Encountered
GNE	Groundwater Not Encountered
BT	Boring Terminated
-200 (%)	Fines Content or % Passing No. 200 Sieve
MC (%)	Moisture Content
LL	Liquid Limit (Atterberg Limits Test)
PI	Plasticity Index (Atterberg Limits Test)
NP	Non-Plastic (Atterberg Limits Test)
K	Coefficient of Permeability
Org. Cont.	Organic Content
G.S. Elevation	Ground Surface Elevation

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% retained on the No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS 5% or less passing No. 200 sieve	SW**	Well-graded sands and gravelly sands, little or no fines
			SP**	Poorly graded sands and gravelly sands, little or no fines
		SANDS with 12% or more passing No. 200 sieve	SM**	Silty sands, sand-silt mixtures
			SC**	Clayey sands, sand-clay mixtures
FINE-GRAINED SIOLS 50% or more passes the No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diamicaceous fine sands or silts, elastic silts
			CH	Inorganic clays or clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
			PT	Peat, muck and other highly organic soils

*Based on the material passing the 3-inch (75 mm) sieve
** Use dual symbol (such as SP-SM and SP-SC) for soils with more than 5% but less than 12% passing the No. 200 sieve

RELATIVE DENSITY
(Sands and Gravels)
Very loose – Less than 4 Blow/Foot
Loose – 4 to 10 Blows/Foot
Medium Dense – 11 to 30 Blows/Foot
Dense – 31 to 50 Blows/Foot
Very Dense – More than 50 Blows/Foot

CONSISTENCY
(Silts and Clays)
Very Soft – Less than 2 Blows/Foot
Soft – 2 to 4 Blows/Foot
Firm – 5 to 8 Blows/Foot
Stiff – 9 to 15 Blows/Foot
Very Stiff – 16 to 30 Blows/Foot
Hard – More than 30 Blows/Foot

RELATIVE HARDNESS
(Limestone)
Soft – 100 Blows for more than 2 Inches
Hard – 100 Blows for less than 2 Inches

MODIFIERS

These modifiers Provide Our Estimate of the Amount of Minor Constituents (Silt or Clay Size Particles) in the Soil Sample
Trace – 5% or less
With Silt or With Clay – 6% to 11%
Silty or Clayey – 12% to 30%
Very Silty or Very Clayey – 31% to 50%

These Modifiers Provide Our Estimate of the Amount of Organic Components in the Soil Sample
Trace – Less than 3%
Few – 3% to 4%
Some – 5% to 8%
Many – Greater than 8%

These Modifiers Provide Our Estimate of the Amount of Other Components (Shell, Gravel, Etc.) in the Soil Sample
Trace – 5% or less
Few – 6% to 12%
Some – 13% to 30%
Many – 31% to 50%

APPENDIX C

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GBC GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

CONSTRAINTS & RESTRICTIONS

The intent of this document is to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of exploration. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

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APPENDIX D

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Ground Stiffness Surveys

Advanced Continuous Surface Wave Ground Stiffness Profiling

Mast Arms: N. Narcoossee Road & Cyrils Drive 4-6-2020 Advanced Continuous Surface Wave Testing Report

Report ref.:	GSS328	Date of issue:	4/13/2020
Professional	David Wilshaw, MS, PG	Prepared	Checked
Status	FINAL	4/9/2020	4/10/2020

DAVID WILSHAW LICENSE No. 2413 STATE OF FLORIDA PROFESSIONAL GEOLOGIST

Ground Stiffness Surveys LLC
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USA
www.groundstiffnesssurveys.com

A bright new wave in geotechnics

Contents

Abbreviations

C-DAS	GSS ACSW data acquisition & analysis software
ACSW	GSS Advanced Continuous Surface Wave testing system
E	Young's Modulus
$E_{X\%}$	Young's Modulus softened to X% strain
GSS	Ground Stiffness Surveys LLC
f	Frequency
G	Shear Modulus
G_0	Small-strain Shear Modulus
V_r	Rayleigh Wave velocity
V_s	Shear Wave velocity
λ	Wavelength
ν	Poisson's Ratio
ρ	Soil density
S/N	Signal to noise (ratio)

1 Project details

Project title	Mast Arms: N Narcoossee Road & Cyrils Drive, St. Cloud, FL
Client	UES
Site location	St. Cloud, FL
Scope of report	Ground Stiffness Surveys LLC (GSS) has been commissioned to undertake Advanced Continuous Surface Wave (ACSW) testing to provide ground stiffness profiles in accordance with the details listed below. This report provides ACSW testing data generated using GSS's C-DAS data acquisition & analysis software. Assumptions and testing standards are listed in Section 4. Average shear wave velocity (V_s) *simple inversion* profiles are provided in Appendix A. Where appropriate *advanced inversion* of the data to generate a layered shear wave velocity (V_s) profile has been undertaken, with data presented as equivalent small-strain Shear Modulus (G_0) in Appendix B. Illustrative strain-softened values of E are provided in Appendix C and separately in an MS Excel spreadsheet with the facility for client adjustment of strain level and other default values. ***A commentary on results for design review purposes is provided as Section 5.***
Report conditions	Numbers and locations of ACSW testing have been determined by the client. The standards under which testing was completed are listed in Section 4. *This report is produced solely for the benefit of the client identified in this report and in accordance with the project description and associated conditions identified below.* No liability is accepted for any reliance placed on this report by any other party. The report is intended for use solely by a suitably qualified and experienced geotechnical engineer in conjunction with other appropriate information on ground conditions. *No design or consultancy advice is offered as part of this report.* Where provided, strain-softened stiffness values are for illustration and information only. Appropriate skill and care by a suitably qualified geotechnical engineer are required in the assessment of ground stiffness or shear wave velocity profile data for design use, including the selection of appropriate strain levels for strain-softening and the applicability of strain-softening functions. Design of ACSW testing, including the suitability of ACSW data for the design, numbers and locations of tests should be determined by a suitably qualified geotechnical engineer. A general description of the terminology, test methodology and analysis techniques used to provide stiffness and shear wave velocity profiles from ACSW test data, including references, is provided as Appendix D. Further information and guidance are available via the GSS website: www.groundstiffnesssurveys.com .
Commercial	Testing was undertaken in accordance with GSS Standard Terms & Conditions. Reference should be made to the relevant ACSW testing proposal. *The report has been produced for and on behalf of Ground Stiffness Surveys LLC and no responsibility for information or opinions included is attached to any individual or implied.*

2 Testing details

Attendances	Gautham Pillappa	
Setting out	GSS	
GSS seismic sources	Standard Shaker – GSS Standard 80kg Shaker - 8 to 91Hz EM Shaker – GSS EM high frequency shaker - 50 to 400Hz Heavy Shaker – GSS high energy 80kg 'Heavy' Shaker – 4 to 50Hz ***Unless otherwise noted below, the GSS Standard Shaker source has been used with a 10-foot long standard test array.***	
ACSW test equipment	**Shaker Serial No.**	**Data Acquisition Unit Serial No.**
	SS03	D148
C-DAS software versions	**Data capture**	**Reporting**
	2.9.1.0 'Cashew'	2.9.3.1 'Cashew'
Project notes	ACSW testing carried out for four new mast arm structures proposed as part of intersection improvements at N. Narcoossee Road and Cyrils Drive, St. Cloud, Osceola County, FL. Overhead power, underground gas, water, fiber optic; conventional SPT borings cannot be used.	

3 Project testing summary

Test	Date	Notes
COMBINED01 SW	Monday, April 6, 2020	Combined CSW01 and CSW02 at SW corner of intersection.
COMBINED02 SE	Monday, April 6, 2020	Combined tests CSW04 and CSW05 at SE corner of intersection. CSW06 excluded due to poor model fit.
COMBINED03	Monday, April 6, 2020	Design curve using combined data from tests CSW01, CSW02, CSW04, CSW05 and CSW07.
CSW01	Monday, April 6, 2020	CSW01 at edge of sidewalk, SW corner of proposed intersection.
CSW02	Monday, April 6, 2020	CSW02 at same location as CSW01 but shaker & geophones flipped to allow data stacking. SW corner of proposed intersection, edge of sidewalk.
CSW03	Monday, April 6, 2020	NW Corner of intersection. Shaker at N end of north to south array, edge of sidewalk. Steep slope to west of array.
CSW04	Monday, April 6, 2020	CSW04 was located on the SE corner of the intersection alongside the overhead power tower, close to tower foundation (assumed drilled shaft). Also, underground gas, water (8-inch), cable and signalization utilities marked
CSW05	Monday, April 6, 2020	CSW05 at SE corner of intersection - moved away from power pole foundation. Shaker at south end of south to north array. Underground gas, water (8-inch), cable & signalization.
CSW06	Monday, April 6, 2020	CSW06 at SE corner, shaker at east end of east to west array. Shaker adjacent to power pole foundation. Underground gas, water (8-inch), cable & signalization.
CSW07	Monday, April 6, 2020	CSW07 at NE mast arm location at bottom of 2-foot bank, adjacent to fence line on right-of-way. Shaker at north end of N-S array.
CSW08	Monday, April 6, 2020	CSW08 also at NE of intersection mast arm but at edge of sidewalk. Shaker at north end of north to south array.

Plate 1 – CSW01

Plate 2 – CSW02

Plate 3 – CSW03

Plate 4 – CSW04

Plate 5 – CSW05

Plate 6 – CSW06

Plate 7 – CSW07

Plate 8 – CSW08

4 ACSW data

4.1 Data acquisition

Data acquisition was undertaken using GSS's C-DAS data acquisition & analysis software which automatically controls testing, assesses data quality and provides field outputs.

C-DAS automatically identifies frequencies where there is inconsistency in velocities and frequencies measured between geophones. Outlying data or very scattered data which may not be reliable has also been excluded from the analyses undertaken but is still presented for transparency using a different symbol.

4.2 Data plots

Data plots generated using GSS's C-DAS data acquisition and analysis software are presented in Appendices A & B. For each test, the following plots, including an appropriate smoothed best fit curve, are provided:

- The *field dispersion curve* – measured Rayleigh Wave velocity (V_r) against measured frequency (Appendix A)
- The *simple inversion* – average V_s against approximate depth based on the dispersion curve data (Appendix A)
- The *synthetic dispersion curve* (where appropriate) - generated by the advanced inversion process (Appendix B)
- The *advanced inversion* results (where appropriate) – layered V_s profile with depth (Appendices A & B)

Deleted invalid, scattered or outlying data not used in the analyses is shown on the field dispersion plots only. Commentary on data quality is given in Section 3 (individual test notes) and in Section 5 (commentary on all results), including any tests where advanced inversion was not deemed appropriate.

Advanced inversion results are converted to G_0 and E_0 stiffness profiles in Appendix C using the relationships and soil density and Poisson's ratio values shown. Softened Young's Modulus (E) values are also provided using a published strain softening model and default strain level. This data is provided separately in MS Excel format to allow any of the default parameters to be adjusted to reflect site specific conditions for design purposes. Note that the strain softened stiffness values provided may not be appropriate for some ground conditions (e.g. in rock) or design applications. Further guidance on use of ACSW data is available at www.groundstiffnesssurveys.com.

A key to data plots presented is given in Appendix D. *All data should be assessed in conjunction with the notes on use of ACSW data provided in Appendix D.*

4.3 Data inversion

Simple (average with depth) and advanced (layered) inversion shear wave velocity (V_s) profiles have been generated by C-DAS in accordance with the procedures and references set out in Appendix D and the default model constraints below. Unless otherwise stated, an effective dispersion curve modelling approach using the WAVe model (Leung & Aung, 2013) is used. Model defaults are reviewed as part of initial inversion and considering available site information; ***any modifications from the default analysis settings below are set out in Section 5.***

C-DAS model constraint	Value	Basis
Poisson's ratio	0.5	Conservative for natural range (has very small impact on derivation of V_s from V_r)
Soil density	1.8 Mg/m^3	Conservative for natural range (has only limited impact on inversion)
Simple inversion depth	wavelength/ 2.5	Foti *et al* 2017
Minimum V_s	50m/s	Minimum natural value for soils; Foti et al 2017
Maximum V_s	1500m/s	Maximum value for non-crystalline rock; Foti *et al* 2017
Minimum layer thickness	1m (Standard & Heavy Shaker sources) 0.5m (EM Shaker source)	Practical minimum layer resolution. May be adjusted to the *minimum* value which meets stiff-soft-stiff layer and layer thickness resolution checks or in line with available site information.
Maximum layer thickness	1m to 10m	Adjusted to the *minimum* value which meets stiff-soft-stiff layer and layer thickness resolution checks or in line with available site information.
Minimum number of model layers	10	Adjusted to ensure approximately 1 layer per 1m of profile (Foti *et al* 2017).
Maximum model depth validity	Simple inversion maximum depth for site	Foti *et al* 2017
Top layer thicknesses	No shallower than depth of first simple inversion point	Foti *et al* 2017
Simple inversion weighting	0.05 (Normally Dispersive profiles) 0.1 (Inversely Dispersive profiles)	Standard calibrated value providing an appropriate degree of constraint to the simple inversion as prescribed by Foti *et al* 2017. Adjusted if required based on available site information.
Numbers of stiff-soft-stiff layers check	1 or 2	Foti *et al* 2017; where greater numbers generated by the inversion the number of layers and layer thicknesses are adjusted.
Layer thickness resolution check	Max 0.5m at shallow depth (typical minimum resolution); min 1m to 2m at base of profile (minimum practical resolution at 10 Hz).	Foti *et al* 2017; where thinner layers generated by the inversion the number of layers and layer thicknesses are adjusted.

Guidance and relevant standards on data inversion are listed in Section 4.5. Notes on the inversions undertaken for each test are given in Section 3. A commentary on the inversions completed is provide in Section 5.

4.4 Conversion of shear wave velocity to stiffness

Advanced inversion layered shear wave velocity profile results are presented in Appendix C as equivalent values of G & E using the parameters and relationships set out.

Default parameters can be changed by the user based on other site data or design requirements in the MS Excel version of the Appendix C data issued with this report - *see GSS website for guidance.*

4.5 Testing standards

ACSW testing has been undertaken in accordance with the following GSS standard guidance documents;

- GSSGN010 Description & limitations of ACSW technique
- GSSSPEC01 ACSW Standard Specification
- GSSMS01 Method Statement: ACSW Stiffness Profiling
- GSSDWG001 ACSW Test Layout

The documents above and further guidance on ACSW testing practice and application are available at www.groundstiffnesssurveys.com.

Key references are listed in Appendix D.

5 Commentary on results

5.1 Notes on results commentary

The qualitative assessment and observations below are based on available ACSW test data only and should be read in conjunction with the limitations set out in Appendix D.

For simplicity, higher shear wave velocity values are described qualitatively as 'stiff' or 'stiffer' and lower shear wave velocity values 'soft' or 'softer'. Guidance for preliminary interpretation of shear wave velocity data in conjunction with available information on ground conditions is provided in Appendix C.

Where appropriate the total range of data quality is indicated as well as the typical range within this through the use of light (total range) and dark blue (typical range) shading (*see example below*).

Example key for qualitative assessment of results

Very poor		
Poor	Total range of data quality observed in results	
Fair		Typical range
Good		
Excellent		

Appropriate interpretation of data presented, based on available geologic and geotechnical information and project design criteria, should be undertaken by a suitably qualified and experienced geotechnical engineer when assessing and utilizing this data. Notes on individual tests are provided in Section 3.

In reviewing the results, reference should be made as necessary to the testing standards listed in Section 4.5, the references listed in Appendix D and guidance available via the GSS website.

5.2 Data & results assessment

Review element	Class	Description	Typical impact
Available ground investigation information *Qualitative assessment of extent of site ground investigation information available to constrain modelling.* *See project notes in Section 2 and Observations section*	None	No reliable site-specific ground investigation data available	No reliable check on modelled results against ground investigation data possible; further review/remodelling may be required once ground investigation data available.
	Poor	Some site-specific ground investigation data available but soil types and/or variation in layer boundaries could vary significantly across site.	Limited assessment of results of modelling possible against ground investigation data.
	Fair	Soil types and/or range of variation in layer boundaries across site well defined.	Accuracy of V_s modelling enhanced by constraints on layer boundaries, allowing reliable assessment of model results against ground investigation data.
	Good	Soil types well-understood and layer boundaries known or very well defined at each test location.	Highest degree of accuracy of V_s modelling possible where layer boundaries well defined.

Review element	Class	Description	Typical impact
Data quality *Qualitative assessment within normal valid data frequency range for source or sources used.*	**Very poor**	Most of the data do not meet data quality requirements and/or are multi-modal.	Data unlikely to be reliably analysable but may provide qualitative evidence of variable ground conditions.
	Poor	Many data points not meeting data quality requirements and/or significant multi-modal data.	Data may not be reliably analysable, unless supported by the results of other nearby tests but may provide qualitative evidence of variable ground conditions.
	Fair	Some data points not meeting data quality requirements and/or some multi-modal data.	Normal minimum standard for data analysis.
	Good	Few data points not meeting data quality requirements and little multi-modal data.	Data likely to support reliable analysis.
	Excellent	Very few data points not meeting data quality requirements and very little to no multi-modal data.	Data highly likely to support reliable analysis.

Review element	Class	Description	Typical impact
Advanced inversion model fit *Confidence level subject to comparison with other adjacent tests and available geotechnical data prior to use.* *Notes on individual tests are provided in Section 3.*	**Very poor**	Average fit of synthetic dispersion curve to field dispersion curve data >30m/s.	Indicates very low level of model confidence, well below normally acceptable levels; *if reported, results should only be used with caution.*
	Poor	Average fit of synthetic dispersion curve to field dispersion curve data >20m/s and <30m/s.	Indicates low level of model confidence, results may be acceptable if comparable with other similar tests; *caution in use of results required.*
	Fair	Average fit of synthetic dispersion curve to field dispersion curve data >10m/s and <20m/s.	Indicates acceptable level of model confidence.
	Good	Average fit of synthetic dispersion curve to field dispersion curve data >5m/s and <10m/s.	Indicates high level of model confidence.
	Excellent	Average fit of synthetic dispersion curve to field dispersion curve data <5m/s.	Indicates very high level of model confidence.

Review element	Class	Description	Typical impact
Strain value used for adjustment of small strain stiffness (G_0, E_0) *Reporting uses a well-established soil softening model applicable to a wide range of soil types. However, this model may not be applicable to rock and problematic soils such as collapsible ground or peat, which may exhibit strain hardening behaviour – see Appendix D.*	**0%**	Unadjusted very small strain value.	Seismic strain level value. Upper bound value for most soils which typically strain soften. Provides a lower bound estimate of stiffness for geomaterials which strain harden.
	0.01%	Small strain value	Typical upper bound value of strain around propped excavations, anchored walls and machine base foundations.
	0.1%	Moderate strain value	Typical upper bound value of strain associated with typical geotechnical projects. Provided as the default value in the MS Excel output spreadsheet.
Applicability to be reviewed by Designer against project design criteria and available geotechnical information.	**1%**	Large strain value	Typical upper bound value associated with standard field (e.g. Plate Load Test) and laboratory (e.g. oedometer consolidation) testing.

Review element	Class	Description	Typical impact
Overall assessment of results – *see Observations section for more detail.* *Qualitative assessment, to be reviewed by Designer based on project geotechnical categorization, against available site information and in relation to design objectives as part of assessment of suitability for use.*	**Poor**	Data quality and analysis results variable and not consistent with available information.	Data not normally issued and, if reported, may be indicative or qualitative only. *To be used with caution only.*
	Fair	Data quality and analysis results generally consistent with each other and/or available information, though some variation in individual test results may be present.	Additional design review required for some or all data prior to use; as appropriate, conservatism to be applied on outliers or for selection of design values. *Some results to be used with caution or qualitatively only.*
	Good	Data quality and analysis results consistent with each other and/or available information.	Standard level of design review appropriate for project required before use.

5.3 Observations

Simple inversion profiles generated extend to between 6m and 11m depth (~20 to 36-feet depth).

Advanced inversion was undertaken using an effective dispersion curve (WAVe) model with 10 layers and a minimum 1m and maximum 2m layer thickness. Advanced inversion profiles generated reflect the simple inversion profiles and have been reported to simple inversion profile depths.

Individual tests were carried out at all four corners of the intersection. Combined test data was used at the south west and south east corners. CSW03 should be used in the design of the mast arm foundation at the northwest corner and CSW07 used for the northeast corner. A single combined "design line" test for the whole project including tests CSW01, CSW02, CSW04, CSW05 and CSW07 was also analysed.

For the purposes of mast arm foundation design, the shear wave velocity, V_s can be correlated with the SPT N_{60} value using the published relationships presented in Appendix C. For ease of use, the relationships are presented below using V_s values in both m/s and ft/s:

SPT N_{60}	2	4	10	30	50	60
V_s m/sec	151	174	210	263	292	303
V_s ft/sec	495	571	689	863	958	994

Using the combined "design line" data, the soil profile comprises loose soil to around 7-feet below grade, medium dense soil from 7 to 11-feet, dense soil from 11 to about 18-feet, then medium dense from 18 to at least 38-feet below grade.

The weakest soil profile was CSW06, where the soil was very loose to 6-feet, medium dense to 13-feet then loose again up to the maximum imaged depth of 26-feet. This may represent disturbance due to utility / power pole foundation construction, however, since this weaker profile was not replicated in adjacent tests CSW04 and CSW05.

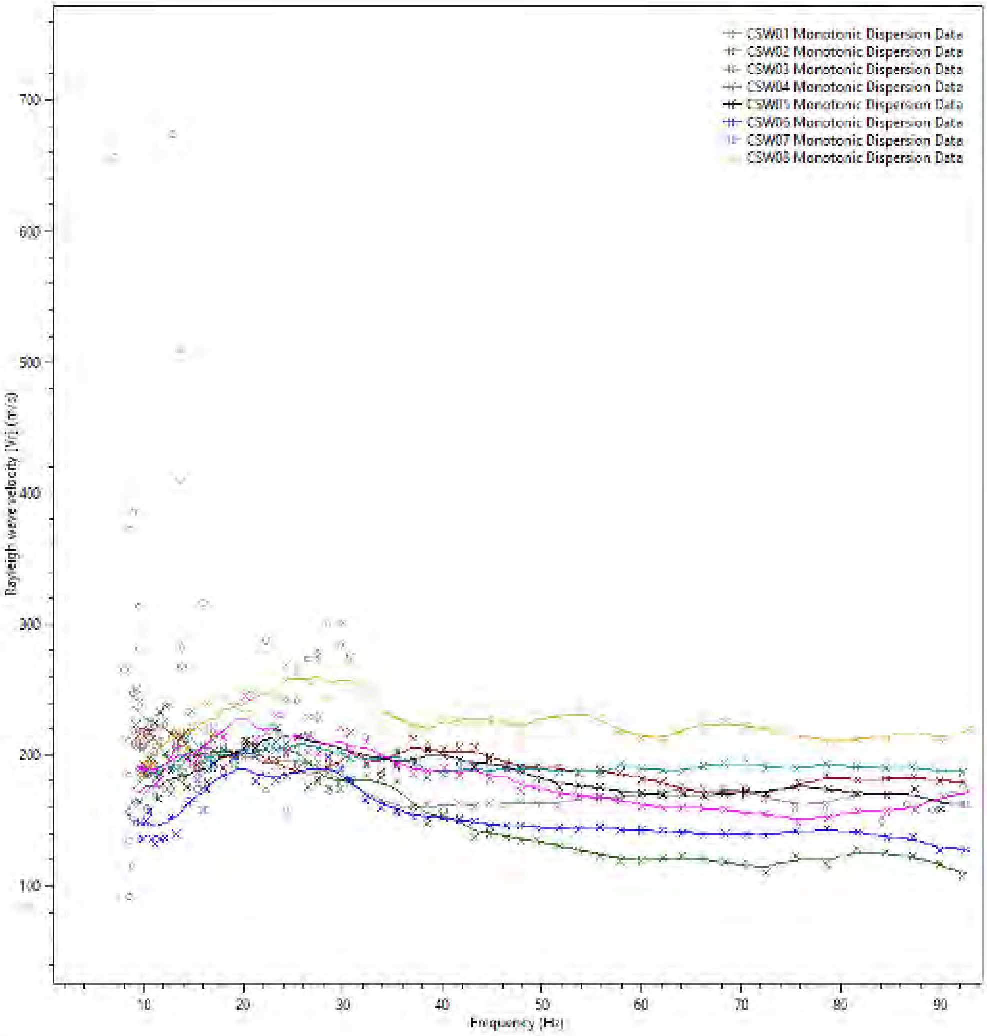


Figure 5.3.1: C-DAS dispersion curve outputs

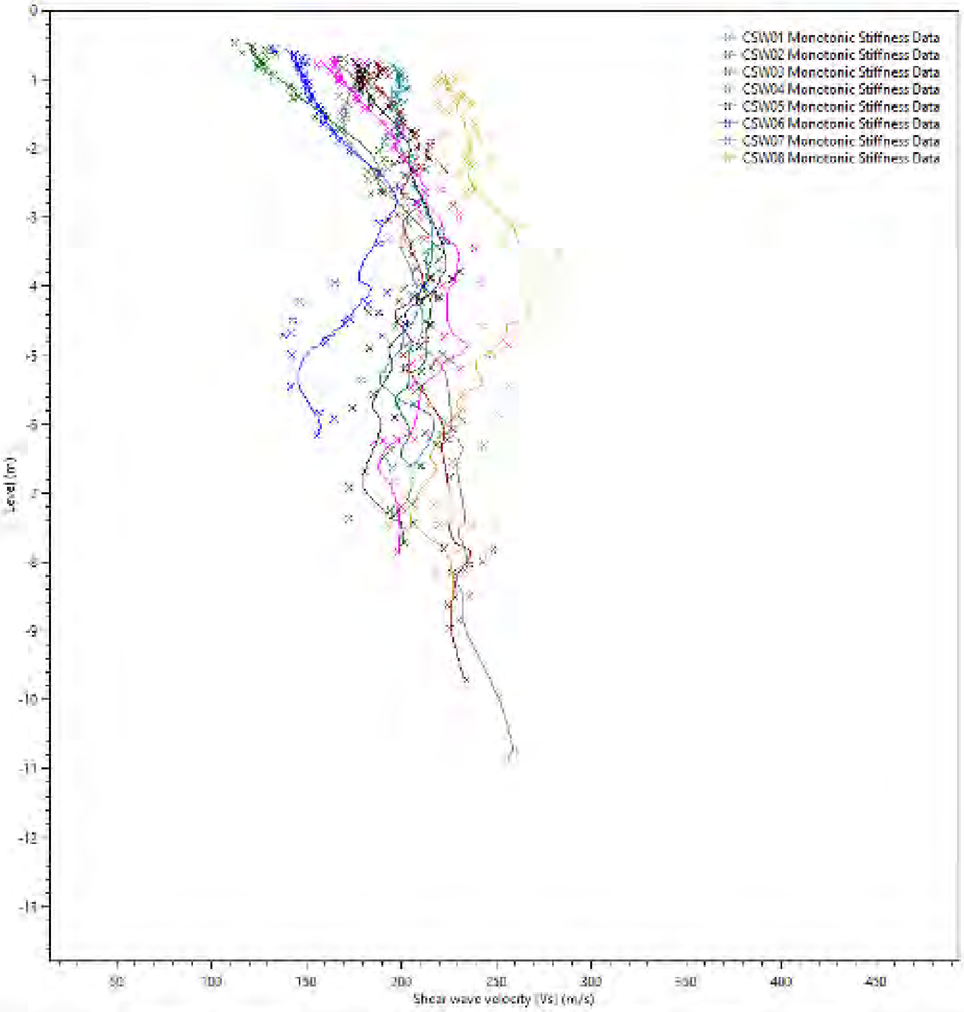


Figure 5.3.2: C-DAS simple inversion outputs

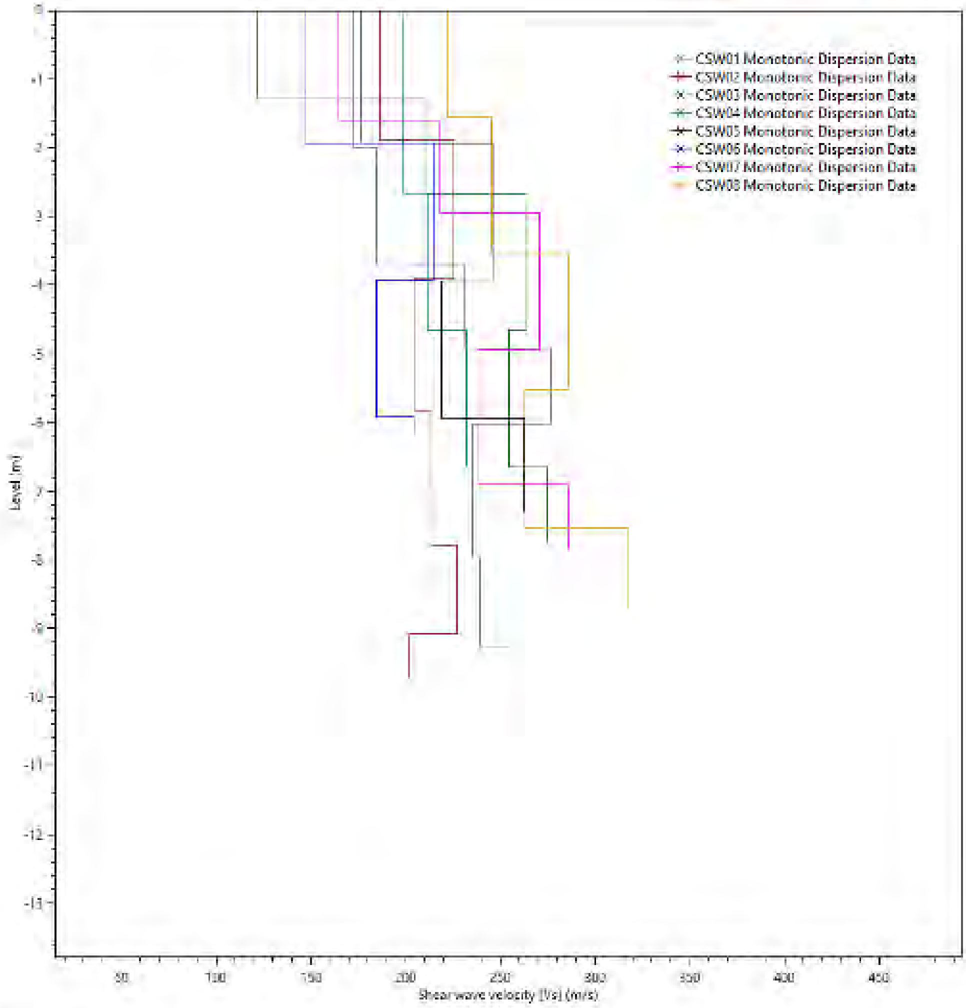


Figure 5.3.3: C-DAS advanced inversion outputs

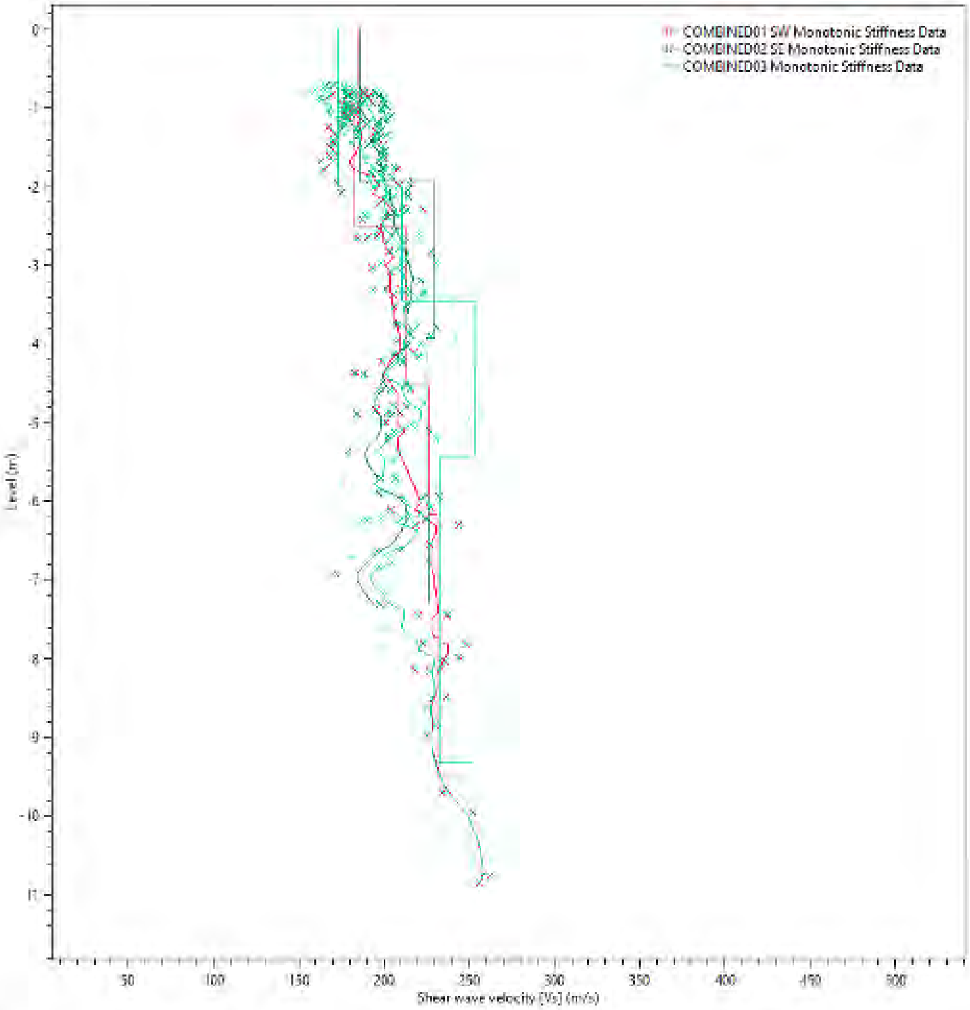
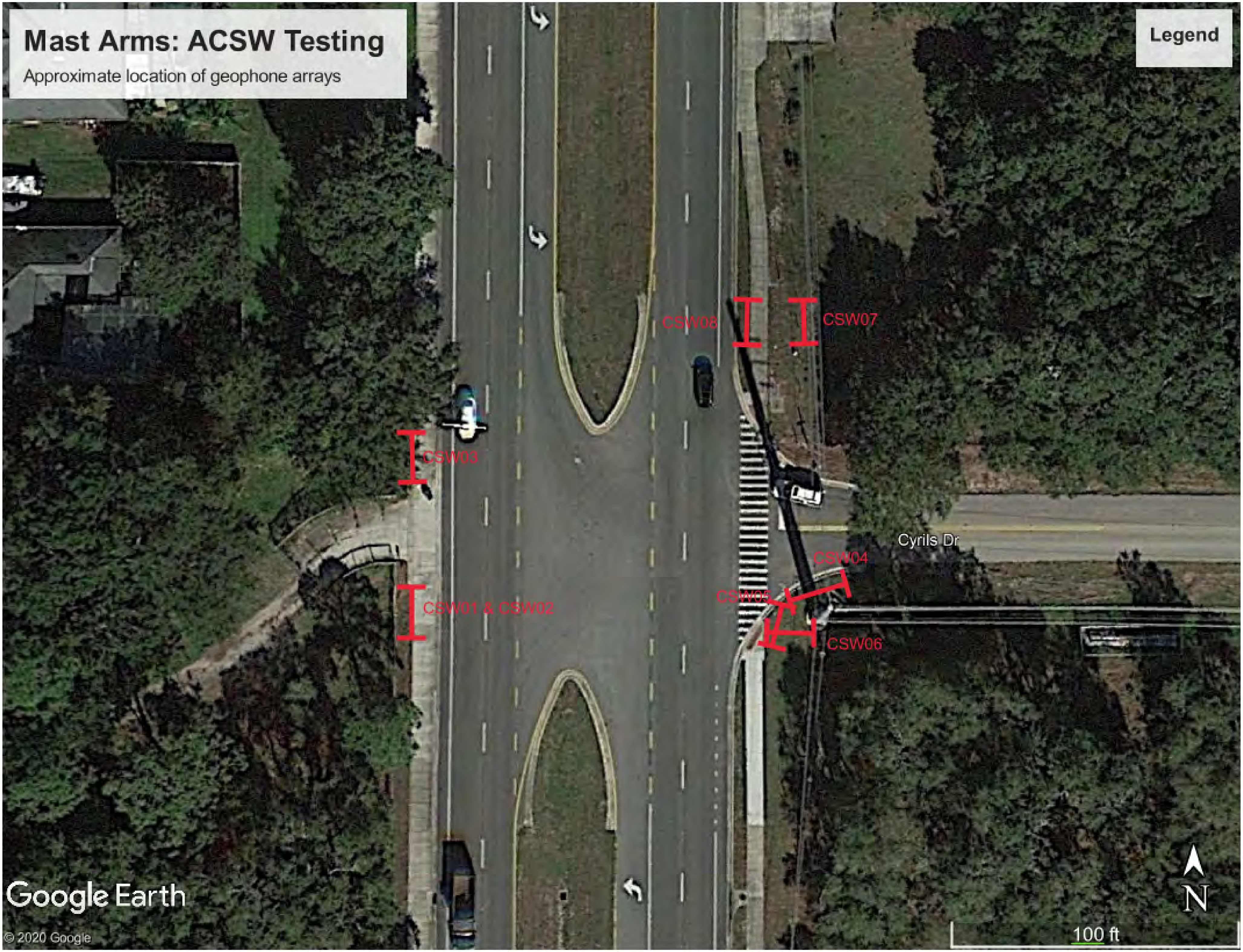


Figure 5.3.4: C-DAS advanced inversion outputs for combined tests

ACSW test location plan

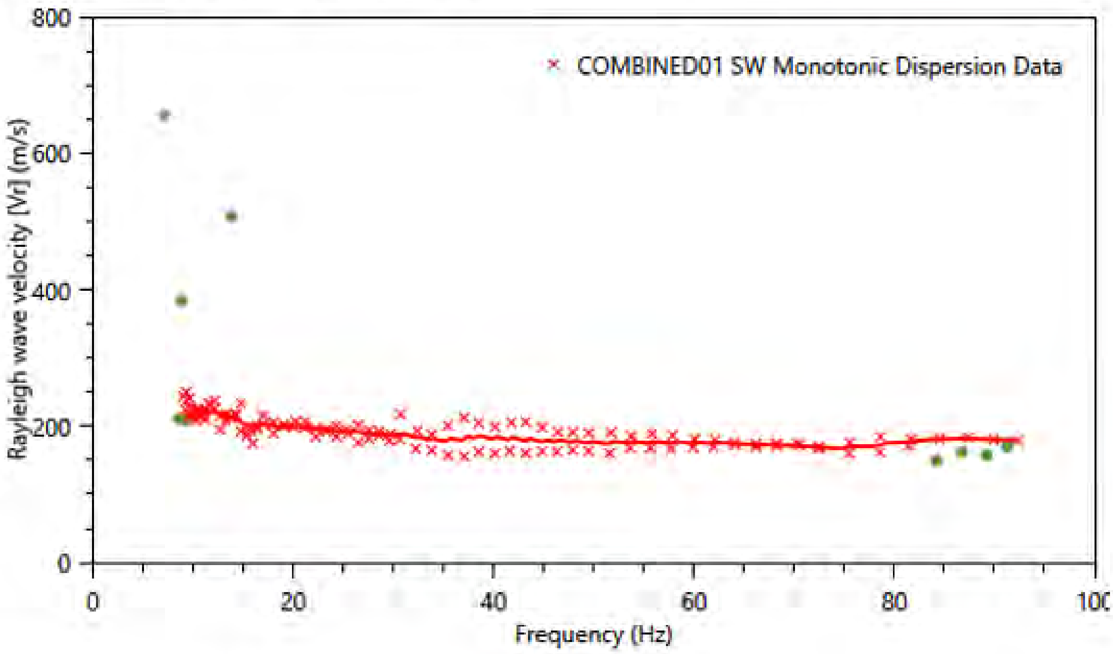


Mast Arms: ACSW Testing
Approximate location of geophone arrays
Legend
CSW08
CSW07
CSW03
CSW01 & CSW02
CSW04
CSW05
CSW06
Cyrils Dr
Google Earth
© 2020 Google
100 ft
N

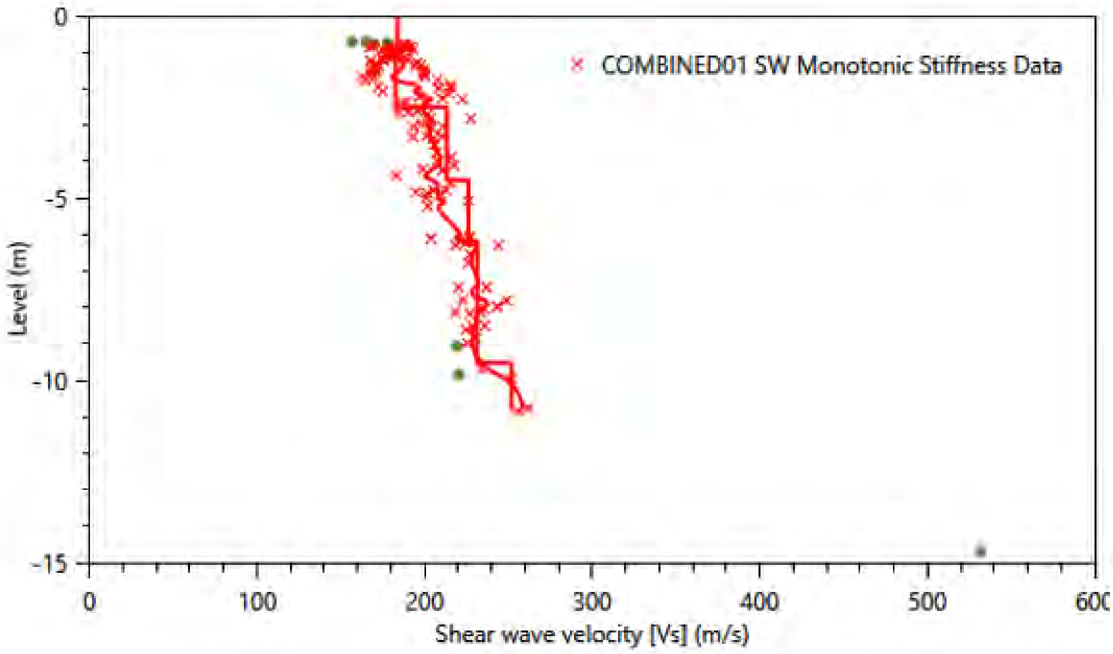
Appendix A: Field dispersion curves & combined simple and advanced inversion plots

See Appendix D for key

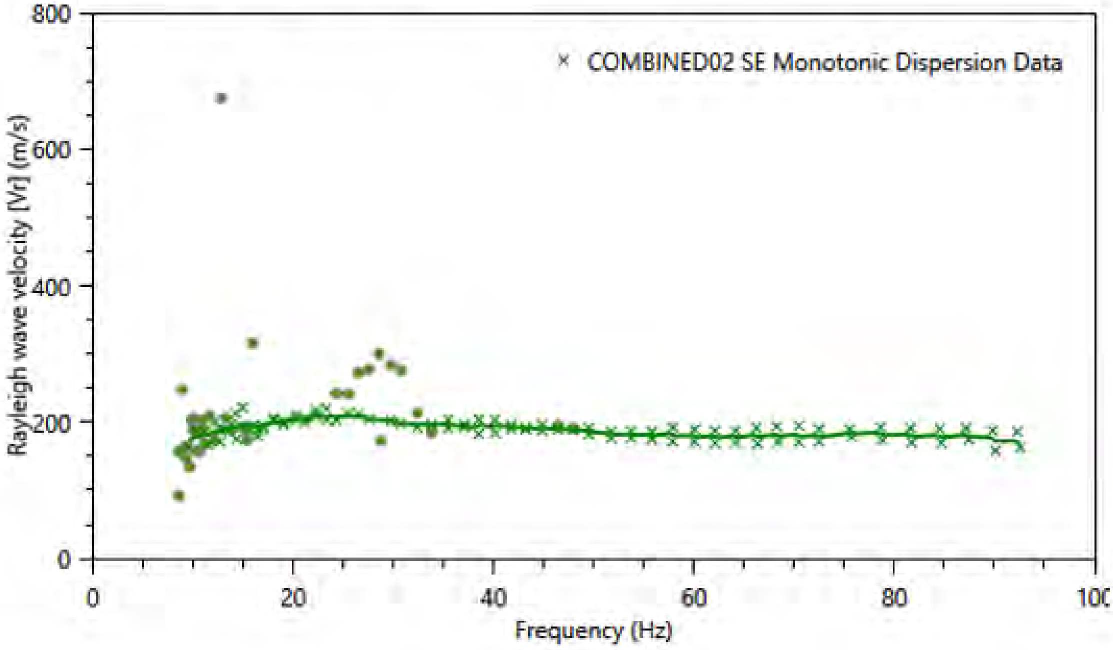
COMBINED01 SW Field dispersion curve



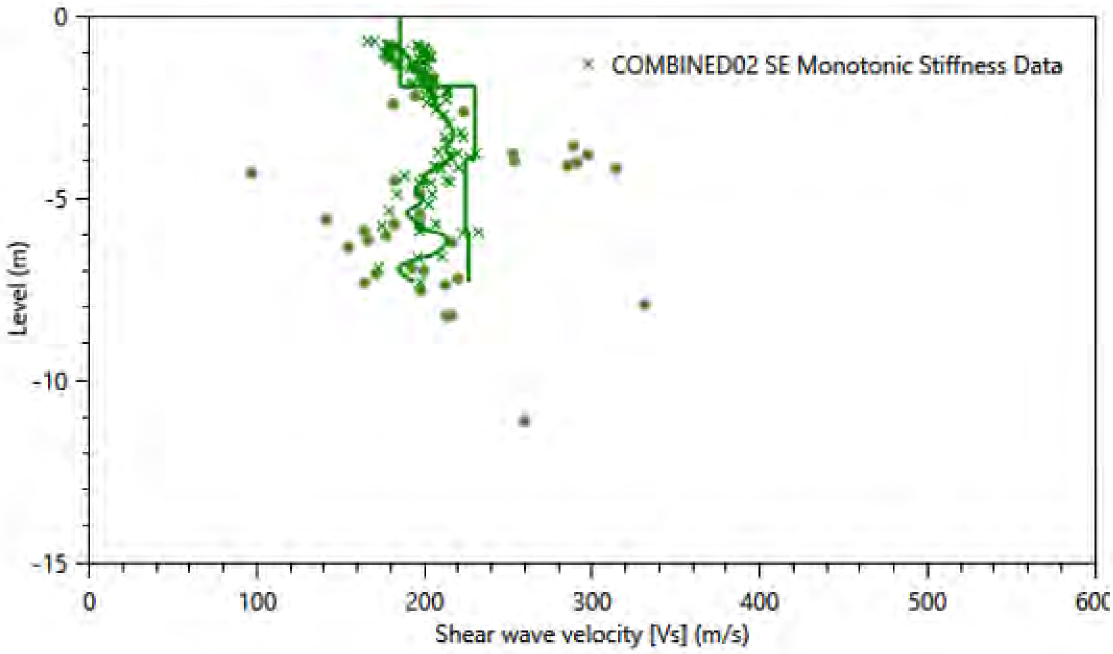
COMBINED01 SW Simple & advanced inversion



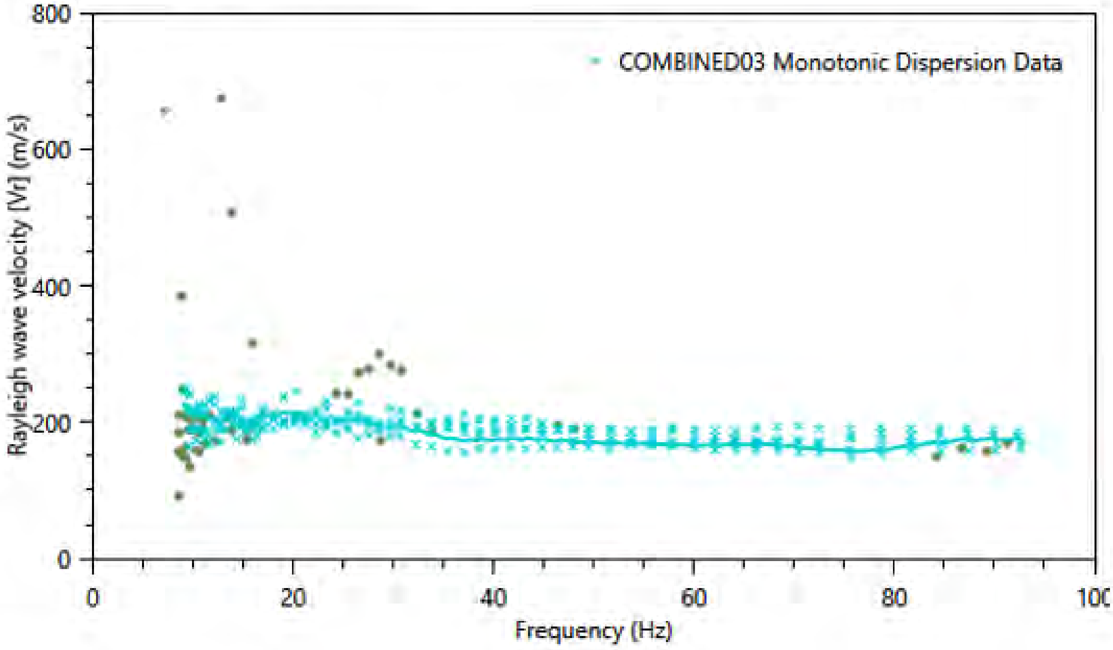
COMBINED02 SE Field dispersion curve



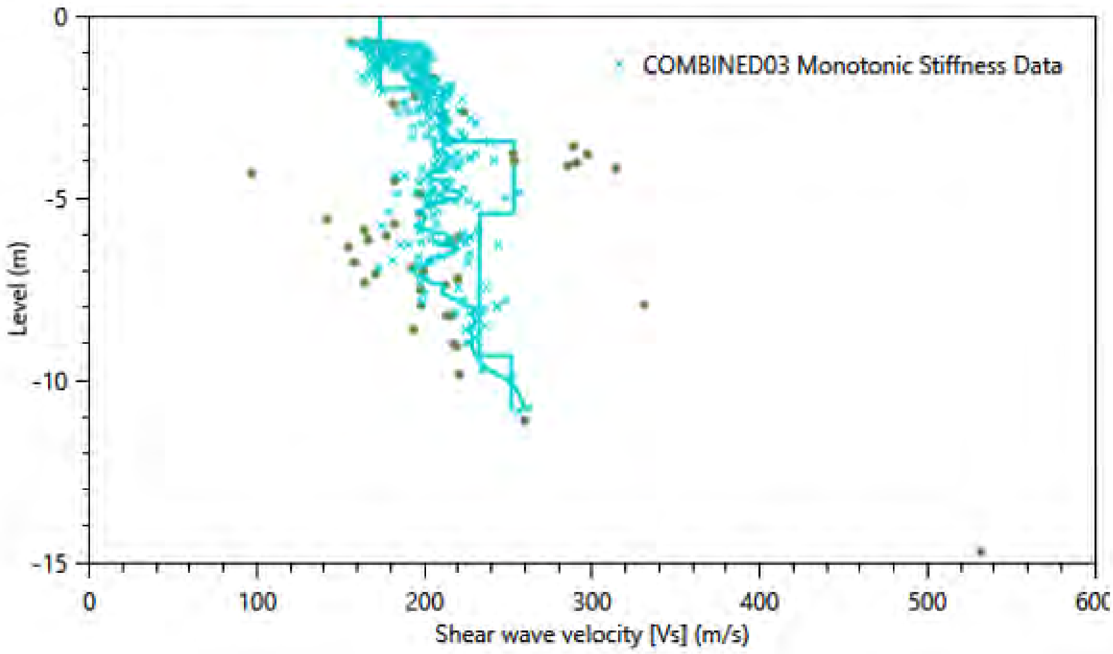
COMBINED02 SE Simple & advanced inversion



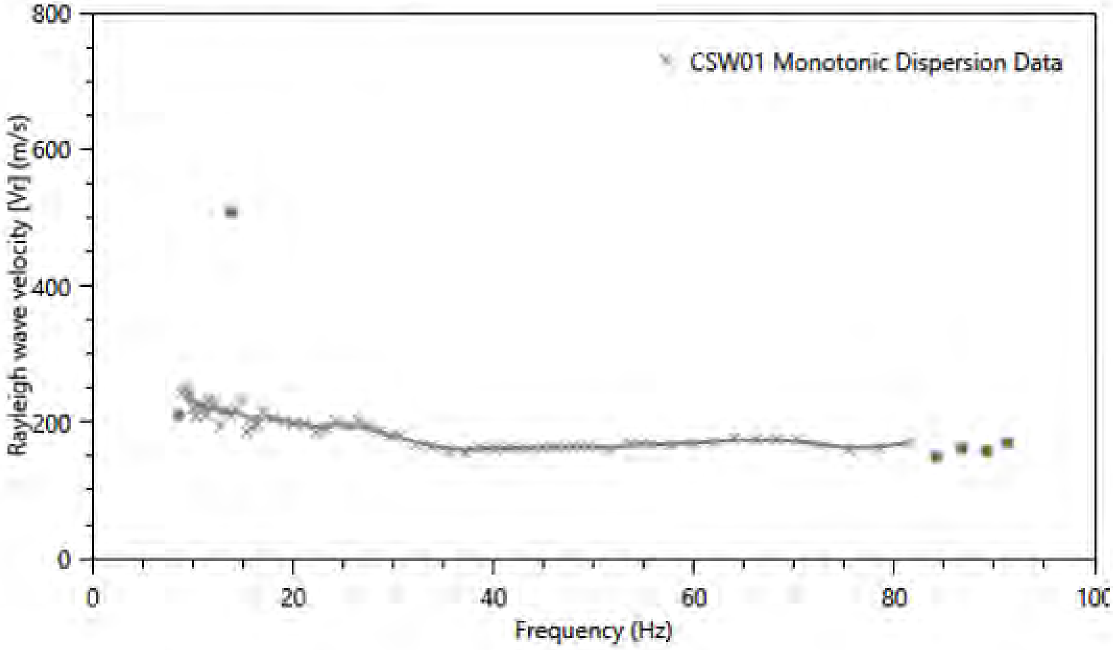
COMBINED03 Field dispersion curve



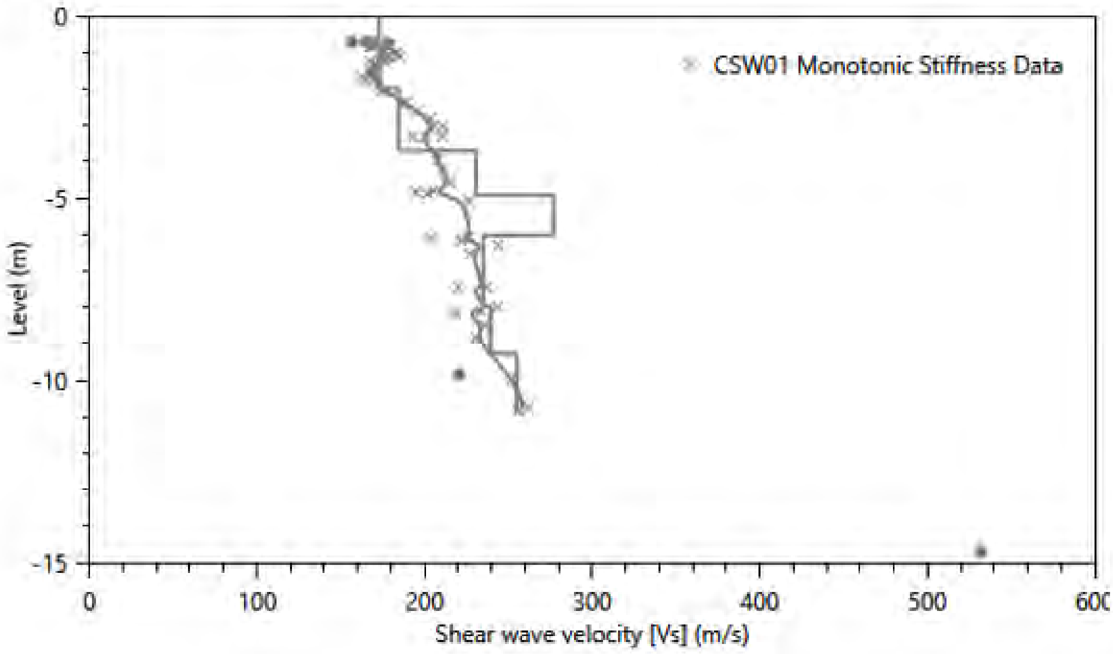
COMBINED03 Simple & advanced inversion



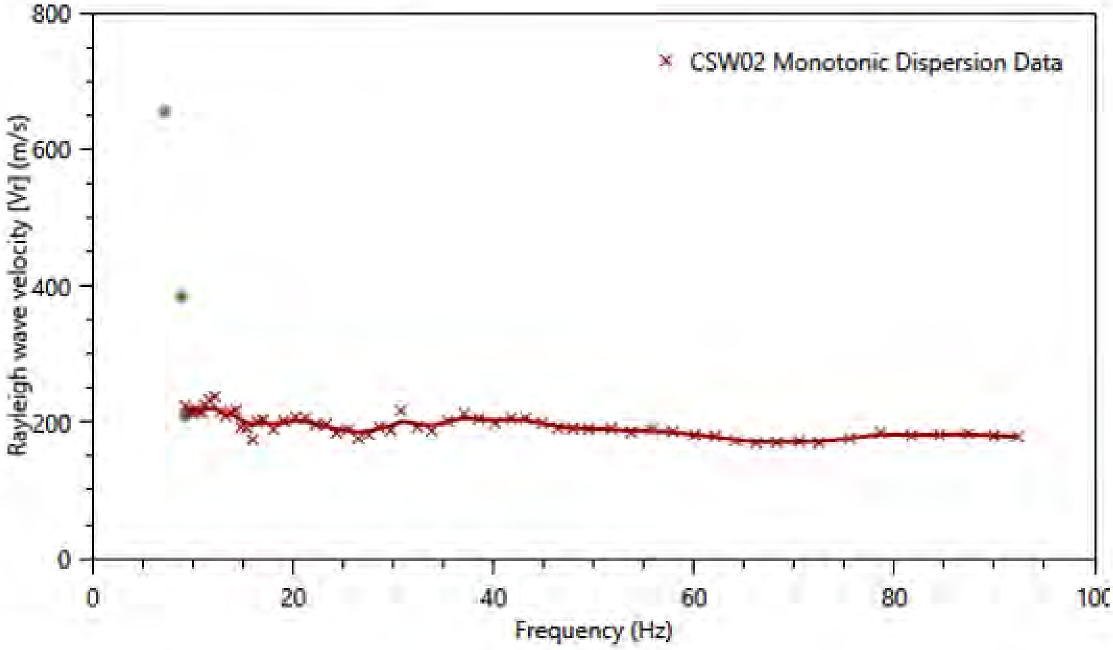
CSW01 Field dispersion curve



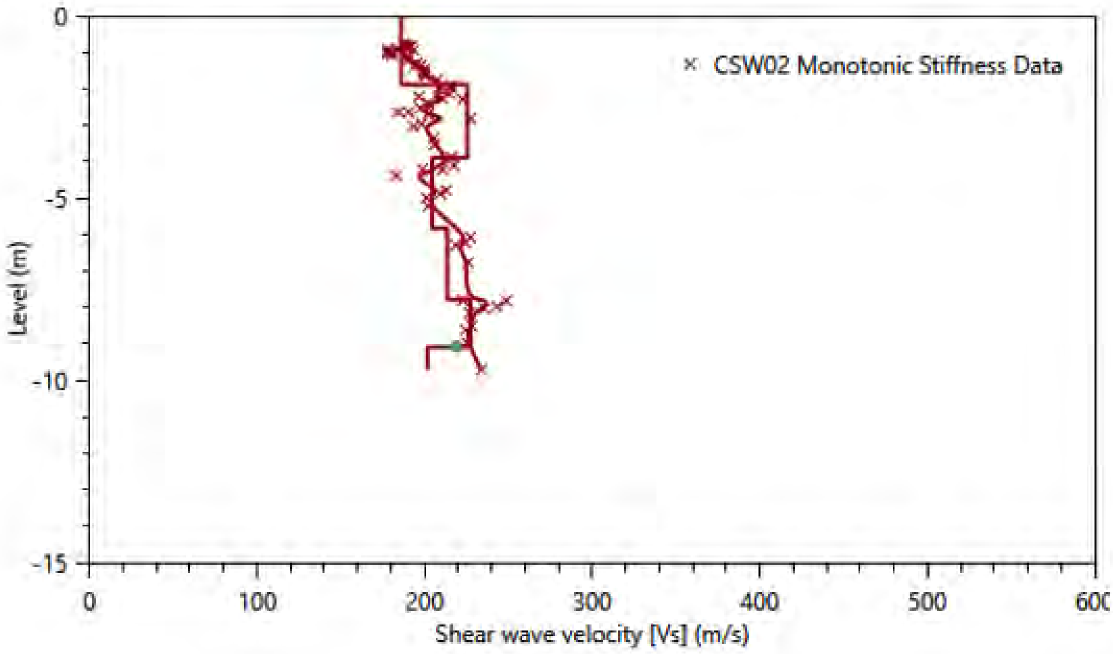
CSW01 Simple & advanced inversion



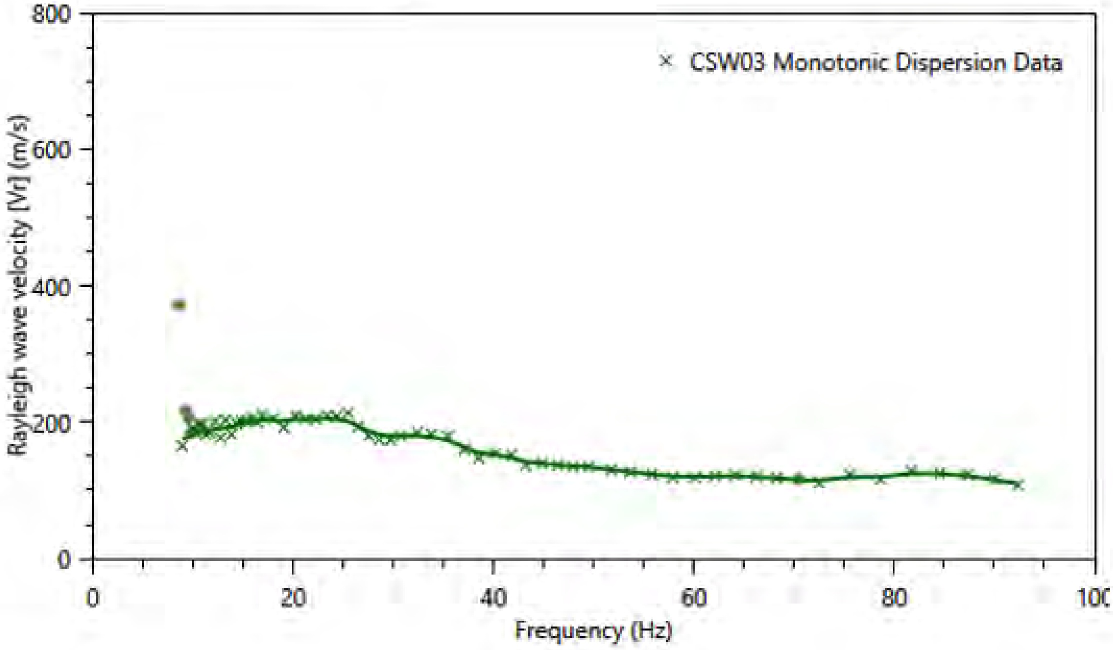
CSW02 Field dispersion curve



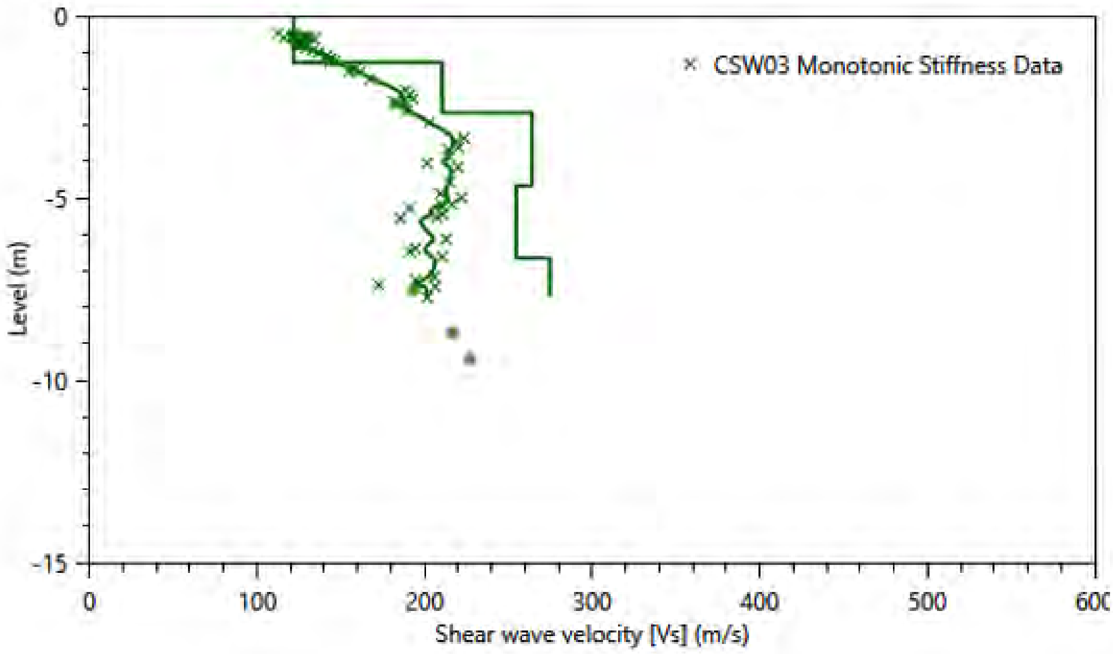
CSW02 Simple & advanced inversion



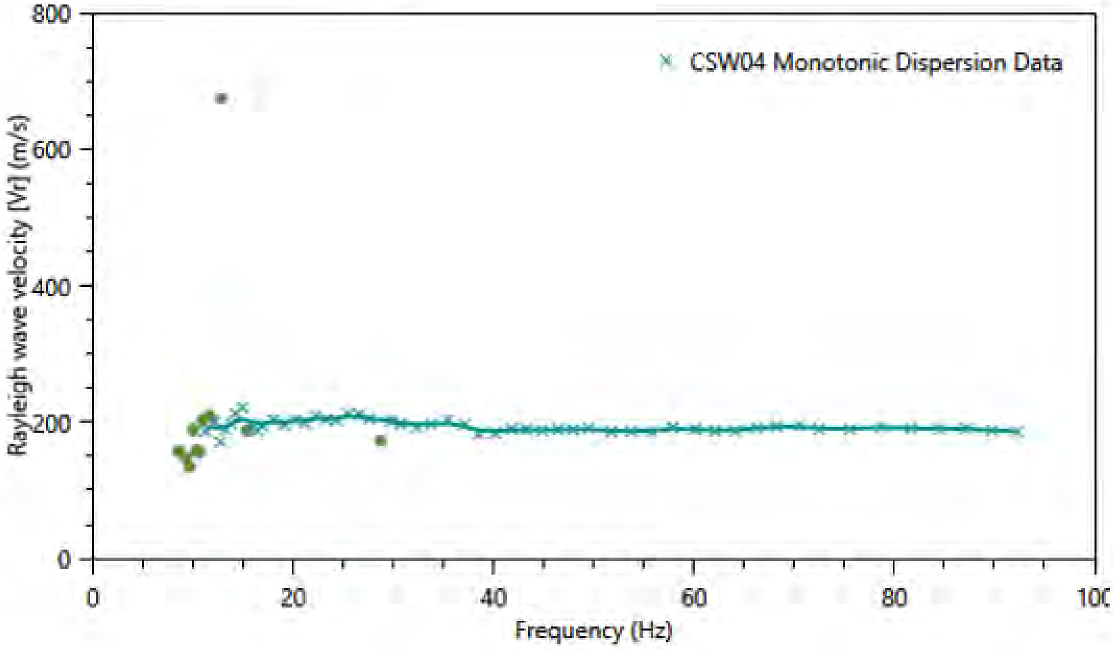
CSW03 Field dispersion curve



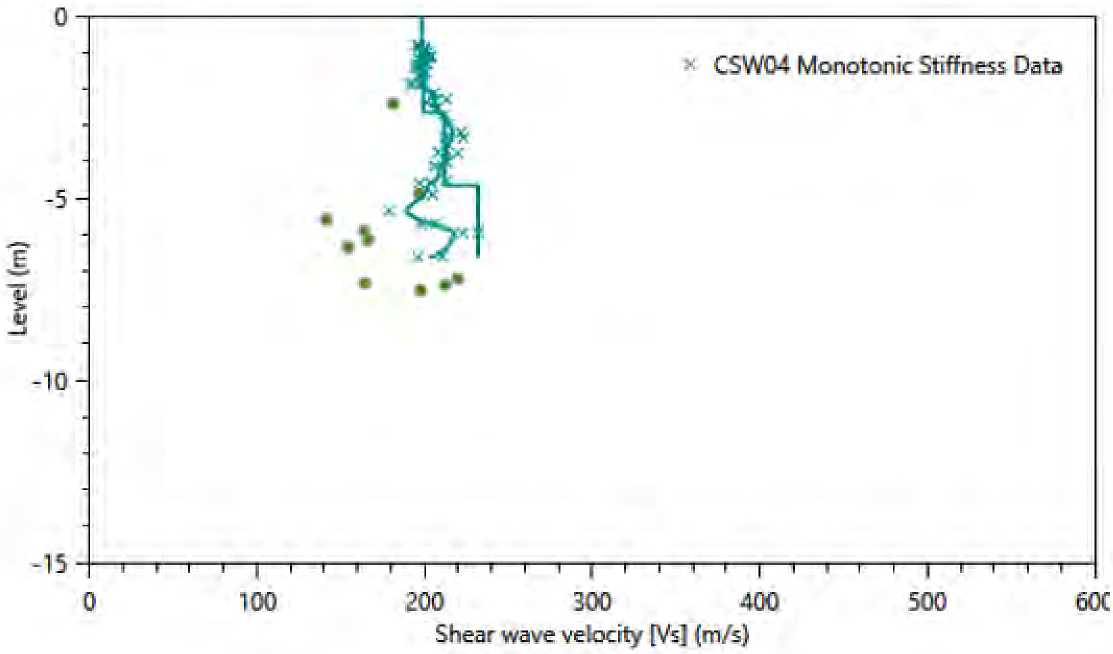
CSW03 Simple & advanced inversion



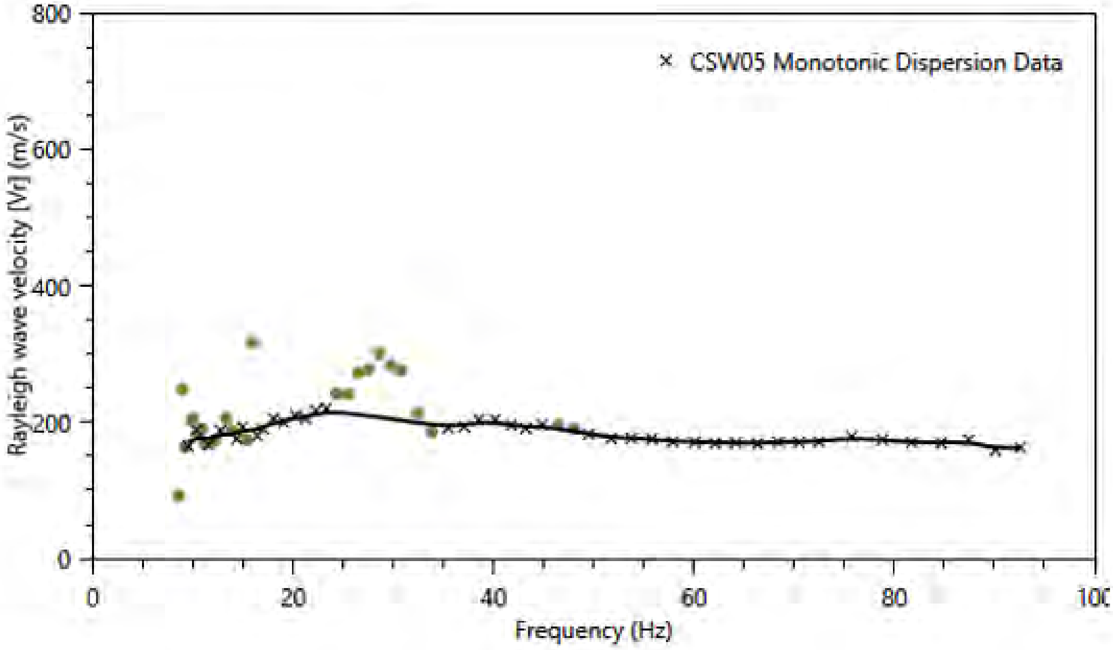
CSW04 Field dispersion curve



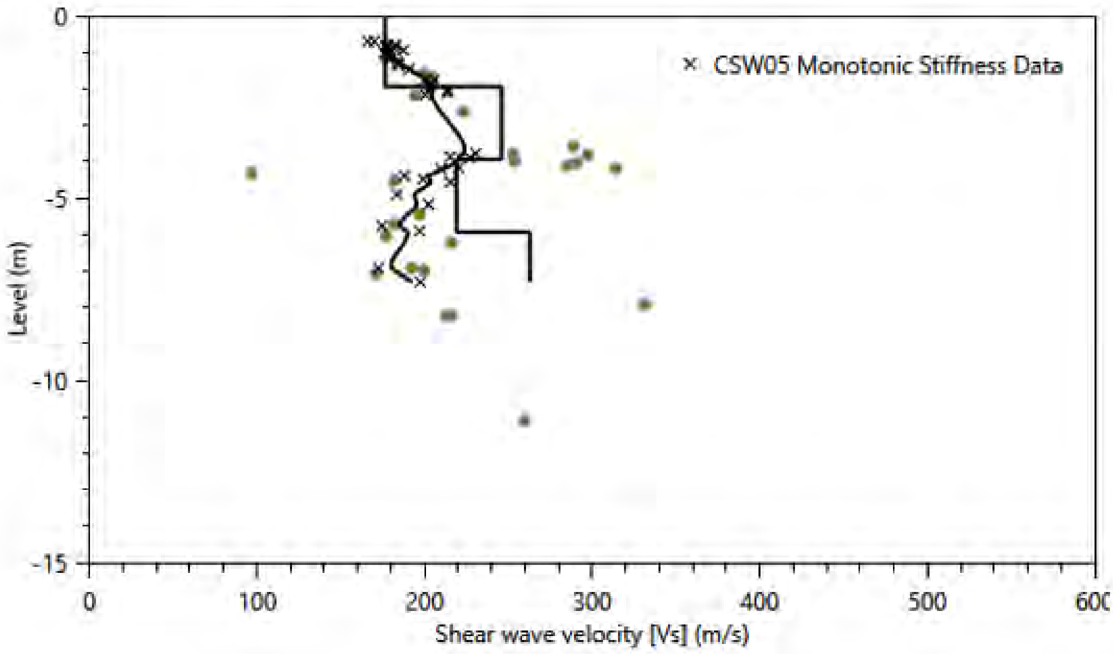
CSW04 Simple & advanced inversion



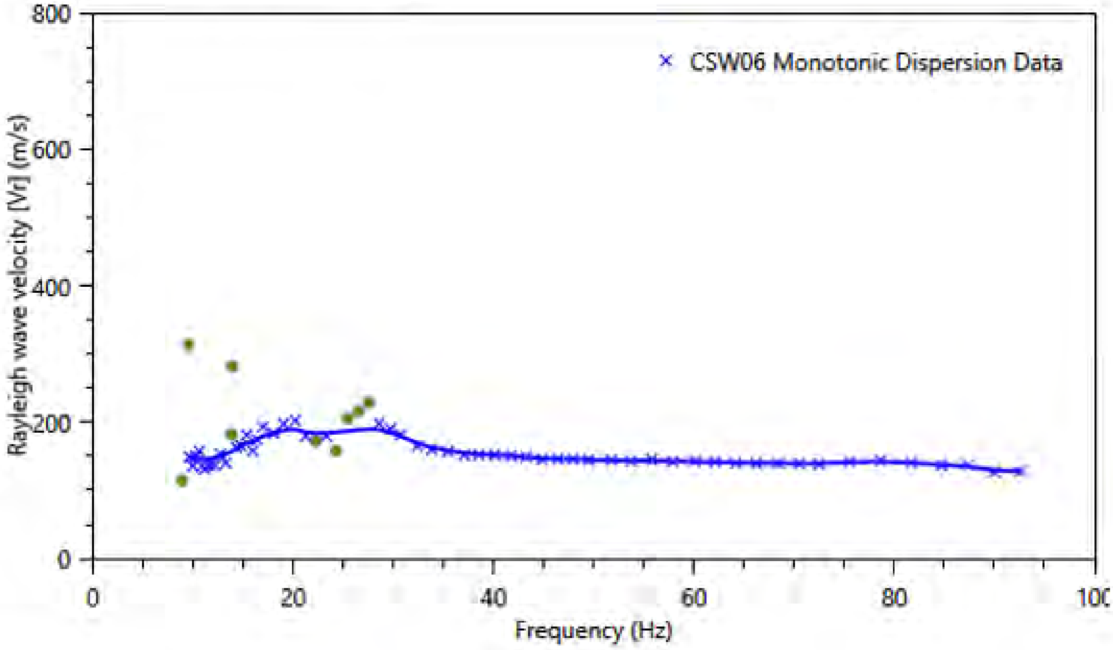
CSW05 Field dispersion curve



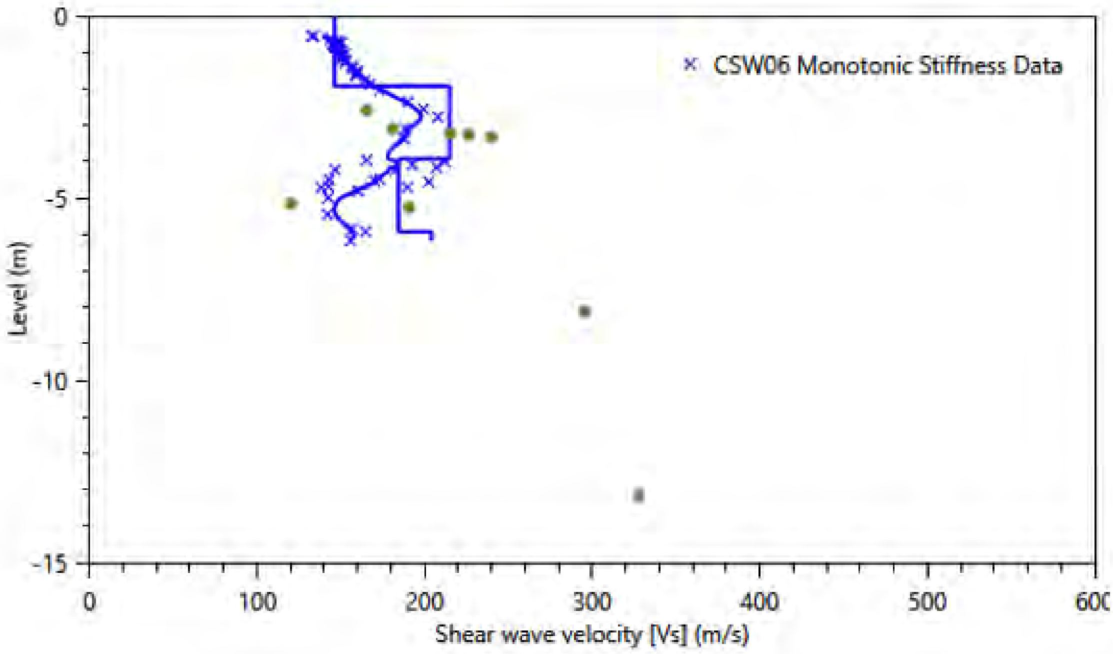
CSW05 Simple & advanced inversion



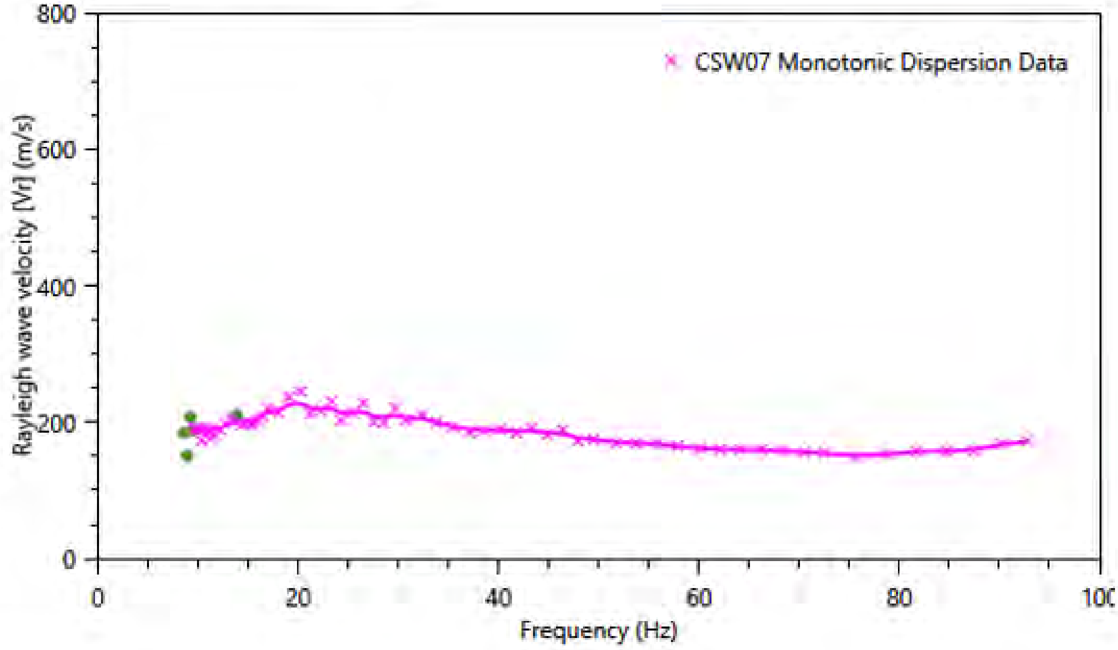
CSW06 Field dispersion curve



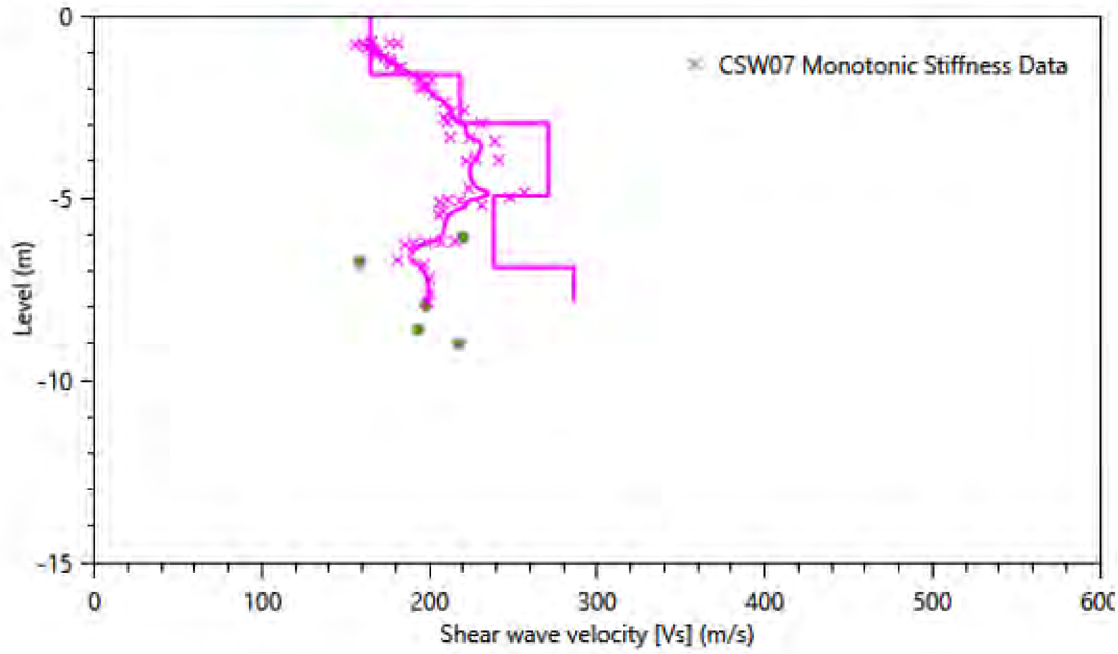
CSW06 Simple & advanced inversion



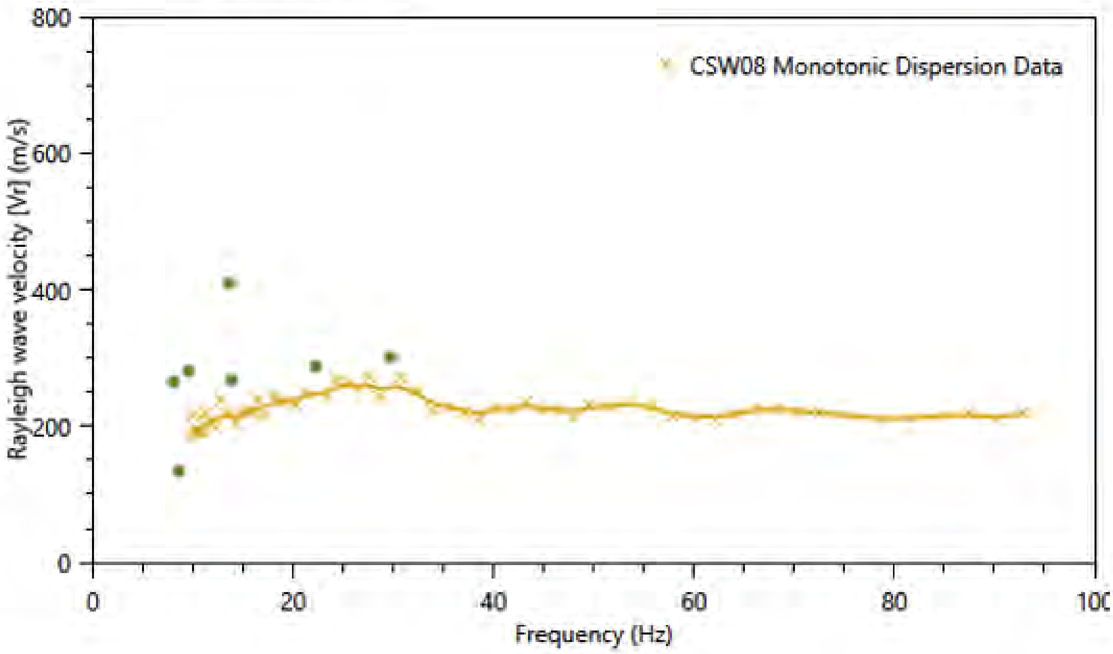
CSW07 Field dispersion curve



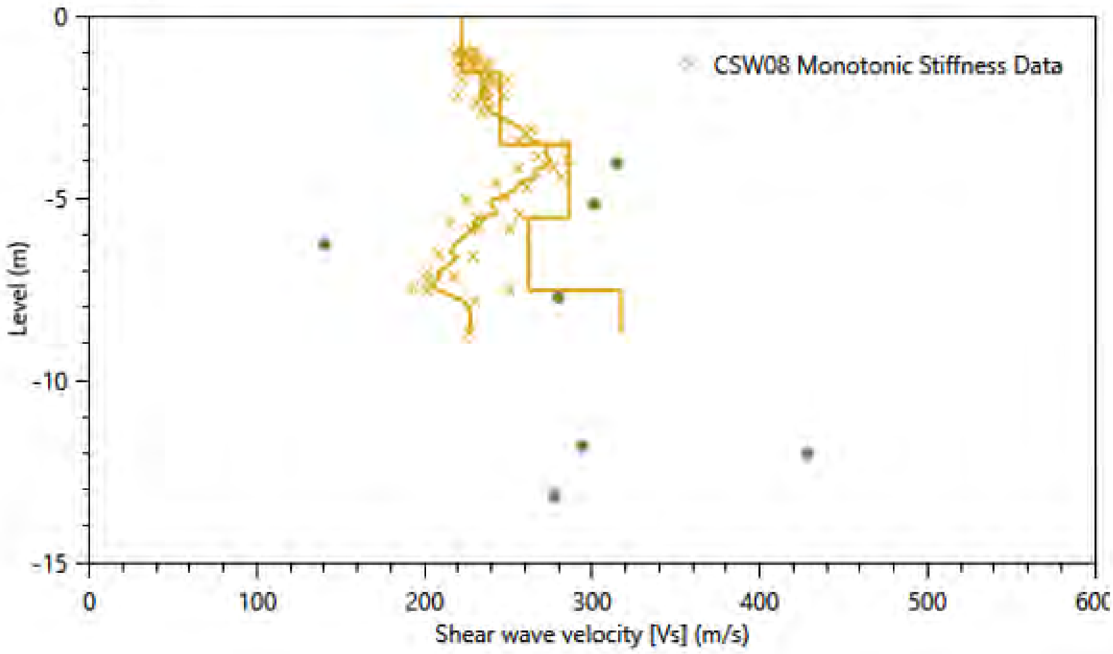
CSW07 Simple & advanced inversion



CSW08 Field dispersion curve



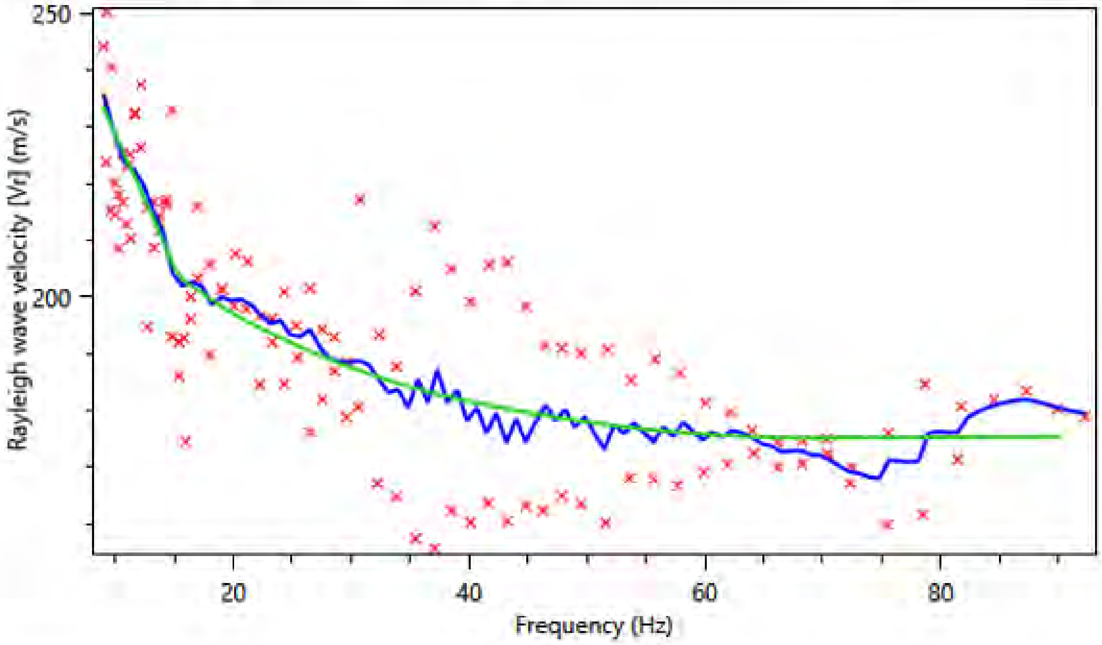
CSW08 Simple & advanced inversion



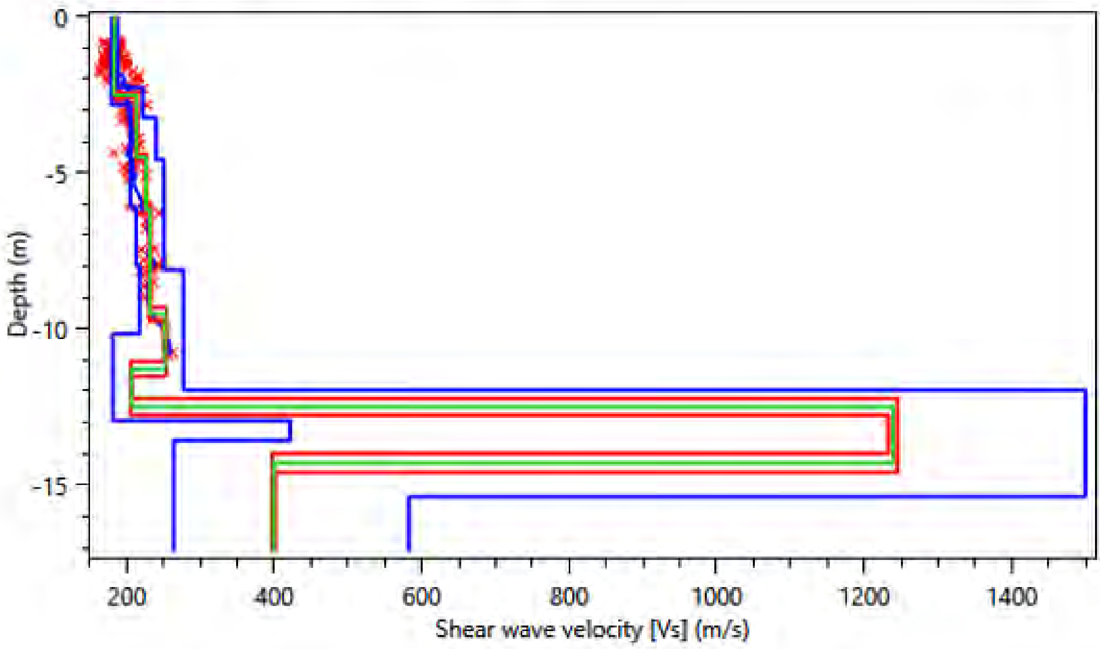
Appendix B: Synthetic dispersion curves & advanced inversion profiles

See Appendix D for key

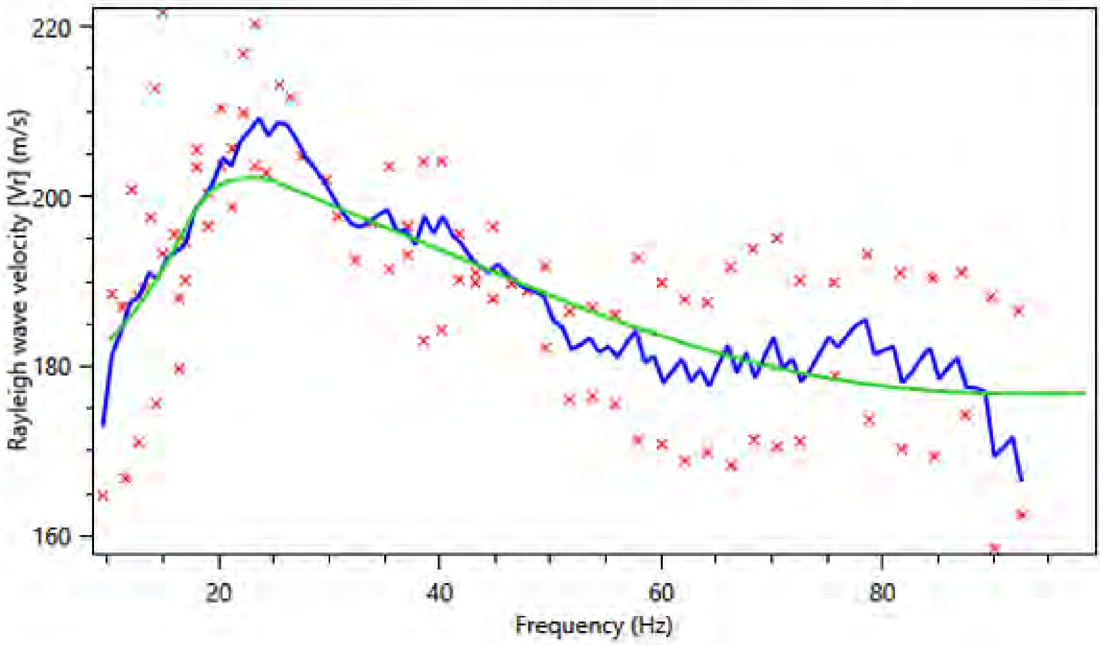
COMBINED01 SW Advanced inversion synthetic dispersion curve



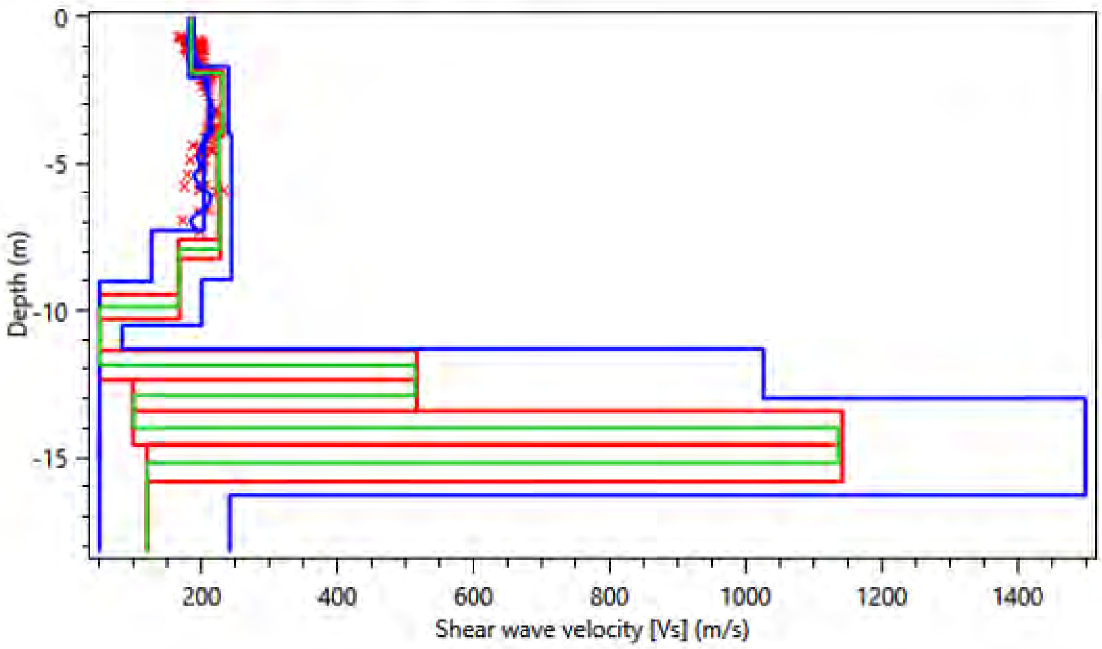
COMBINED01 SW Advanced inversion



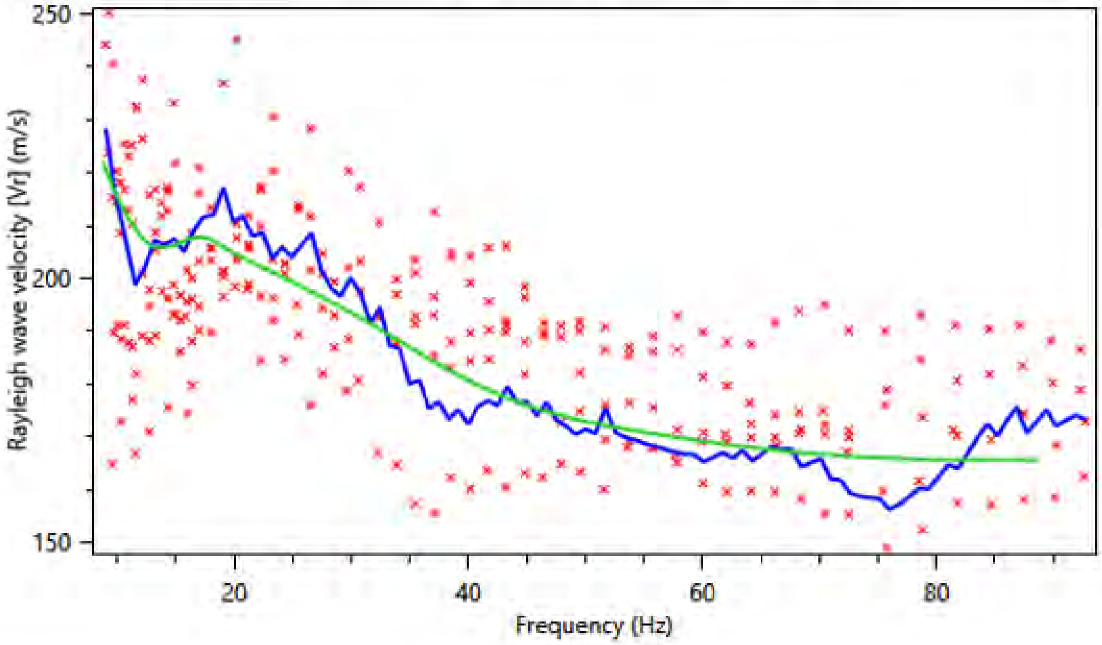
COMBINED02 SE Advanced inversion synthetic dispersion curve



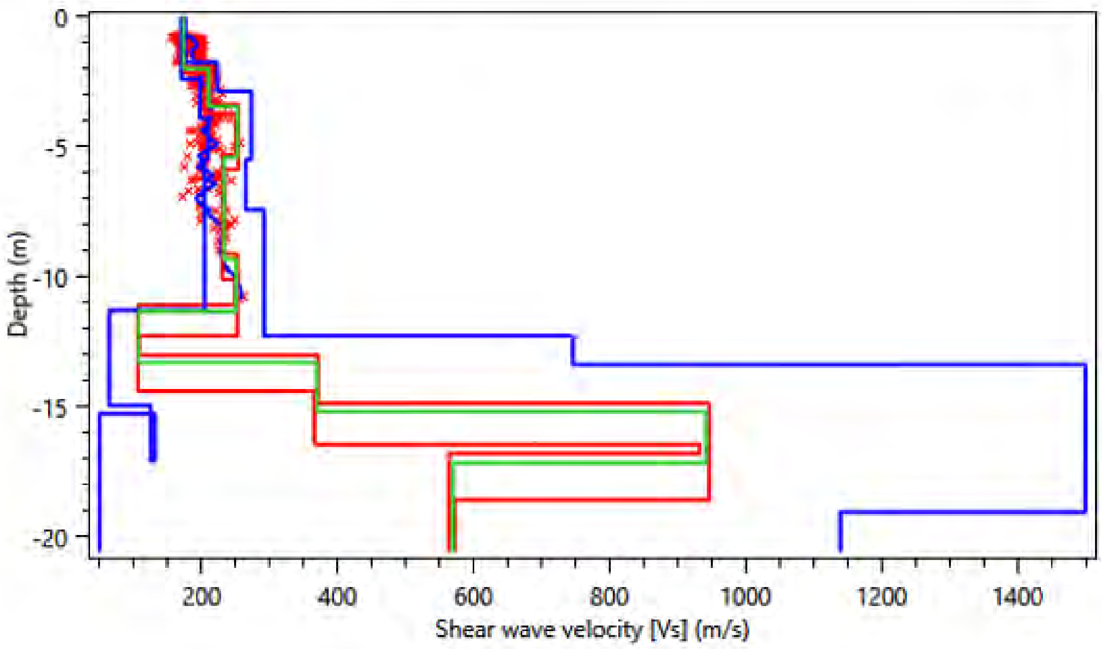
COMBINED02 SE Advanced inversion



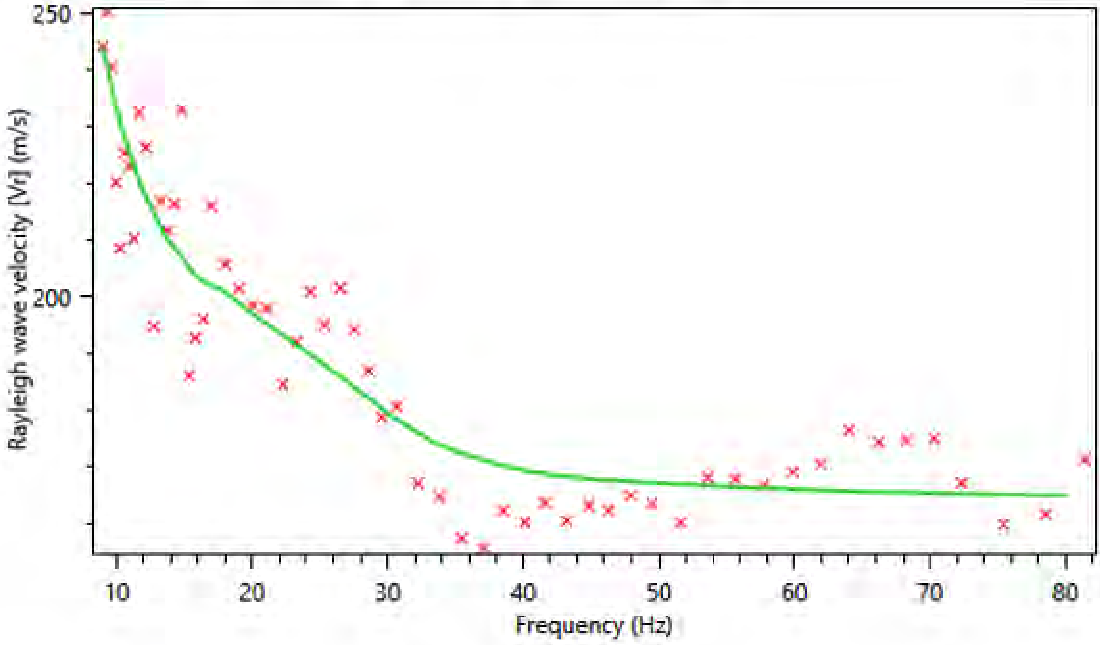
COMBINED03 Advanced inversion synthetic dispersion curve



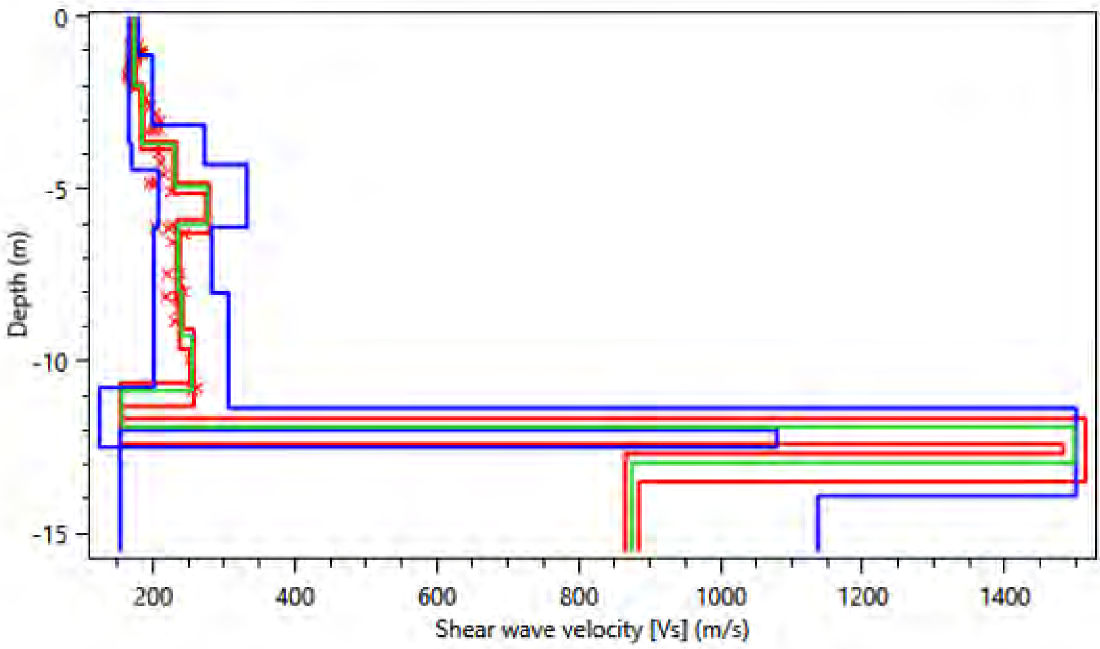
COMBINED03 Advanced inversion



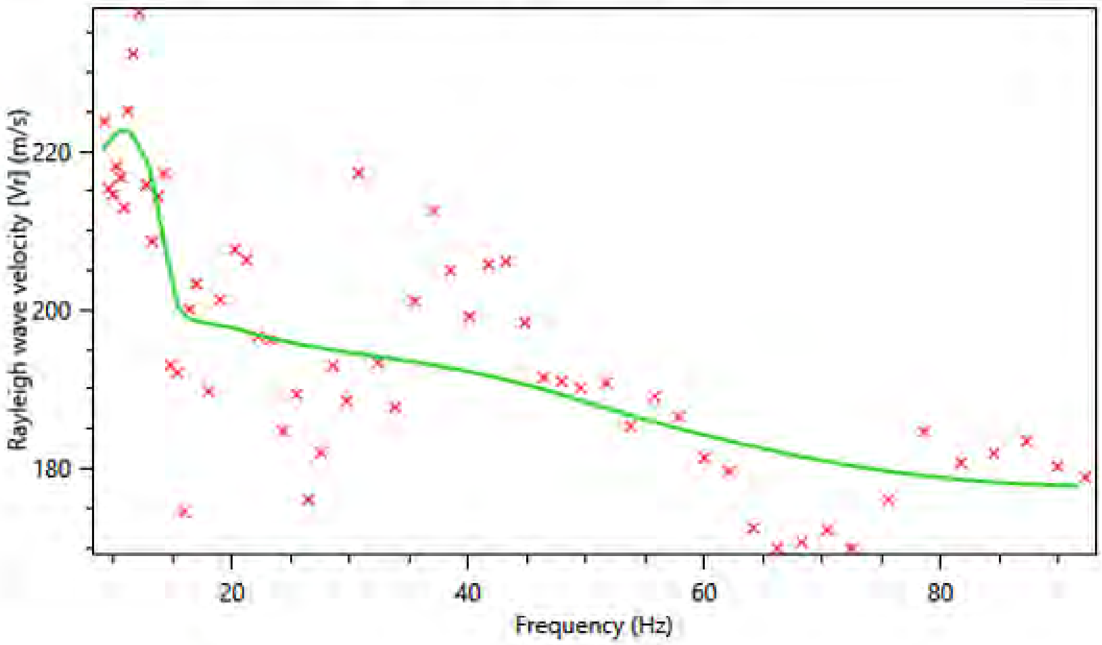
CSW01 Advanced inversion synthetic dispersion curve



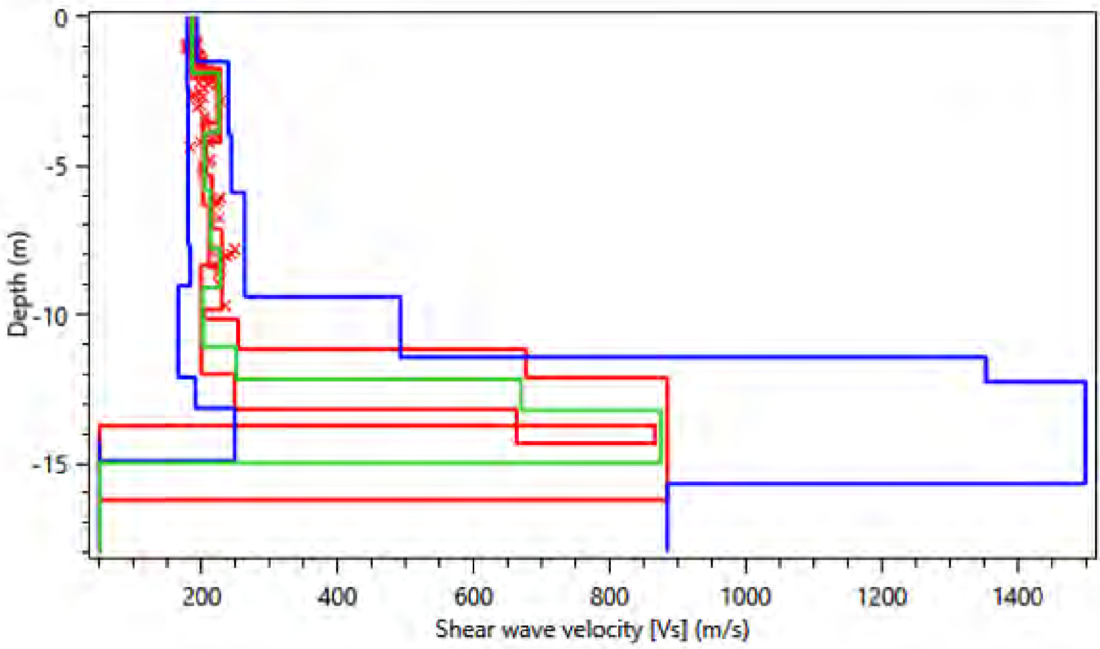
CSW01 Advanced inversion



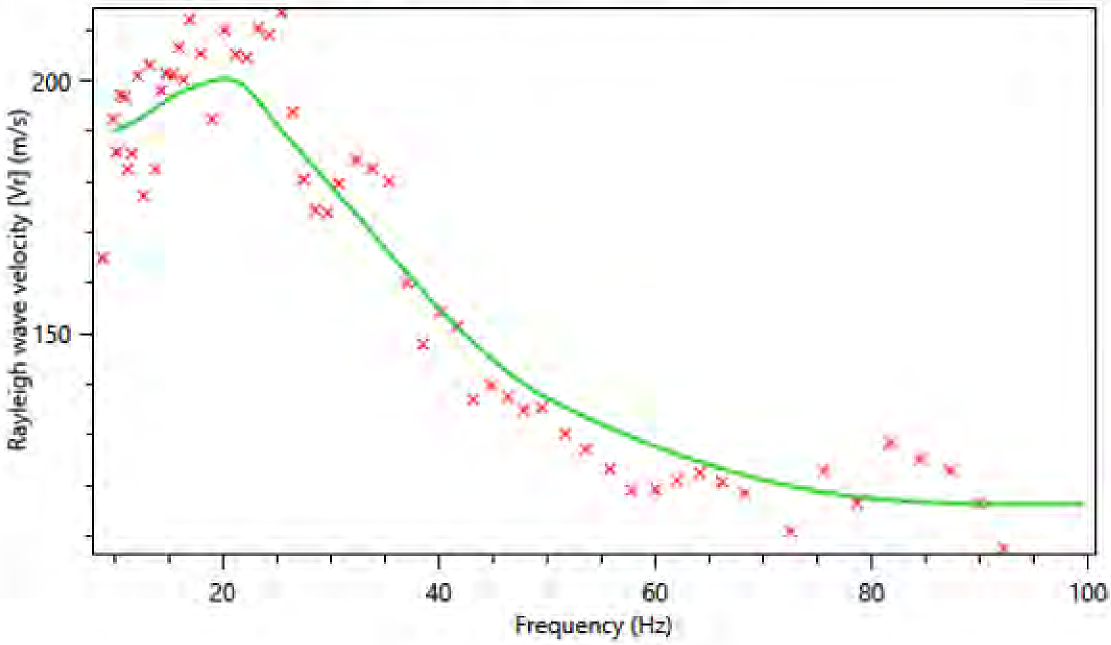
CSW02 Advanced inversion synthetic dispersion curve



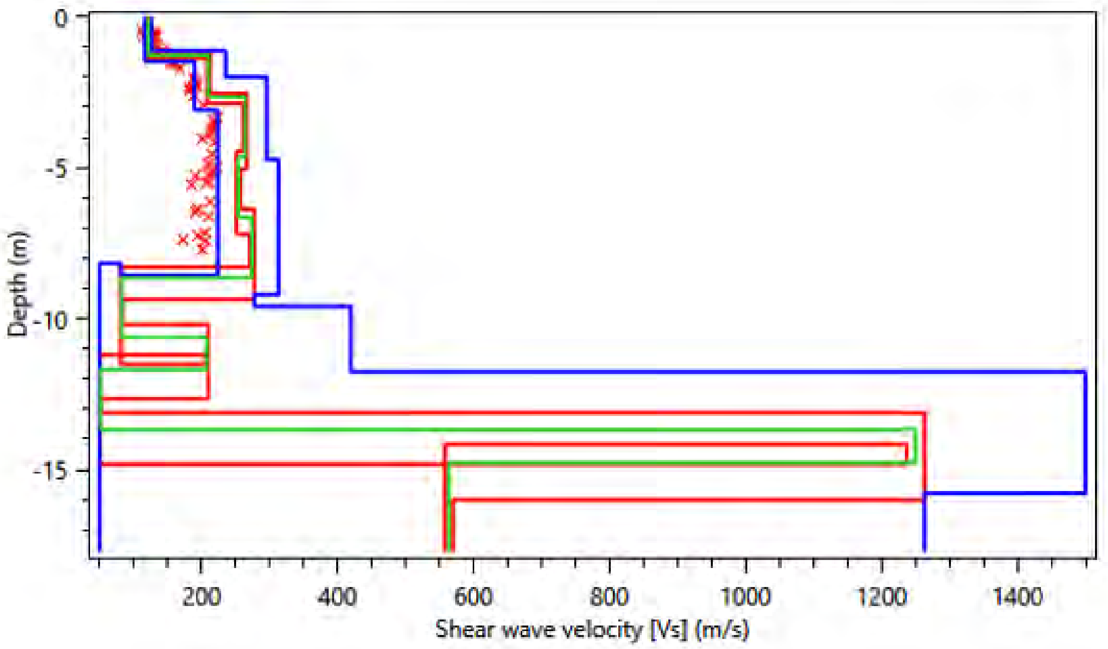
CSW02 Advanced inversion



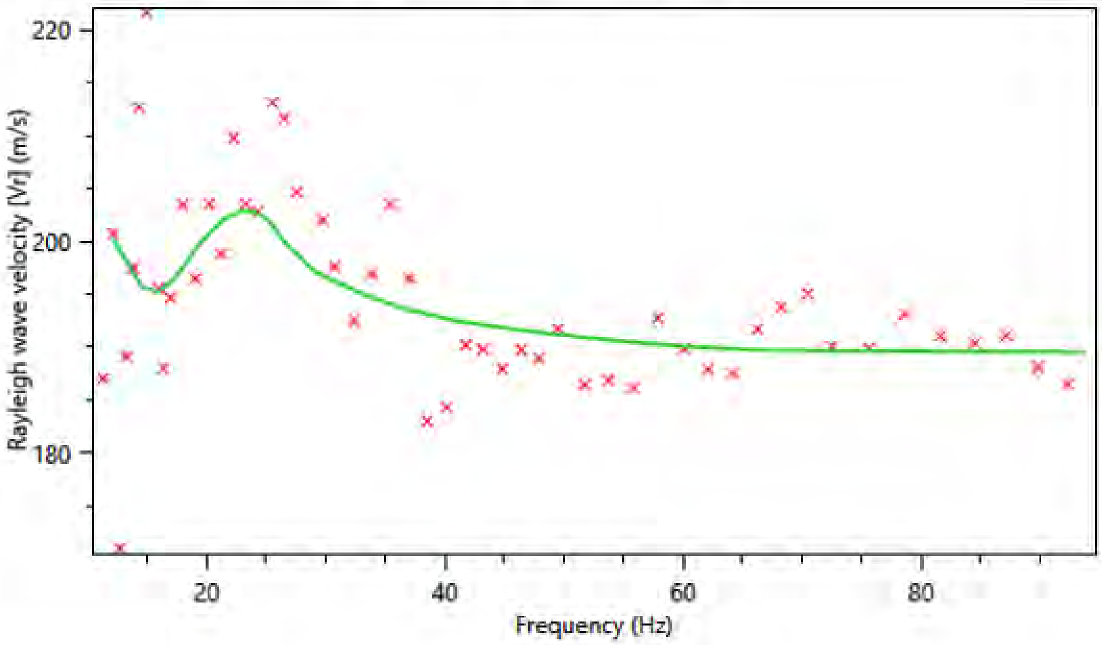
CSW03 Advanced inversion synthetic dispersion curve



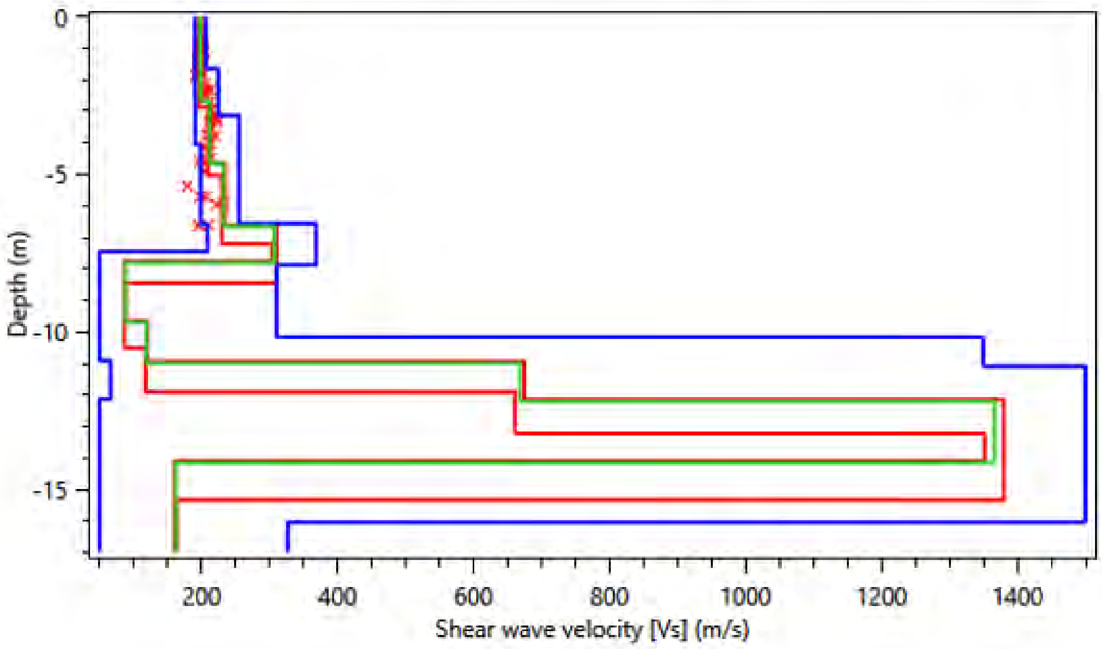
CSW03 Advanced inversion



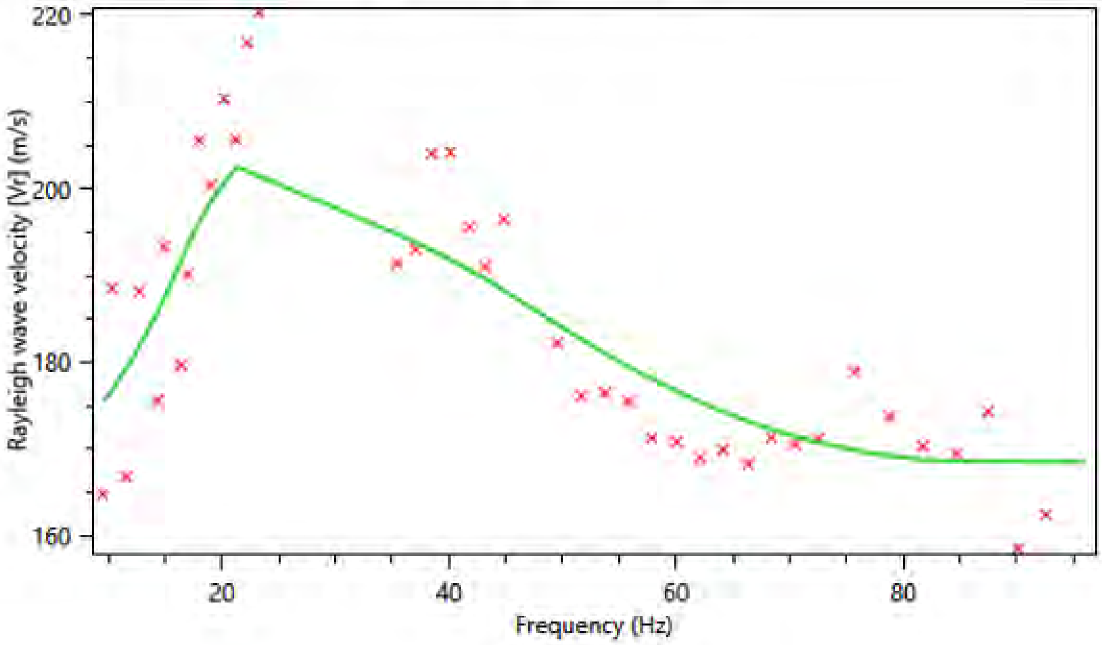
CSW04 Advanced inversion synthetic dispersion curve



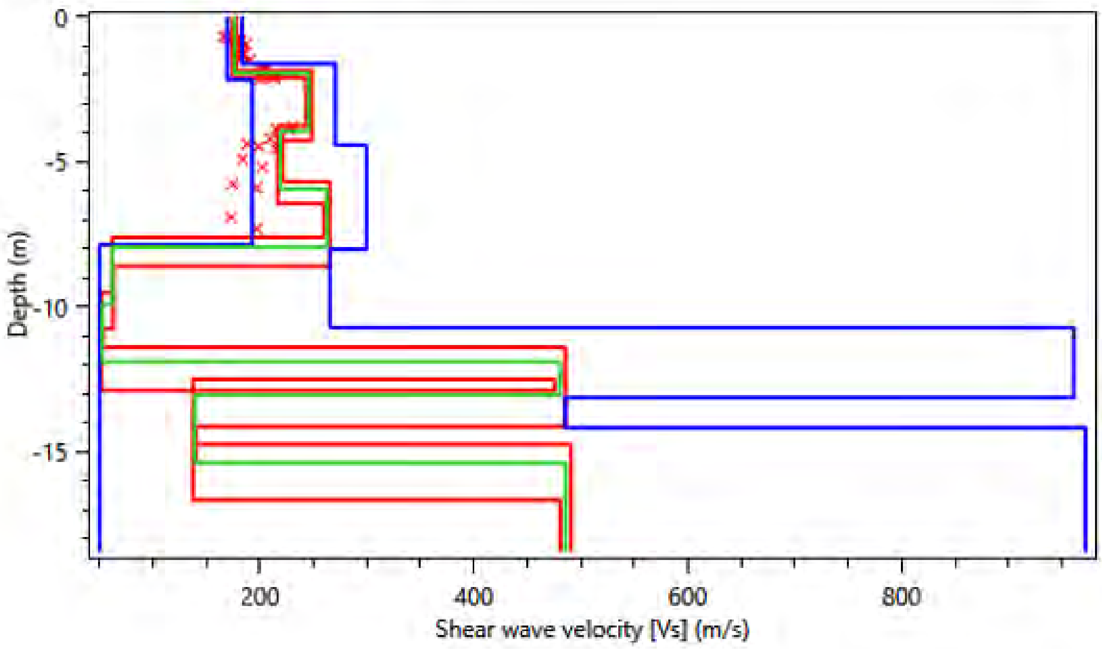
CSW04 Advanced inversion



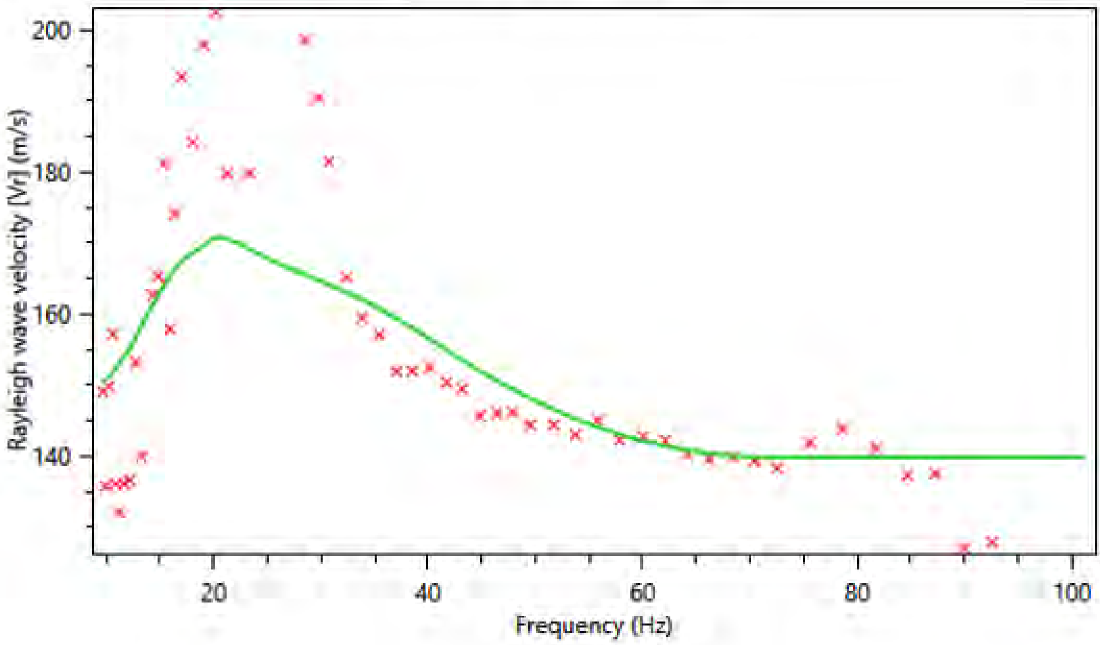
CSW05 Advanced inversion synthetic dispersion curve



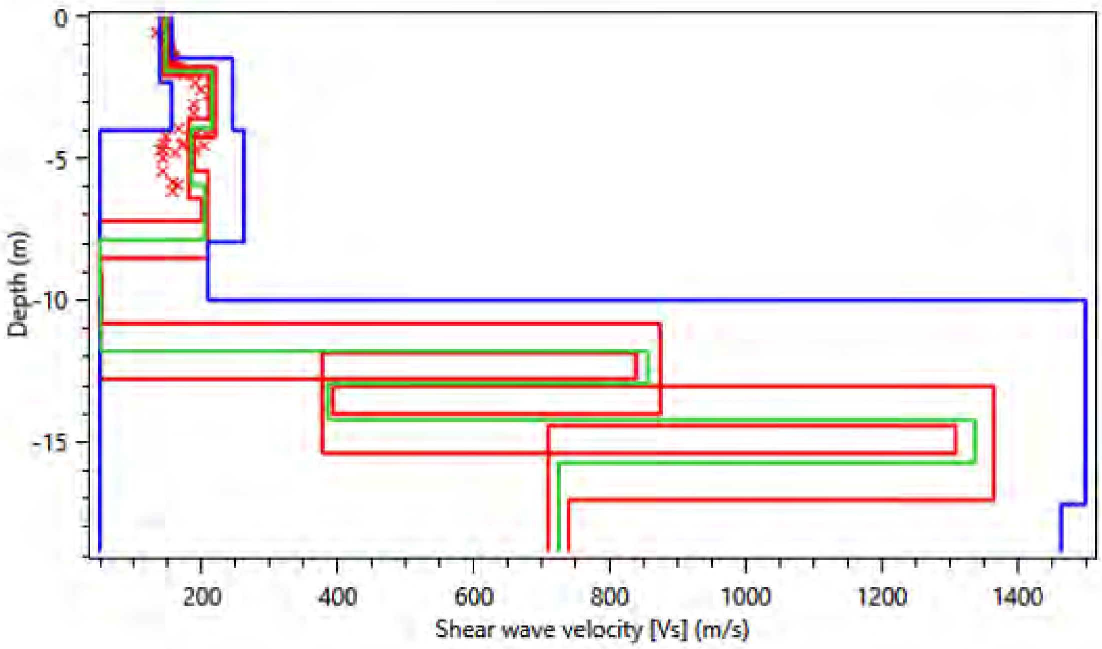
CSW05 Advanced inversion



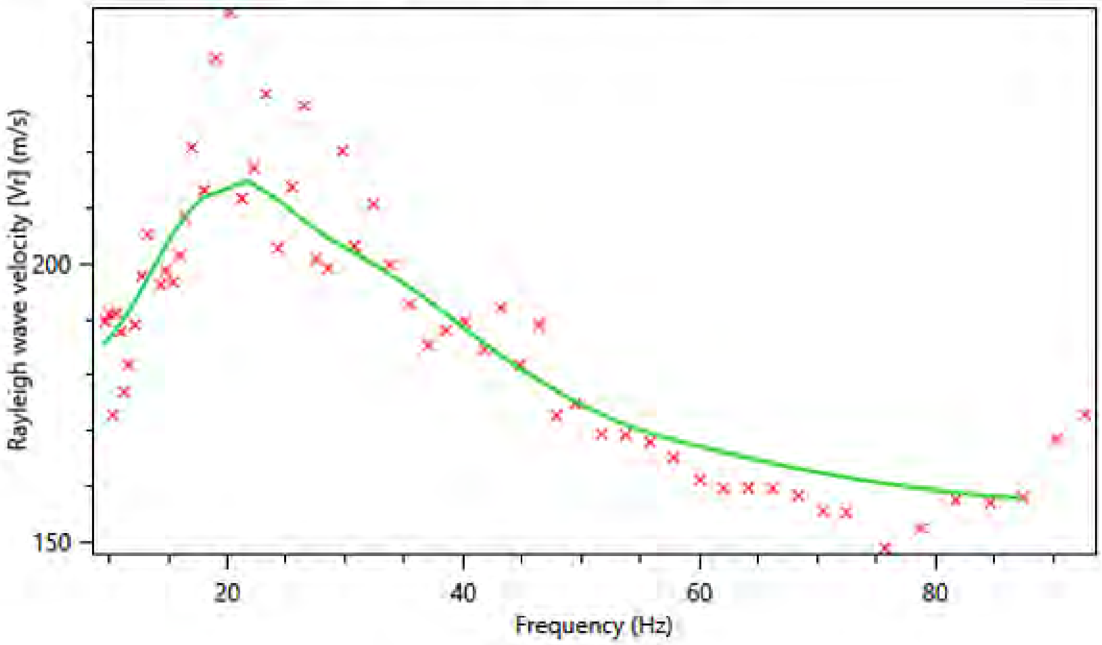
CSW06 Advanced inversion synthetic dispersion curve



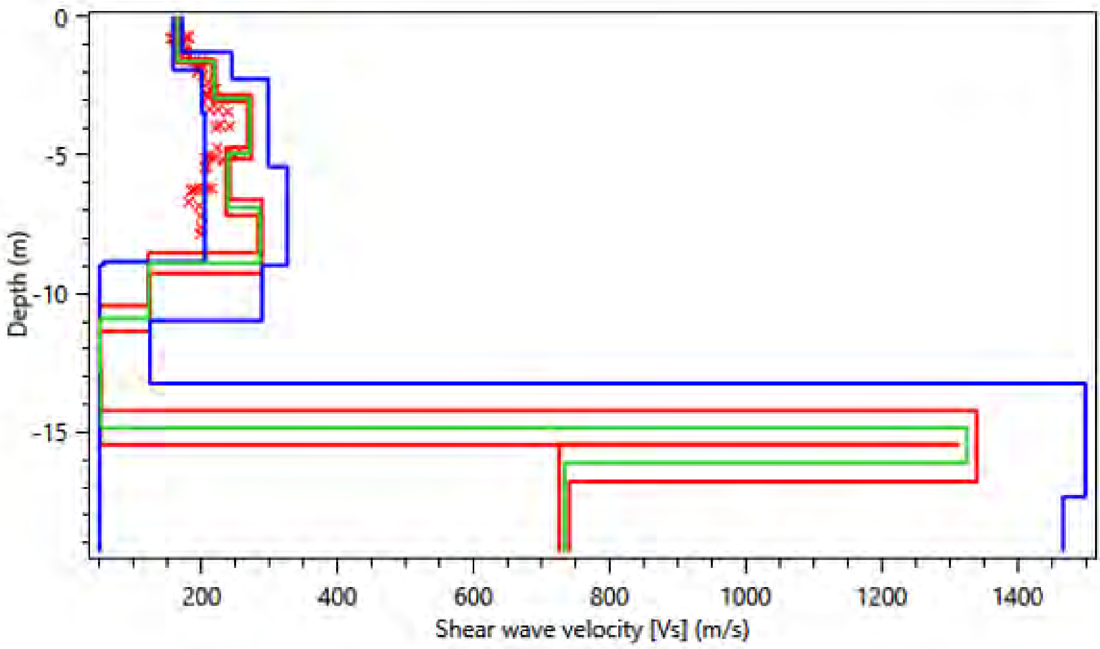
CSW06 Advanced inversion



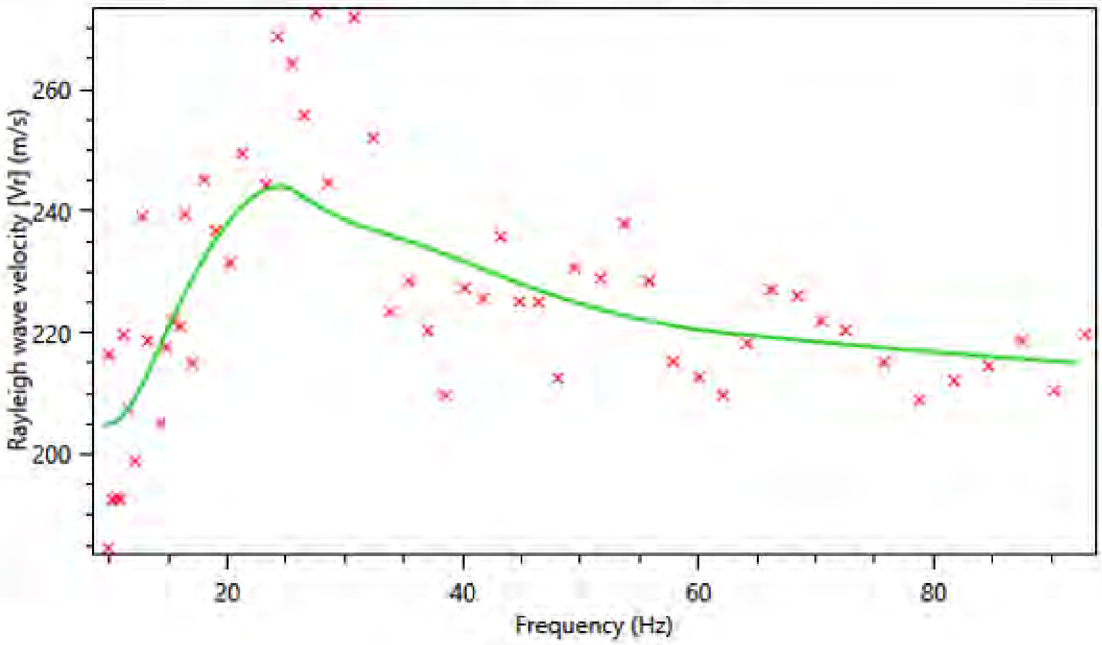
CSW07 Advanced inversion synthetic dispersion curve



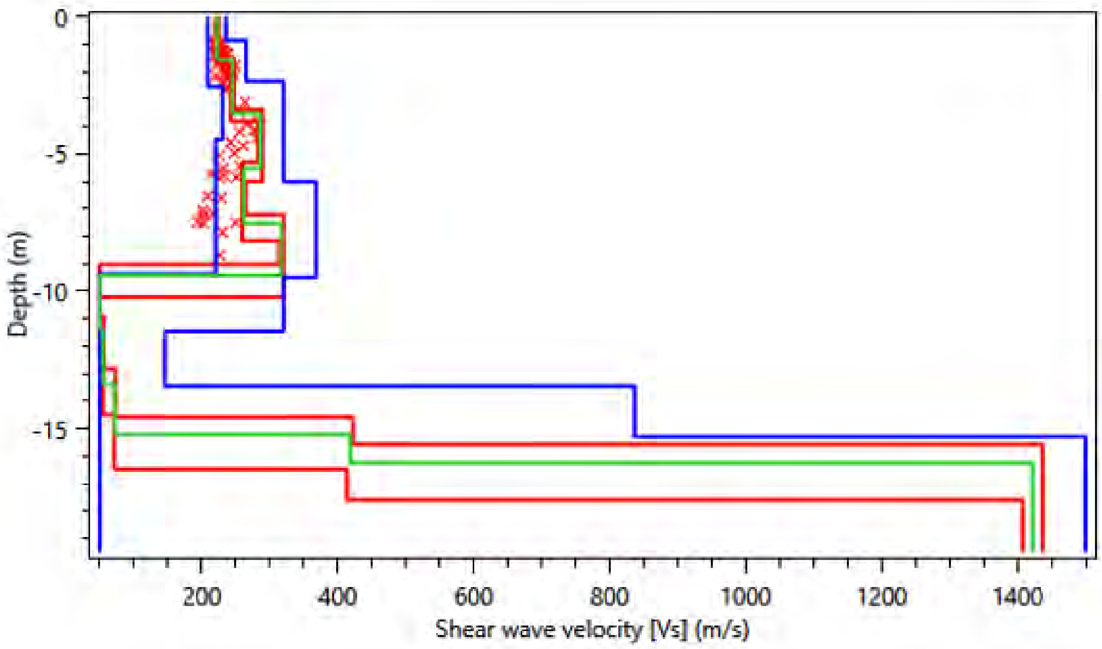
CSW07 Advanced inversion



CSW08 Advanced inversion synthetic dispersion curve



CSW08 Advanced inversion



Appendix C: Advanced inversion data

Project:	Mast Arms Narcoossee & Cyrils		**Report:**	GSS328
Shift:	4/6/2020		**Client:**	UES
Test:	COMBINED03		**Date:**	4/6/2020

Test notes: Design curve using combined data from tests CSW01, CSW02, CSW04, CSW05 and CSW07.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below.
See the GSS report ref GSS328 for conditions of use of data

Eastings

Northings ***Level (m)*** Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
569	7	0.0	112	503	0.26	1268.0	431.9
691	5	6.6	112	742	0.26	1870.5	637.1
831	6	11.3	112	1072	0.26	2702.7	920.5
764	6	17.8	112	907	0.26	2286.0	778.6
763	6	24.1	112	905	0.26	2280.5	776.7
825	7	30.6	112	1059	0.26	2667.5	908.5

Notes:

1 Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of γ=112 lb/ft^3 and ν=0.26 are assumed. *Refer to above GSS report conditions for further information.*

2 Density = $\rho = \gamma_t / g$ (where γ_t = unit weight in lb/ft^3)

3 Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs

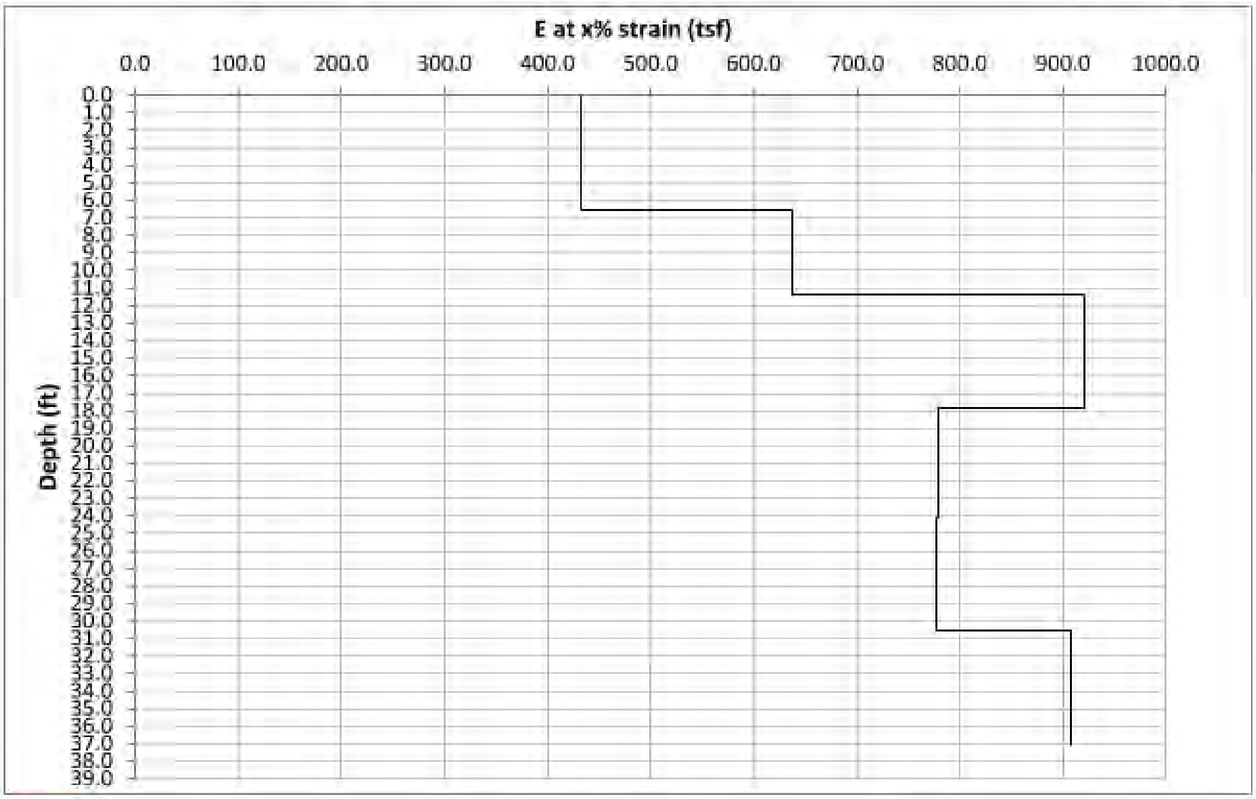
4 Shear modulus = $G = \rho v_s^2$

5 Youngs modulus = E=G.(2.(1+v))

6 Softened values of stiffness are calculated using Rollins equation:
where γ is shear strain

$$\frac{G}{G_o} = \frac{1}{\left[1+16\gamma\left(1.2+10^{-20\gamma}\right)\right]}$$

Rollins et al. (1998)



Project:	Mast Arms Narcoossee & Cyrils	**Report:**	GSS328
Shift:	4/6/2020	**Client:**	UES
Test:	COMBINED01 SW	**Date:**	4/6/2020

Test notes: Combined CSW01 and CSW02 at SW corner of intersection.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below.
See the GSS report ref GSS328 for conditions of use of data

Eastings

Northings

Level (m)

Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
603	3	0.0	112	566	0.26	1425.4	485.5
599	5	3.4	112	558	0.26	1405.9	478.8
700	7	8.2	112	762	0.26	1919.8	653.9
742	5	14.8	112	855	0.26	2155.8	734.3
760	6	20.3	112	897	0.26	2261.6	770.3
759	5	26.4	112	896	0.26	2256.8	768.7
826	6	31.2	112	1060	0.26	2671.7	910.0

Notes:

1 Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of Υ=112 lb/ft^3 and v=0.26 are assumed. *Refer to above GSS report conditions for further information.*

2 Density = $\rho = \Upsilon_t / g$ (where Υ_t = unit weight in lb/ft^3)

3 Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs

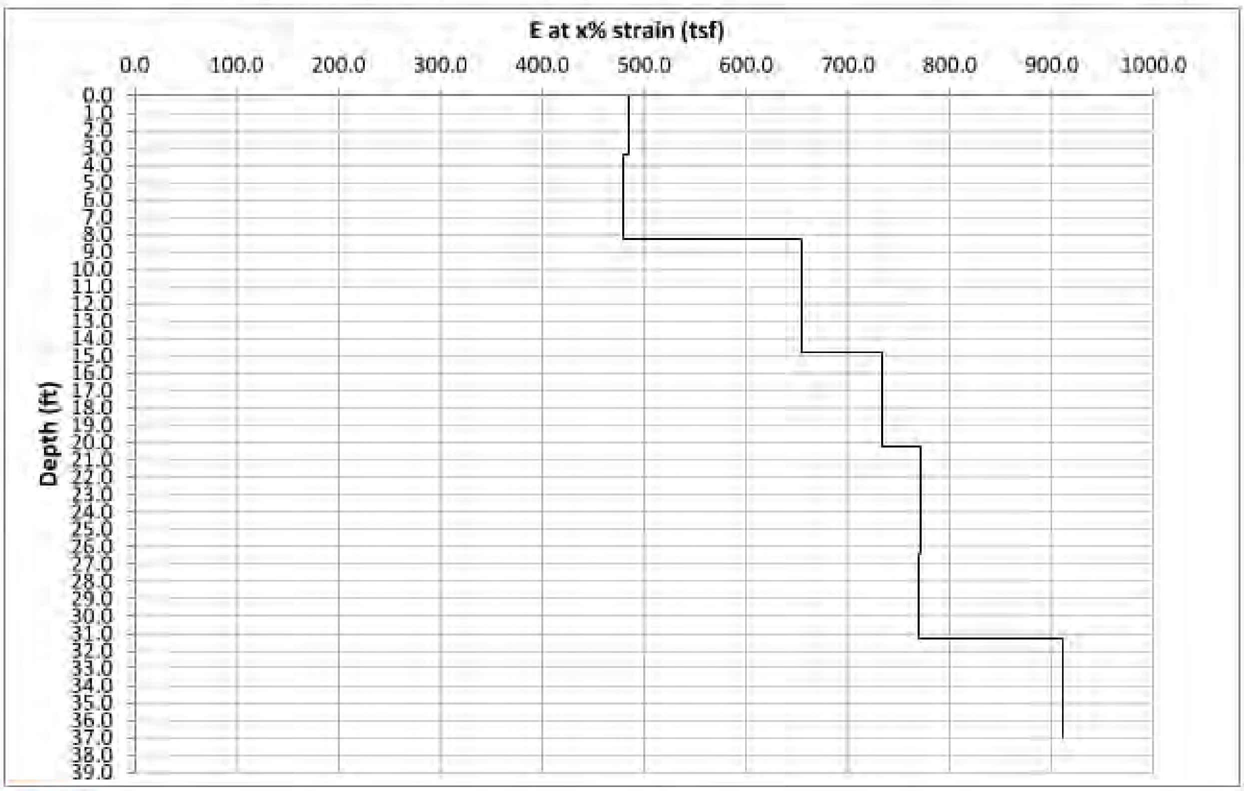
4 Shear modulus = G = $\rho.v_s^2$

5 Youngs modulus = E=G.(2.(1+v))

6 Softened values of stiffness are calculated using Rollins equation: where Υ is shear strain

$$\frac{G}{G_o} = \frac{1}{\left[1 + 16\gamma\left(1.2 + 10^{-20\gamma}\right)\right]}$$

Rollins et al. (1998)



	Project:	Mast Arms Narcoossee & Cyrils	**Report:**	GSS328
	Shift:	4/6/2020	**Client:**	UES
	Test:	COMBINED02 SE	**Date:**	4/6/2020

Test notes: Combined tests CSW04 and CSW05 at SE corner of intersection. CSW06 excluded due to poor model fit.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below
See the GSS report ref GSS328 for conditions of use of data

Eastings		
Northings		

Level (m)

Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
607	6	0.0	112	573	0.26	1444.4	492.0
755	7	6.3	112	886	0.26	2231.5	760.0
736	7	12.9	112	843	0.26	2123.6	723.3
742	7	19.4	112	856	0.26	2156.8	734.6

Notes:

1 Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of γ=112 lb/ft^3 and v=0.26 are assumed. *Refer to above GSS report conditions for further information.*

2 Density = $\rho = \gamma_t / g$ (where γ_t = unit weight in lb/ft^3)

3 Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs

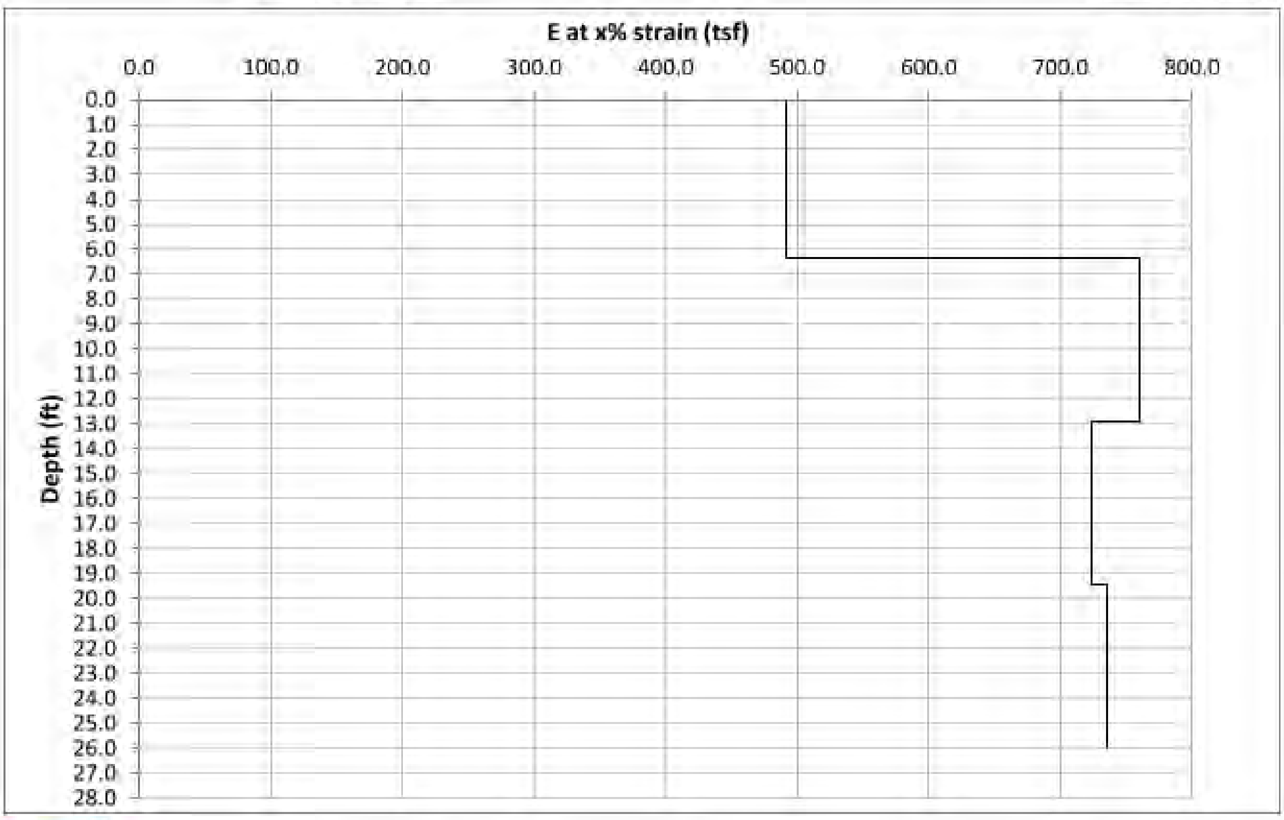
4 Shear modulus = $G = \rho . v_s^2$

5 Youngs modulus = $E = G.(2.(1+v))$

6 Softened values of stiffness are calculated using Rollins equation: where γ is shear strain

$$\frac{G}{G_o} = \frac{1}{\left[1 + 16\gamma\left(1.2 + 10^{-20\gamma}\right)\right]}$$

Rollins et al. (1998)



Project:	Mast Arms Narcoossee & Cyrils	Report:	GSS328
Shift:	4/6/2020	Client:	UES
Test:	CSW01	Date:	4/6/2020

Test notes: CSW01 at edge of sidewalk, SW corner of proposed intersection.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below.
See the GSS report ref GSS328 for conditions of use of data

Eastings		
Northings		

Level (m)

Strain level softened to: 0.1 %

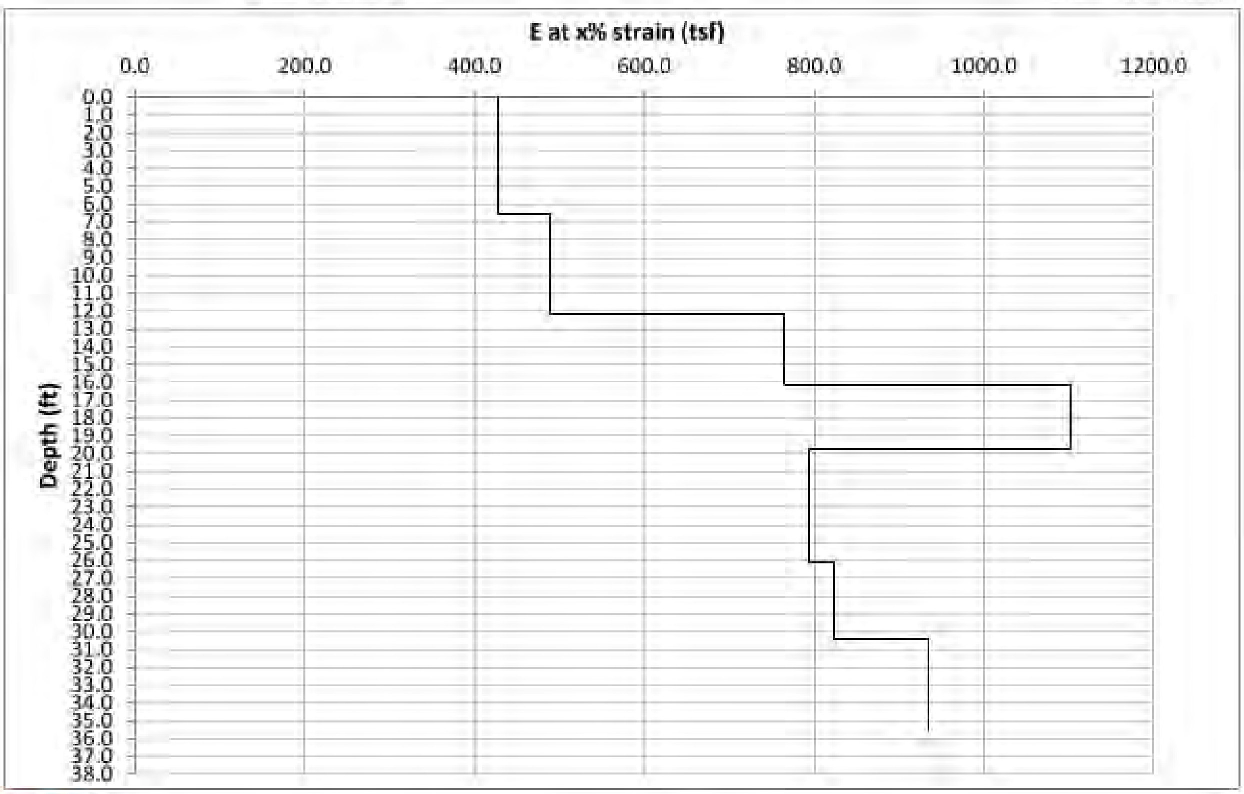
Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
567	7	0.0	112	499	0.26	1258.0	428.5
605	6	6.5	112	570	0.26	1435.4	488.9
757	4	12.1	112	890	0.26	2243.7	764.2
908	4	16.2	112	1283	0.26	3232.1	1100.8
771	6	19.8	112	925	0.26	2330.6	793.8
786	4	26.1	112	959	0.26	2417.8	823.5
837	5	30.4	112	1088	0.26	2740.9	933.6

Notes:

1. Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of Υ=112 lb/ft^3 and v=0.26 are assumed. *Refer to above GSS report conditions for further information.*
2. Density = $\rho = \Upsilon_t / g$ (where Υ_t = unit weight in lb/ft^3)
3. Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs
4. Shear modulus = G = $\rho . v_s^2$
5. Youngs modulus = E=G.(2.(1+v))
6. Softened values of stiffness are calculated using Rollins equation: where Υ is shear strain

$$\frac{G}{G_o} = \frac{1}{\left[1+16\gamma\left(1.2+10^{-20\gamma}\right)\right]}$$

Rollins et al. (1998)



Project:	Mast Arms Narcoossee & Cyrils	Report:	GSS328
Shift:	4/6/2020	Client:	UES
Test:	CSW02	Date:	4/6/2020

Test notes: CSW02 at same location as CSW01 but shaker & geophones flipped to allow data stacking. SW corner of proposed intersection, edge of sidewalk.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below.
See the GSS report ref GSS328 for conditions of use of data

Eastings

Northings

Level (m)

Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
611	6	0.0	112	579	0.26	1460.0	497.3
740	7	6.2	112	851	0.26	2143.8	730.2
671	6	12.8	112	700	0.26	1764.4	601.0
701	6	19.1	112	763	0.26	1921.7	654.5
745	4	25.5	112	864	0.26	2176.1	741.2
662	7	29.8	112	682	0.26	1717.8	585.1

Notes:

1 Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of Υ=112 lb/ft^3 and v=0.26 are assumed. *Refer to above GSS report conditions for further information.*

2 Density = $\rho = \Upsilon_t / g$ (where Υ_t = unit weight in lb/ft^3)

3 Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs

4 Shear modulus = G = $\rho.v_s^2$

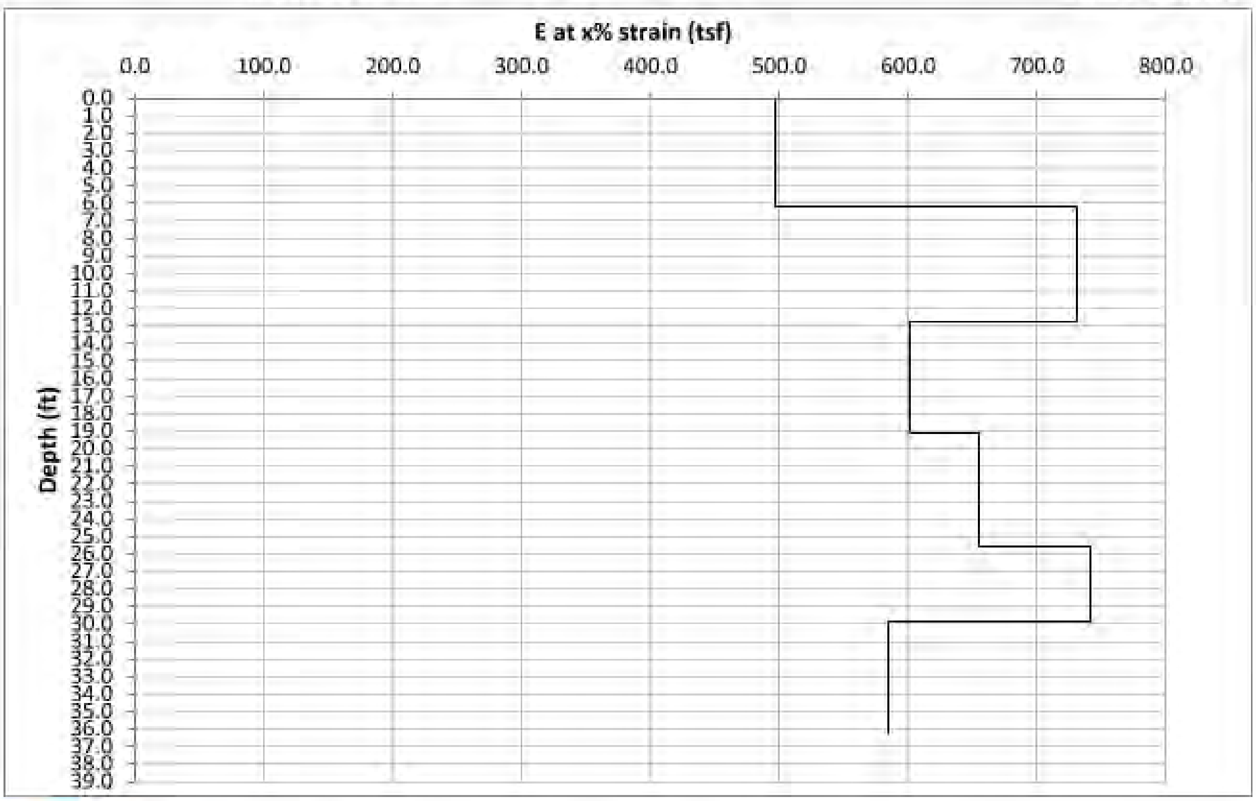
5 Youngs modulus = E=G.(2.(1+v))

6 Softened values of stiffness are calculated using Rollins equation:

where Υ is shear strain

$$\frac{G}{G_o} = \frac{1}{\left[1+16\gamma\left(1.2+10^{-20\gamma}\right)\right]}$$

Rollins et al. (1998)



Project:	Mast Arms Narcoossee & Cyrils	**Report:**	GSS328
Shift:	4/6/2020	**Client:**	UES
Test:	CSW03	**Date:**	4/6/2020

Test notes: NW Corner of intersection. Shaker at N end of north to south array, edge of sidewalk. Steep slope to west of array.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below.
See the GSS report ref GSS328 for conditions of use of data

Eastings

Northings ***Level (m)*** Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
400	4	0.0	112	248	0.26	625.3	213.0
691	5	4.2	112	742	0.26	1868.8	636.5
867	7	8.7	112	1169	0.26	2945.6	1003.3
835	7	15.3	112	1084	0.26	2731.3	930.3
901	7	21.8	112	1263	0.26	3181.6	1083.6

Notes:

1 Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of Υ=112 lb/ft^3 and v=0.26 are assumed. *Refer to above GSS report conditions for further information.*

2 Density = $\rho = \Upsilon_t / g$ (where Υ_t = unit weight in lb/ft^3)

3 Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs

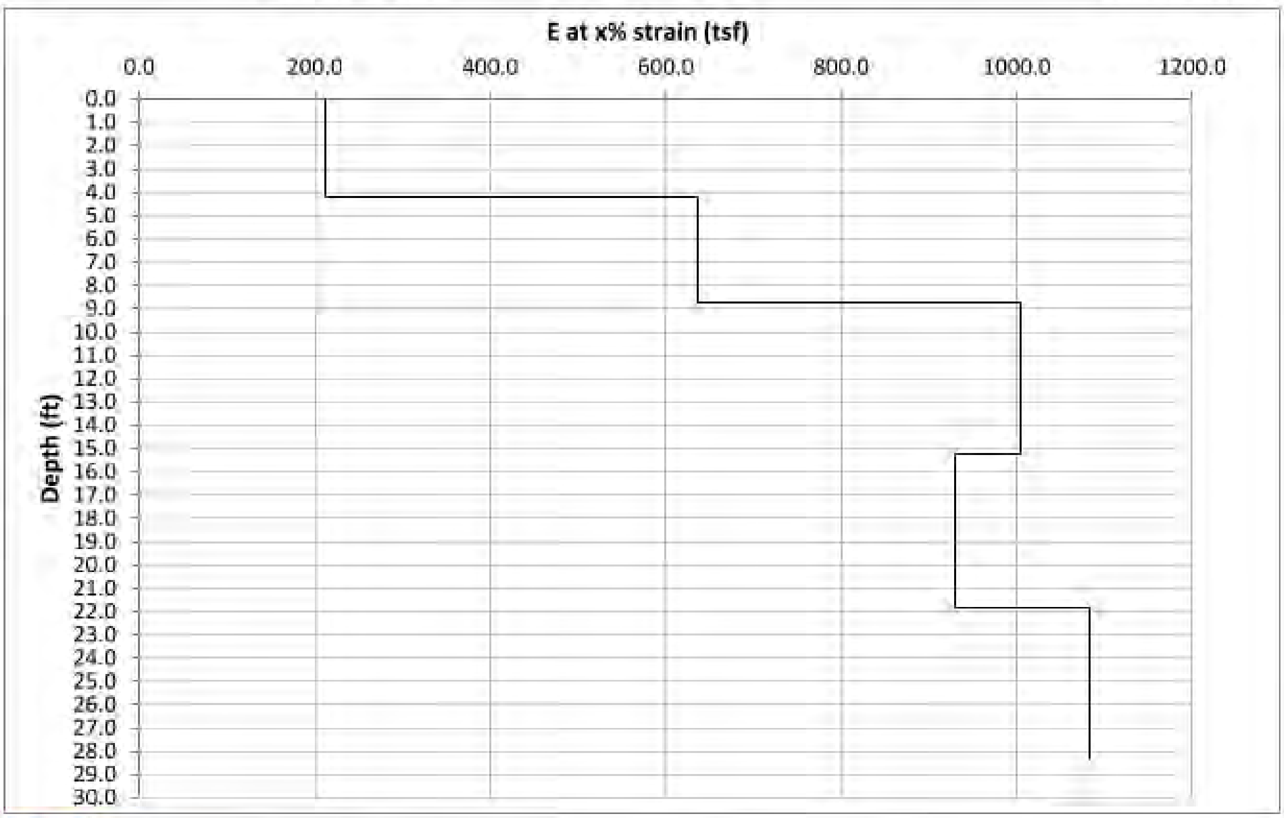
4 Shear modulus = $G = \rho . v_s^2$

5 Youngs modulus = $E = G.(2.(1+v))$

6 Softened values of stiffness are calculated using Rollins equation:
where Υ is shear strain

$$\frac{G}{G_o} = \frac{1}{\left[1 + 16\gamma\left(1.2 + 10^{-20\gamma}\right)\right]}$$

Rollins et al. (1998)



Project:	Mast Arms Narcoossee & Cyrils	Report:	GSS328
Shift:	4/6/2020	Client:	UES
Test:	CSW04	Date:	4/6/2020

Test notes: CSW04 was located on the SE corner of the intersection alongside the overhead power tower, close to tower foundation (assumed drilled shaft). Also underground gas, water (8-inch), cable and signalization utilities marked

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below
See the GSS report ref GSS328 for conditions of use of data

Eastings
Northings
Level (m)

Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
651	4	0.0	112	658	0.26	1658.6	564.9
653	5	4.1	112	663	0.26	1671.7	569.4
695	7	8.7	112	751	0.26	1891.5	644.2
762	7	15.3	112	901	0.26	2271.3	773.6

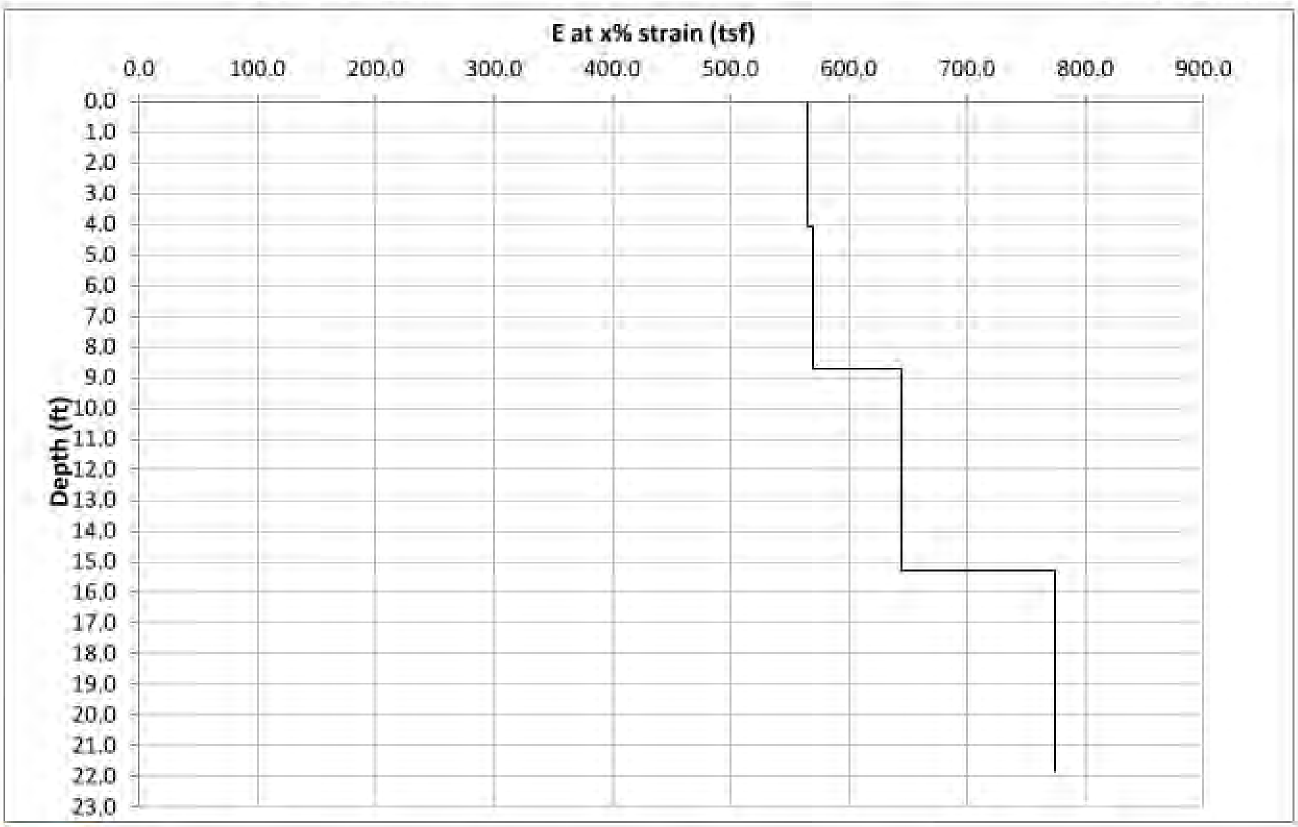
Notes:

1. Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of γ=112 lb/ft^3 and v=0.26 are assumed. *Refer to above GSS report conditions for further information.*
2. Density = $\rho = Y_t / g$ (where Y_t = unit weight in lb/ft^3)
3. Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs
4. Shear modulus = $G = \rho . v_s^2$
5. Youngs modulus = $E=G.(2.(1+v))$
6. Softened values of stiffness are calculated using Rollins equation:

$$\frac{G}{G_o} = \frac{1}{\left[1+16\gamma\left(1.2+10^{-20\gamma}\right)\right]}$$

where γ is shear strain

Rollins et al. (1998)



Project:	Mast Arms Narcoossee & Cyrils	**Report:**	GSS328
Shift:	4/6/2020	**Client:**	UES
Test:	CSW05	**Date:**	4/6/2020

Test notes: CSW05 at SE corner of intersection - moved away from power pole foundation. Shaker at south end of south to north array. Underground gas, water (8-inch), cable & signalization.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below
See the GSS report ref GSS328 for conditions of use of data

Eastings
Northings ***Level (m)*** Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
579	6	0.0	112	521	0.26	1312.5	447.0
807	7	6.4	112	1012	0.26	2549.5	868.4
719	7	12.9	112	803	0.26	2022.9	689.0
862	7	19.5	112	1155	0.26	2910.3	991.2

Notes:

1 Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of Υ=112 lb/ft^3 and v=0.26 are assumed. *Refer to above GSS report conditions for further information*

2 Density = $\rho = \Upsilon_1 / g$ (where Υ_1 = unit weight in lb/ft^3)

3 Stiffness is provided in units of short $tons/ft^2$ or tsf where 1 short ton = 2,000lbs

4 Shear modulus = $G = \rho . v_s^2$

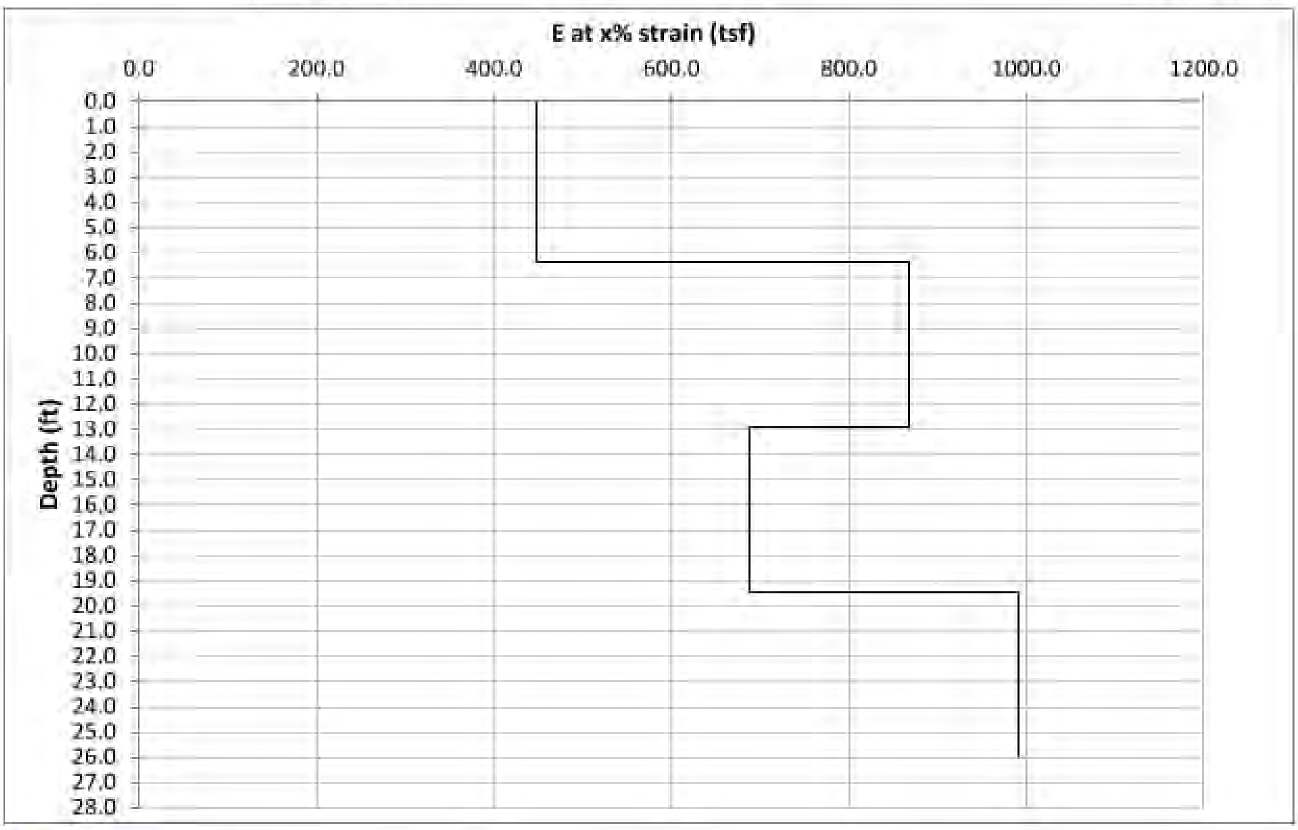
5 Youngs modulus = $E=G.(2.(1+v))$

6 Softened values of stiffness are calculated using Rollins equation:

$$\frac{G}{G_o} = \frac{1}{\left[1+16\gamma\left(1.2+10^{-20\gamma}\right)\right]}$$

where γ is shear strain

Rollins et al. (1998)



Project:	Mast Arms Narcoossee & Cyrils	Report:	GSS328
Shift:	4/6/2020	Client:	UES
Test:	CSW06	Date:	4/6/2020

Test notes: CSW06 at SE corner, shaker at east end of east to west array. Shaker adjacent to power pole foundation. Undergroun gas, water (8-inch), cable & signalization.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below.
See the GSS report ref GSS328 for conditions of use of data

Eastings
Northings
Level (m)

Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
480	6	0.0	112	359	0.26	903.7	307.8
705	7	6.3	112	772	0.26	1946.5	663.0
605	7	12.9	112	569	0.26	1434.0	488.4
670	6	19.4	112	698	0.26	1759.8	599.4

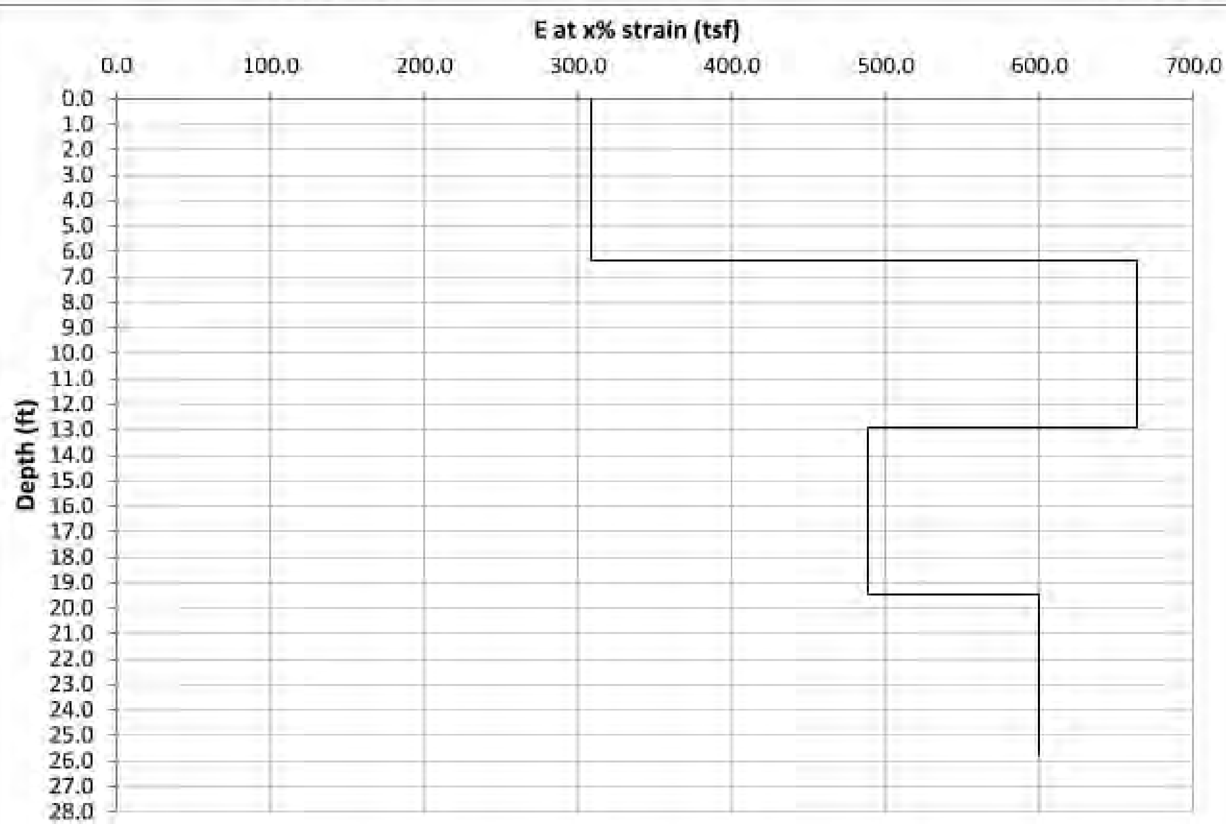
Notes:

1. Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of Υ=112 lb/ft^3 and v=0.26 are assumed. *Refer to above GSS report conditions for further information.*
2. Density = $\rho = \Upsilon_t / g$ (where Υ_t = unit weight in lb/ft^3)
3. Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs
4. Shear modulus = G = $\rho . v_s^2$
5. Youngs modulus = E=G.(2.(1+v))
6. Softened values of stiffness are calculated using Rollins equation:

$$\frac{G}{G_o} = \frac{1}{\left[1+16\gamma\left(1.2+10^{20\gamma}\right)\right]}$$

where Υ is shear strain

Rollins et al. (1998)



Project:	Mast Arms Narcoossee & Cyrils	Report:	GSS328
Shift:	4/6/2020	Client:	UES
Test:	CSW07	Date:	4/6/2020

Test notes: CSW07 at NE mast arm location at bottom of 2-foot bank, adjacent to fence line on right-of-way. Shaker at north end of N-S array.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below
See the GSS report ref GSS328 for conditions of use of data

Eastings | |
Northings | |

Level (m) | Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
540	5	0.0	112	453	0.26	1142.2	389.0
716	4	5.3	112	797	0.26	2008.7	684.2
889	7	9.7	112	1227	0.26	3092.1	1053.2
783	6	16.2	112	952	0.26	2398.8	817.0
938	7	22.6	112	1369	0.26	3448.8	1174.7

Notes:

1 Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of Y=112 lb/ft^2 and v=0.26 are assumed. *Refer to above GSS report conditions for further information.*

2 Density = $\rho = \Upsilon_t / g$ (where Υ_t = unit weight in lb/ft^3)

3 Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs

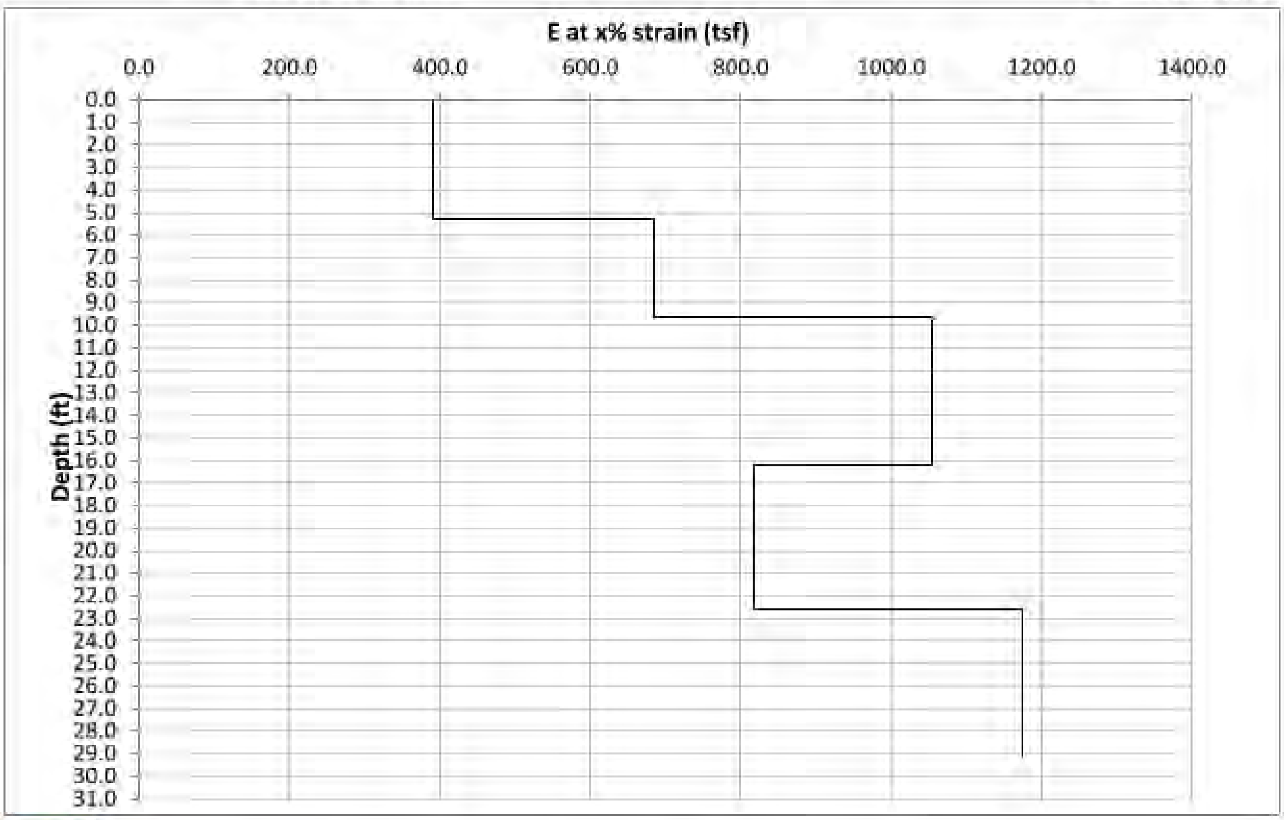
4 Shear modulus = $G = \rho . v_s^2$

5 Youngs modulus = $E = G.(2.(1+v))$

6 Softened values of stiffness are calculated using Rollins equation:
where Υ is shear strain

$$\frac{G}{G_o} = \frac{1}{\left[1+16\gamma\left(1.2+10^{-20\gamma}\right)\right]}$$

Rollins et al. (1998)



Project:	Mast Arms Narcoossee & Cyrils	Report:	GSS328
Shift:	4/6/2020	Client:	UES
Test:	CSW08	Date:	4/6/2020

Test notes: CSW08 also at NE of intersection mast arm but at edge of sidewalk. Shaker at north end of north to south array.

Default values of density and Poisson's Ratio in the highlighted columns may be adjusted to known values
Strain level of softened value of Young's Modulus using the Rollins equation can be adjusted in the cell below.
See the GSS report ref GSS328 for conditions of use of data

Eastings
Northings
Level (m)

Strain level softened to: 0.1 %

Vs (ft/s)	Thickness (ft)	Depth (ft)	Unit weight (lb/ft^3)	Go (tsf)	v	Eo (tsf)	E at x% strain (tsf)
729	5	0.0	112	826	0.26	2080.4	708.6
805	6	5.1	112	1007	0.26	2537.0	864.1
938	7	11.6	112	1369	0.26	3448.9	1174.7
860	7	18.1	112	1151	0.26	2899.4	987.5
1041	6	24.7	112	1684	0.26	4242.7	1445.1

Notes:

1 Vs values have been determined from advanced inversion of field dispersion data. Vs values derived by inversion rely on assumptions of soil density and Poisson's Ratio. Where no project specific data is provided then default values of Υ=112 lb/ft^3 and v=0.26 are assumed. *Refer to above GSS report conditions for further information.*

2 Density = $\rho = \Upsilon_t / g$ (where Υ_t = unit weight in lb/ft^3)

3 Stiffness is provided in units of short tons/ft^2 or tsf where 1 short ton = 2,000lbs

4 Shear modulus = G = $\rho . v_s^2$

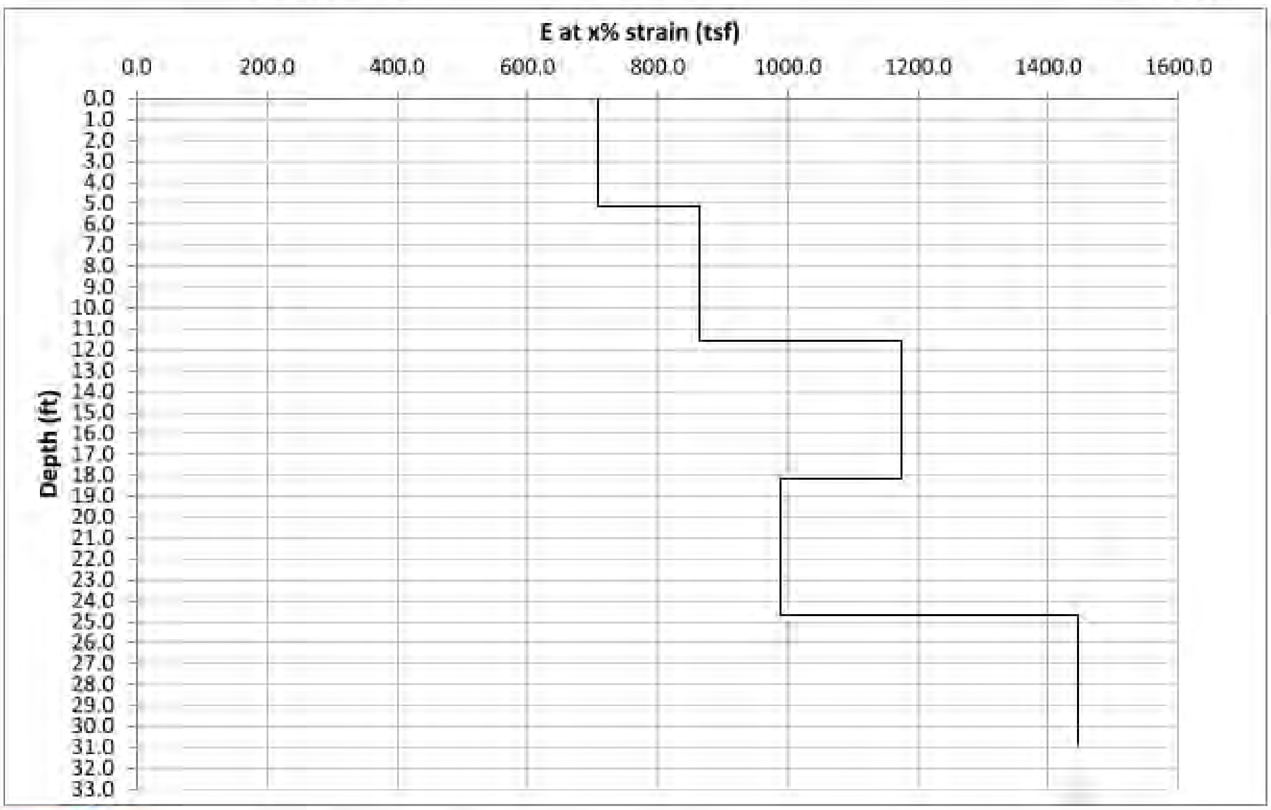
5 Youngs modulus = E=G.(2.(1+v))

6 Softened values of stiffness are calculated using Rollins equation:

$$\frac{G}{G_o} = \frac{1}{\left[1+16\gamma\left(1.2+10^{-20\gamma}\right)\right]}$$

where Υ is shear strain

Rollins et al. (1998)



Ground Stiffness Surveys

INTERPRETATION OF SHEAR WAVE VELOCITY VALUES

Ground Stiffness Surveys

SITE CLASSIFICATION USING V_s

V_s (m/s) for upper 30m of geologic profile	ASCE 7-10 seismic site class	ASCE 7-10 description
>1524	A	Hard Rock
762 - 1524	B	Rock
366 - 760	C	Very Dense Soil and Soft Rock
365 - 183	D	Stiff Soil
<183	E	Soft Clay Soil

From ASCE 7-10 Table 20.2-1 seismic site classification using V_{s30} Shear Wave Velocity

V_s RELATIONSHIP WITH UNDRAINED SHEAR STRENGTH

Dickenson, 1994 $V_s = 23 S_u^{0.475}$

See PEER Report 2012/08 (2012) Guidelines for Estimation of Shear Wave Velocity Profiles

Vs (m/s)	Cu (kPa)	BS5930 classification: Shear strength of cohesive soils	Range kPa
49	5	Extremely Low	<10
69	10	Very Low	10-20
95	20	Low	20-40
133	40	Medium	40-75
178	75	High	75-150
249	150	Very High	150-300
345	300		

V_s RELATIONSHIP WITH RELATIVE DENSITY

Hasancebi and Ulusay, 2007 for sand $V_s = 131 N_{60}^{0.205}$

See PEER Report 2012/08 (2012) Guidelines for Estimation of Shear Wave Velocity Profiles

Vs (m/s)	SPT N value	BS5930 classification: Relative density of granular soils	Range SPT N
151	2	Very loose	0-4
174	4	Loose	4-10
210	10	Medium dense	10-30
263	30	Dense	30-50
292	50	Very dense	>50
303	60		

V_s RELATIONSHIP WITH CBR

Vs (m/s)	Density (kg/m³)	Go (MPa)	v	Eo (MPa)	E at 0.1% strain (MPa)	CBR
105	1800	20	0.26	50	17	1
130	1800	30	0.26	77	26	2
150	1800	41	0.26	102	35	3
165	1800	49	0.26	123	42	4
190	1800	65	0.26	164	56	6
210	1800	79	0.26	200	68	8
225	1800	91	0.26	230	78	10
235	1800	99	0.26	251	85	12

TRRL Laboratory Report 1132 (Powell et al, 1984) $E = 17.6(\text{CBR})^{0.64}$ MPa

Notes & limitations

See GSS Guidance Note GN020 for limitations and references - to be used with relevant intrusive investigation information.

This document is intended to indicate potential approaches for the use of ACSW data by suitably qualified geotechnical engineers as part of a general design review. It may be subject to periodic review and change.

No guarantees as to accuracy are made and where necessary original references and relevant design guidance should be reviewed. ACSW test data should be reviewed against all available information on ground conditions as part of an appropriately scoped ground investigation.

Appendix D: Basis and interpretation of ACSW data

Basis and interpretation of ACSW data

Introduction

Advanced Continuous Surface Wave (ACSW) testing is a proprietary engineering testing system developed by Ground Stiffness Surveys LLC (GSS) based on the general methodology for Continuous Surface Wave testing set out in Heymann, 2007. Surface Rayleigh wave velocities over a range of frequencies are accurately measured using a short array of geophones to produce a *dispersion curve* plot of Rayleigh wave velocity (V_r) against frequency. These data can then be used to generate a reliable shear wave velocity (V_s) with depth profile, which in turn can be converted to a stiffness profile using standard relationships. Typical ACSW profile depths are 20 to 30-feet using the GSS Standard Shaker but are dependent on the stiffness of the ground (deeper profile depths are obtained in stiffer ground for the same test frequency).

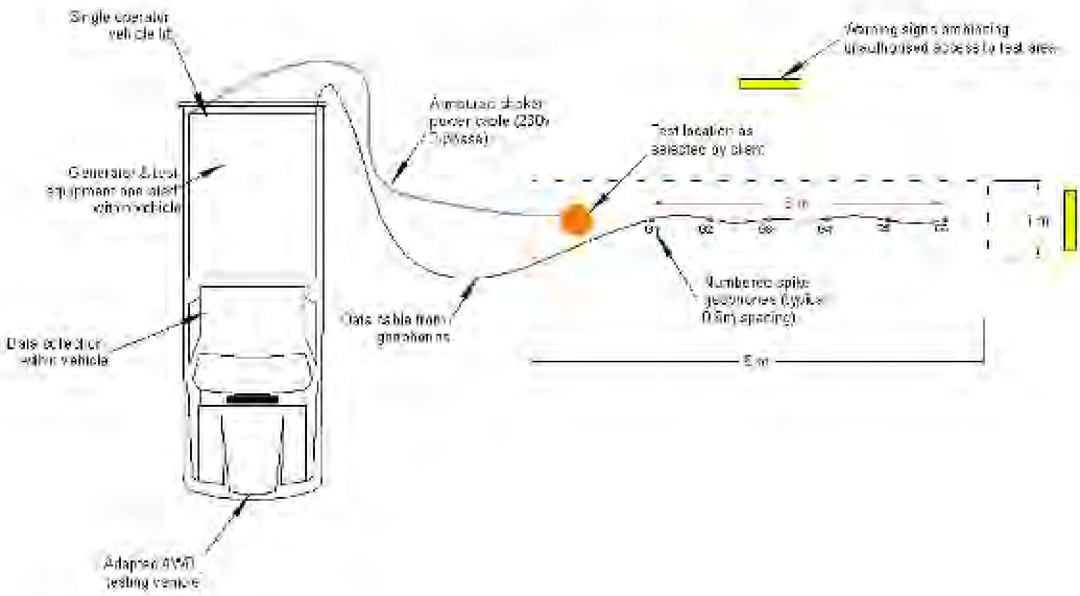


Figure 1 – Standard ACSW test layout

There is a wealth of publications available on the application of surface wave testing for shear wave velocity and stiffness profiling. The reliability of CSW data is such that it is the recommended means of assessing the stiffness of some kinds of geomaterials; for example, chalk (*CIRIA C574 Engineering in Chalk, 2002*).

The ACSW testing is controlled, reviewed and the results analysed using GSS's proprietary integrated custom testing software, C-DAS. The software allows easy comparison between tests in the field and during processing, by which data quality and consistency can be assessed. Test reports are automatically generated by the software, removing the risk of any transcribing errors.

ACSW measurement over 100 cycles at known frequencies allows effective exclusion of noise during data processing by C-DAS. C-DAS automatically compares phase angle consistency between geophones and measured against generated frequency, providing continuous calibration checks. Data out of tolerance is automatically removed. Outlying or highly scattered data can be graphically reviewed using C-DAS and removed from subsequent analysis.

C-DAS generates the following test plots, each of which provides valuable information on the ground profile:

- A *dispersion curve* of Rayleigh wave velocity against frequency
- A *simple inversion* average shear wave velocity (or stiffness) with approximate depth profile
- An *advanced inversion* shear wave velocity (or stiffness) with depth profile

Dispersion curve

The form of the *dispersion curve* defines the shear wave velocity (and stiffness profile). Test frequency data which are not consistent over the geophone array are removed automatically by C-DAS. Review and comparison of test profiles in C-DAS then allows any outlying data or parts of the *dispersion curve* which are unacceptably scattered to be removed.

For a layered deposit with increasing stiffness with depth (a '*normally dispersive*' profile), the form of the *dispersion curve* should be an even polynomial curve with a single inflection point within the lower frequencies. Changes from this form can indicate, for example, where significantly stiffer or softer layers are present (an '*inversely dispersive*' profile). Very rapid oscillations or breaks in the profile can indicate the presence of sharp stiffness contrast boundaries, which cannot be addressed by the available advanced inversion analysis methods but are reported when assessing the quality of data.

In some data sets, a '*multimodal*' response occurs where the ground is excited to behave in a different manner to the normal '*fundamental mode*', particularly at higher frequencies (shallower depths). This *multimodal* response can be apparent as:

- Very high Rayleigh wave velocities at low frequencies
- A rising dispersion curve at high frequencies
- Gaps or jumps in the dispersion curve

Multimodal data within the dispersion curve will affect the advanced inversion analysis process and expert user assessment of these effects is required. The presence of *multimodal* effects and any concerns over the resultant quality of analyses is commented on in the report.

Simple Inversion

The *simple inversion* profile is an average shear wave velocity (or stiffness) profile against approximate depth generated from the *dispersion curve* using a set of standard assumptions included in the report. Shear wave velocity (and stiffness) is generated from the measured Rayleigh wave velocity at each frequency applying conservative assumptions regarding Poisson's ratio and unit weight and using standard relationships which are relatively insensitive to the assumptions made.

Equation 1 (Heymann, 2007) - relationship between V_s, V_r and Poisson's Ratio (v)

$$\frac{V_r}{V_s} \cong \frac{0.874 + 1.117v}{1 + v}$$

Equation 2 - relationship between Vs, small-strain Shear Modulus (G_0) & soil density (ρ)

$$G_0 = \rho . V_s^2$$

The approximate depth of each data point in the *dispersion curve* is determined as a proportion of the measured wavelength. Common practice is that this is normally wavelength divided by 2.5 (Foti *et al.* 2017), but it can be locally calibrated to range between 2 and 4.

The *simple inversion* profile is a good indication of small-scale local variation in stiffness, which cannot be resolved by the *advanced inversion* process. The *simple inversion* allows qualitative comparison between tests and an independent check on the *advanced inversion* results. For *normally dispersive* conditions, the averaging effect of the profile will mean that the *simple inversion* will be conservative at any depth.

The *simple inversion* has been traditionally and successfully used for design purposes and construction control; however care must be taken in using these data in that:

- Depths are approximate only; more accurate boundaries may be generated by the *advanced inversion*
- In some circumstances, the averaging effect may mean that stiffnesses indicated may not be conservative (for example where the ground is *inversely dispersive*)
- Where *multimodal* data is present, this may provide an overestimate of stiffness (particularly at shallow depth)

In some circumstances (e.g. very complex or poor data) it may be possible only to present the *simple inversion*. Comments on the *simple inversion* data for assessment of the *advanced inversion* results are included in the report.

Advanced inversion

Advanced inversion involves the generation of a layered stiffness profile from the *dispersion curve* data. Published algorithms, selected depending on the extent of *multimodal* data, are used to generate a *synthetic dispersion curve* from an assumed ground profile, which is then compared with the *field dispersion curve* using standard model constraints in line with guidance given in Foti *et al* 2017. An appropriate automatic iterative search methodology is then selected, which refines the model until the minimum statistical misfit between the field and synthetic *dispersion curve* is achieved. Checks are made in the modelling process against the *simple inversion* profile, adjacent test locations and, where available, any information on known ground profile.

In using the *advanced inversion* profile, it should be noted that:

- The level of resolution of layer thicknesses and accuracy of layer boundary depth possible is around 1.5-feet at shallow depth, increasing to 3 to 6-feet at the typical maximum depth of the profile
- Within each modelled layer, the stiffnesses of any thinner layers will be averaged
- Transitional boundaries will be represented as a stepped boundary and allowance for this simplification will be required in subsequent analysis
- Strongly *multimodal* data are more difficult to model; the fit of any model generated and therefore the accuracy of any results will tend to be poorer
- Model profiles extending significantly beyond the depth of the *simple inversion* profile will not generally be reliable and hence will normally not be reported in the absence of other information
- It is theoretically possible in some cases for more than one solution to the advanced inversion. Whilst the modelling undertaken follows appropriate guidance and uses the *simple inversion* to limit this possibility, comparison with other tests and against available information on ground conditions is required
- In some cases, it may not be considered possible to present a reliable *advanced inversion* profile.

The fit of the *synthetic dispersion curve* to the field data is assessed statistically by C-DAS as a misfit value; the lower the misfit value the greater confidence in the model. The misfit of the final inversion model is reported qualitatively using the following ranges:

- >30m/s Very Poor
- ≤30m/s Poor
- ≤20m/s Fair
- ≤10m/s Good
- ≤5m/s Excellent

Having calculated the most likely layered profile, C-DAS provides a graphical indication of the uncertainty with the model in two formats, using a threshold of the change in the statistical fit of 5% or less. The first calculation is made by adjusting all layers in the model at once, for both stiffness and depth, which represent the most likely 5% error range in the inversion process. The second calculation shows the maximum extent of adjusting each layer individually to achieve a 5% change in the model fit and provides the maximum extent of the search area in which the model could reasonably lie. Larger error extent areas indicate greater uncertainty in the model. The modelling approach used and any site-specific cautions regarding the use or validity of data are included in the report (including the quality of fit).

Advanced inversion data is output as a shear wave velocity profile. The profile is provided in editable spreadsheet format which provides conversions to small-strain shear stiffness (G_0), small strain Young's modulus (E_0) and a strained softened value of E based on published functions. Default values of Poisson's ratio, unit weight and percentage strain in the spreadsheet can be adjusted based on site specific user knowledge and requirements.

Use of data

The ACSW report is intended for use by an experienced geotechnical engineer, considering the general and site-specific qualifications for the ACSW data set out above and in the test report, including the overall model fit and the extent of layer misfit bars presented. Suitable intrusive investigation data will be required to determine the nature of the materials included within the profiles for design purposes. As with all geotechnical test data, the user should:

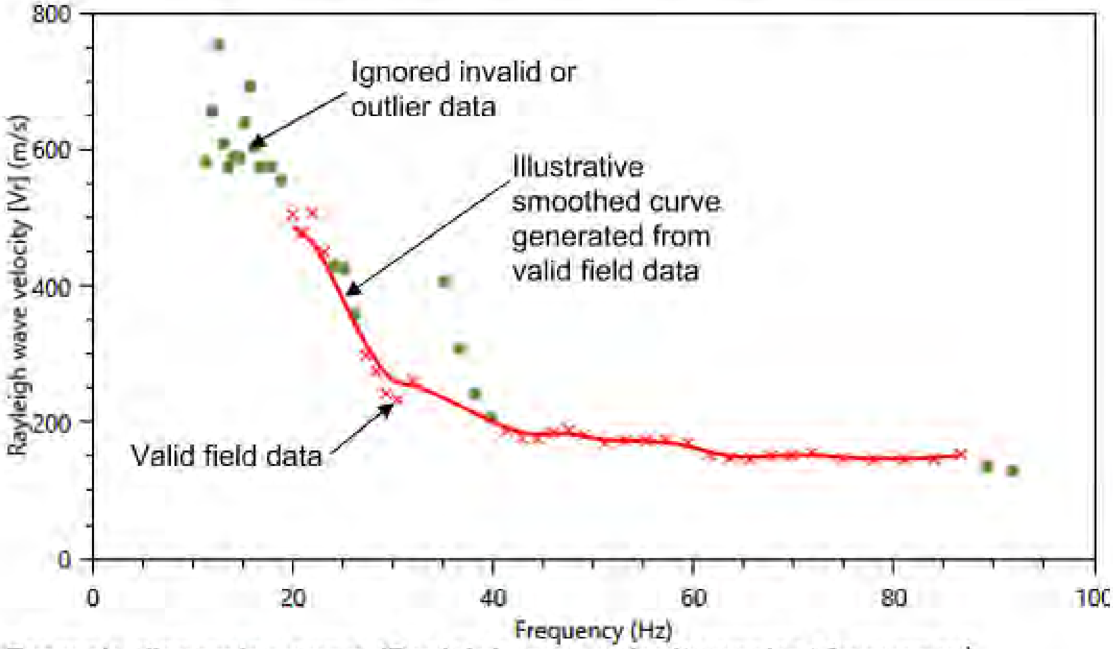
- Review the assumptions used based on available information and design requirements (these can be altered in the *advanced inversion* output spreadsheet)
- For stiffness data consider the application of strain-stiffness functions, drainage conditions and the appropriate stiffness modulus to apply
- Compare tests to assess the variability of data and to select design values and profiles
- Compare test data against other information including published information, intrusive investigation and other data
- Apply appropriate conservatism based on the intended design use, design codes and any uncertainties

References & further information

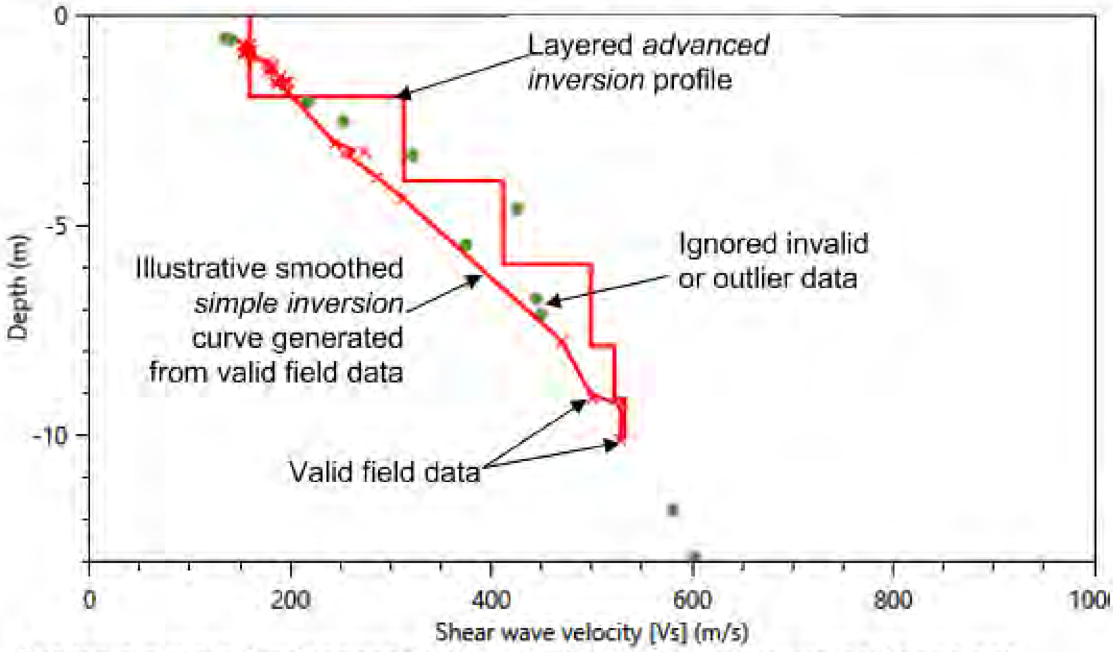
- Heymann, G. (2007) Ground stiffness measurement by the continuous surface wave test. *Journal of the South African Institution of Civil Engineering*. Vol.49, No.1, p25-31.
- Foti, S. *et al.* (2017) Guidelines for the good practice of surface wave analysis: a product of the InterPACIFIC project *Bull Earthquake Eng* DOI 10.1007/s10518-017-0206-7
- Leong, E. and Aung, A. (2013) Global Inversion of Surface Waves Dispersion Curves Based on Improved Weighted Average Velocity (WAVe) Method. *Journal of Geotechnical and Geoenvironmental Engineering*, 10.1061/(AS CE)GT.1943-5606.0000939 (Apr. 8, 2013).
- Wathelet, M (2008) An improved neighbourhood algorithm: Parameter conditions and dynamic scaling. *Geophysical Research Letters*, 35(9), DOI:10.1029/2008GL033256, 2008.

The above is intended as a brief introduction to ACSW testing for assessment by an experienced geotechnical engineer user. Additional information on the ACSW technique including specification, limitations and application is available on the GSS website. A full *range of references is also available. Further advice should be sought where there are concerns as to the use of ACSW test data reported.*

Key to C-DAS output graphs: *Appendix A*

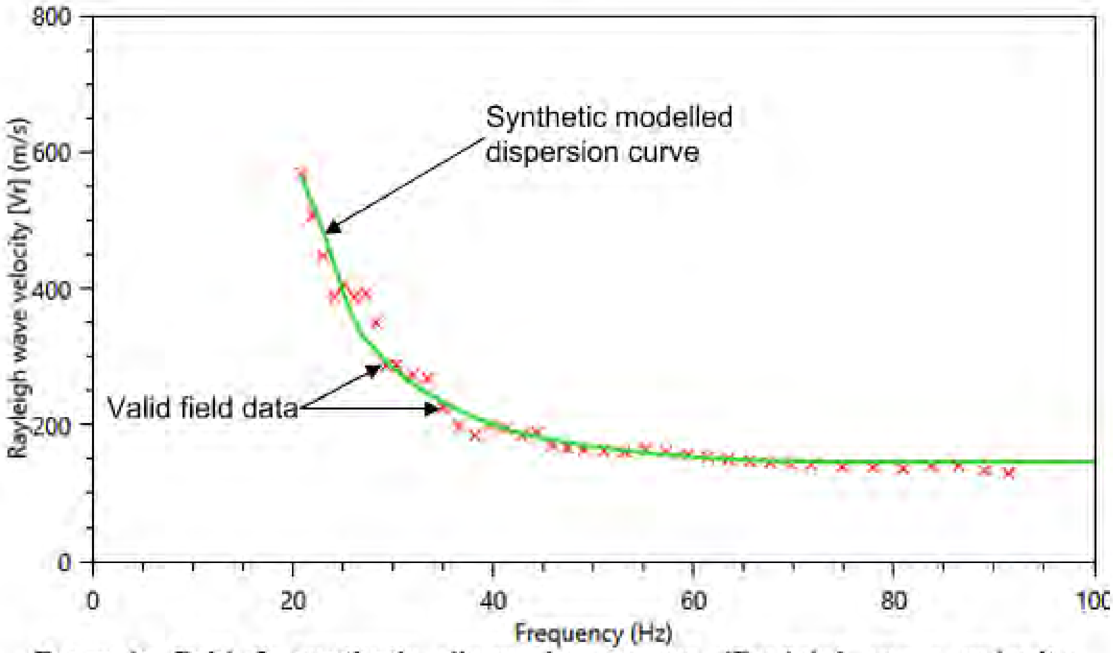


Example dispersion curve (Rayleigh wave velocity against frequency)

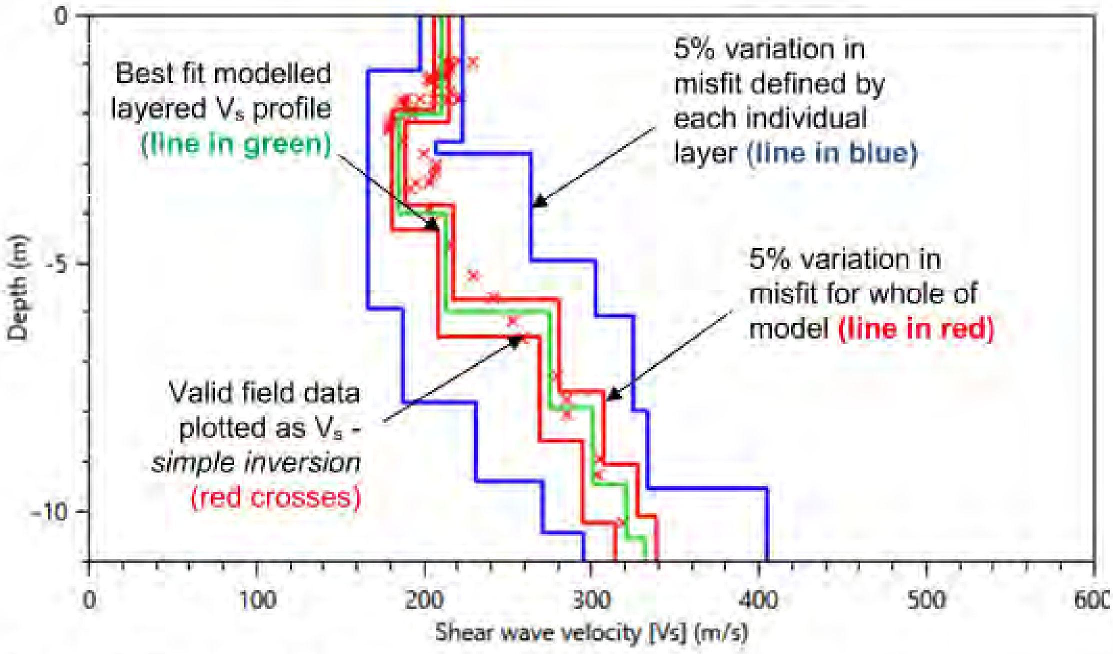


Example simple & advanced inversion plots (shear wave velocity against depth)

Key to C-DAS output graphs: *Appendix B*



Example field & synthetic dispersion curves (Rayleigh wave velocity against frequency)



Example modelled shear wave velocity profile

LOCATIONS:
- Atlanta
- Daytona Beach
- Fort Myers
- Fort Pierce
- Gainesville
- Jacksonville
- Miami
- Ocala
- Orlando (Headquarters)
- Palm Coast
- Panama City
- Pensacola
- Rockledge
- Sarasota
- Tampa
- Tifton
- West Palm Beach

April 26, 2021

Poulos & Bennett, LLC
2602 E. Livingston Street
Orlando, Florida 32803

Attention: Mr. Lance Bennett, P.E.
lbennett@poulosandbennett.com

Reference: **Limited Geotechnical Exploration**
Cyrils Drive Roadway Widening – Ponds
Sunbridge Community
Osceola County, Florida
UES Project No.: 0130.1700290.0013
UES Document No.: 1861197

Dear Mr. Bennett:

We understand that you are in the process of permitting for the proposed Sunbridge Community in Osceola County, Florida. UES has previously performed various explorations for the above referenced project. We were provided with the following documents for our use during this phase of the exploration:

- Cyrils Drive / Narcoossee Road to Absher Road – Road Widening, Post Development Basin Map, dated March 9, 2021 and prepared by Poulos & Bennett. *This plan showed the four pond locations where the SPT borings were requested. However, during our field activities, we were requested to not perform borings within Basin 102.*

UES performed a total of six (6) SPT borings within the three pond locations (except Basin 102). The six (6) SPT borings, designated CP-01 and CP-04 through CP-08, shown on the attached Boring Location Plan in Appendix B-2, were performed in general accordance with the procedures of ASTM D 1586 "Standard Method for Penetration Test and Split-Barrel Sampling of Soils". SPT sampling was performed continuously within the top 10 feet to detect variations in the near surface soil profile and on approximate 5 feet centers thereafter.

Survey control was not provided for the test boring locations before our field exploration program. The boring locations were staked on site by using handheld GPS devices and subsequently performed by UES. The indicated test boring locations should be considered accurate to the degree of the methodologies used. The approximate boring locations are shown in Appendix B

2.0 STORMWATER MANAGEMENT DESIGN

We understand that this phase of the project will include three (3) stormwater ponds (excluding Basin 102). Borings CP-01 and CP-04 through CP-08 were performed within these pond areas. Our recommended design parameters are summarized in Table I below.

TABLE I
STORMWATER MANAGEMENT DESIGN PARAMETERS

Design Parameter	Estimated Values					
Pond	Pond E-1	Pond 107			Pond 108	
Relevant Boring Logs	CP-01	CP-04	CP-05	CP-06	CP-07	CP-08
Estimated Seasonal High Groundwater Depth (feet)	2.5	1	2	1	1	1
Estimated Average Wet SHGWT Depth (feet)	3.5	2	3	3	3	3
Estimated Seasonal Low Groundwater Depth (feet)	6.5	5	6	5	5	5

Ground surface elevations at the boring locations would be beneficial to help us to identify any anomalies in our measured and estimated seasonal high groundwater levels, as well as improve the usefulness the groundwater information during the civil engineering design of the site.

It is our understanding that the information contained in the above table will be used to design the wet stormwater ponds for this project.

4.0 CLOSURE

We appreciate the opportunity to be working with you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Sincerely yours,
UNIVERSAL ENGINEERING SCIENCES, INC.
Certificate of Authorization No. 549

Ricardo C. Kiriakidis, PhD., P.E.
Geotechnical Department Manager

Gautham S. Pillappa, M.S., P.E.
Senior Geotechnical Engineer
Florida Registration No. 82816

Attachments:
Appendix A
USGS Site Location Map
Appendix B
Soil Boring Location Plan
Boring Logs

APPENDIX A

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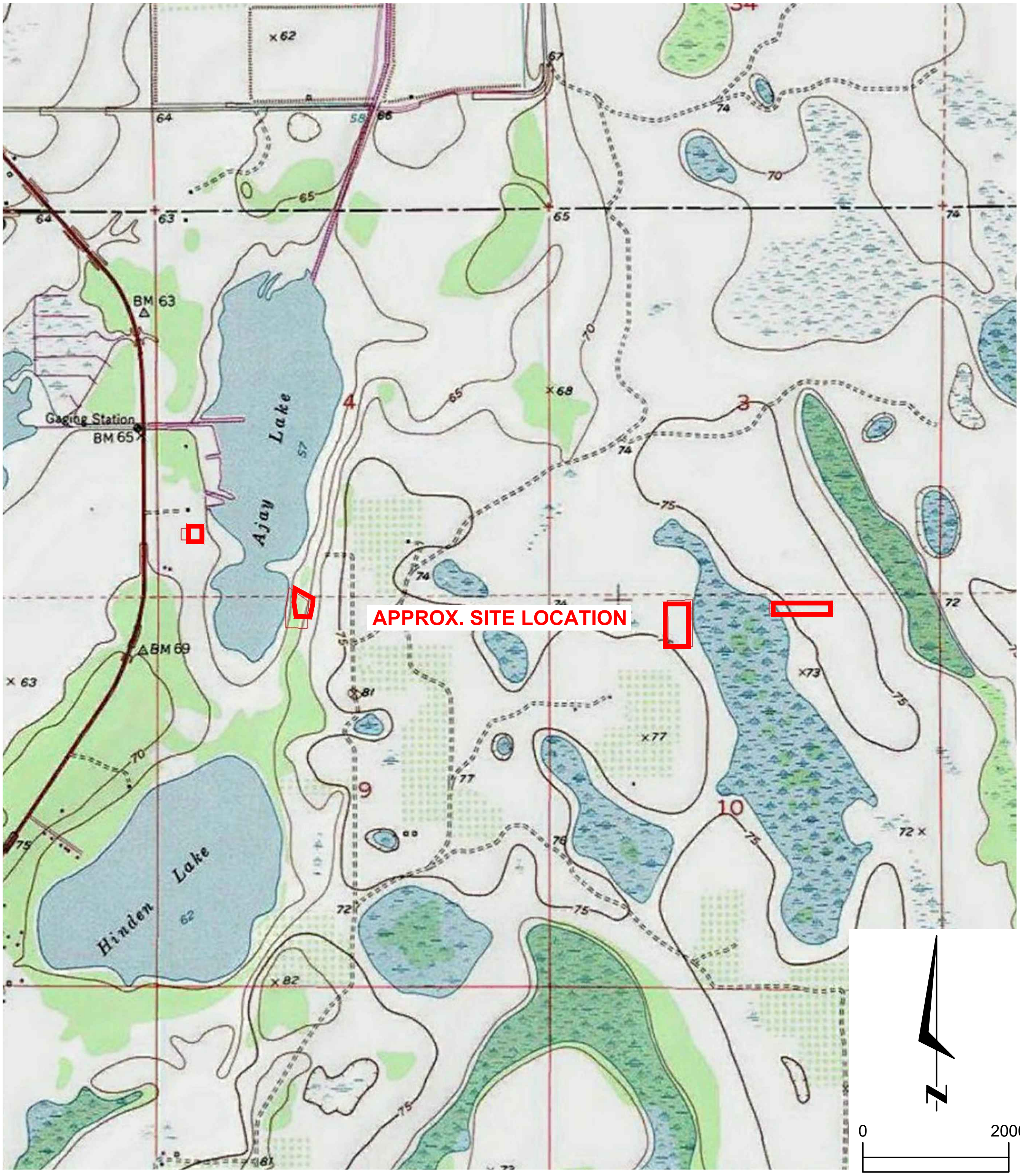

SOURCE: USGS QUADRANGLE MAP OF "NARCOOSSEE, FLORIDA".

21-0230-01

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LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING - PONDS
OSCEOLA COUNTY, FLORIDA

SITE LOCATION MAP

DRAWN BY: N.F.	DATE: 4 - 19 - 2021	CHECKED BY: G.P.	DATE: 04.26.2021
SCALE: AS SHOWN	PROJECT NO: 0130.1700290.0013	REPORT NO: 1861197	PAGE NO: A-1

APPENDIX B

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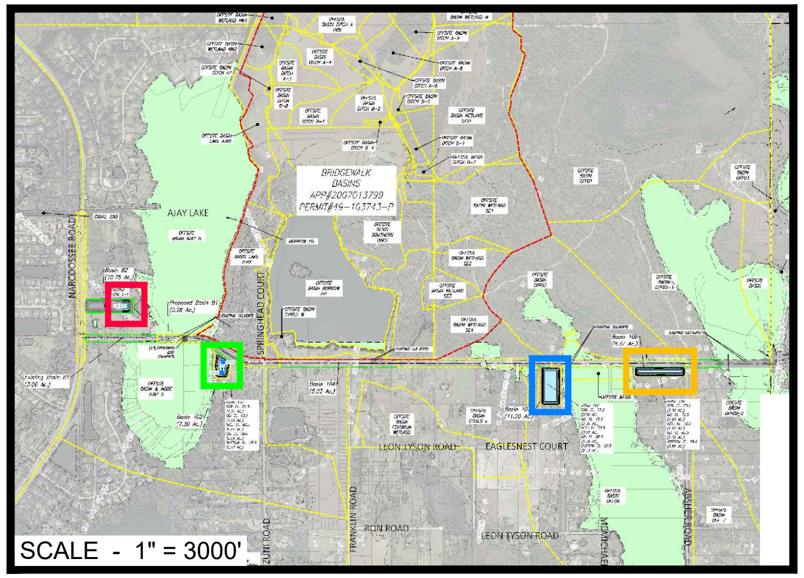

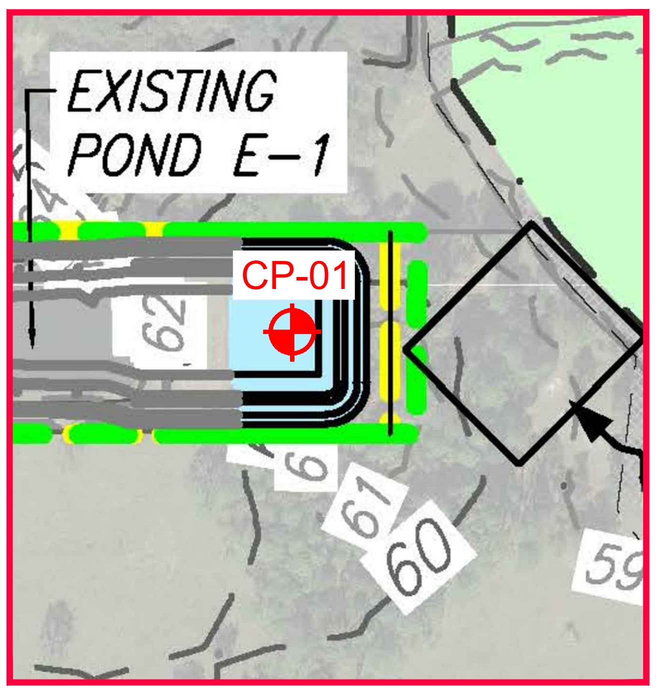

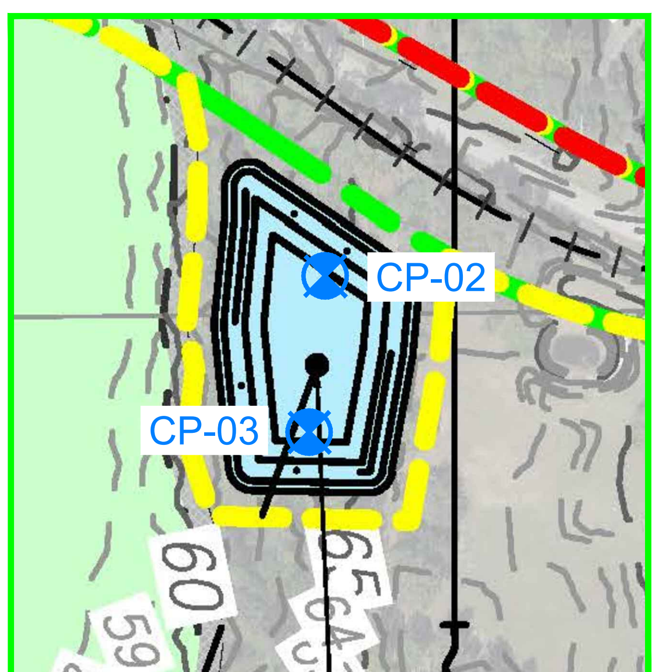

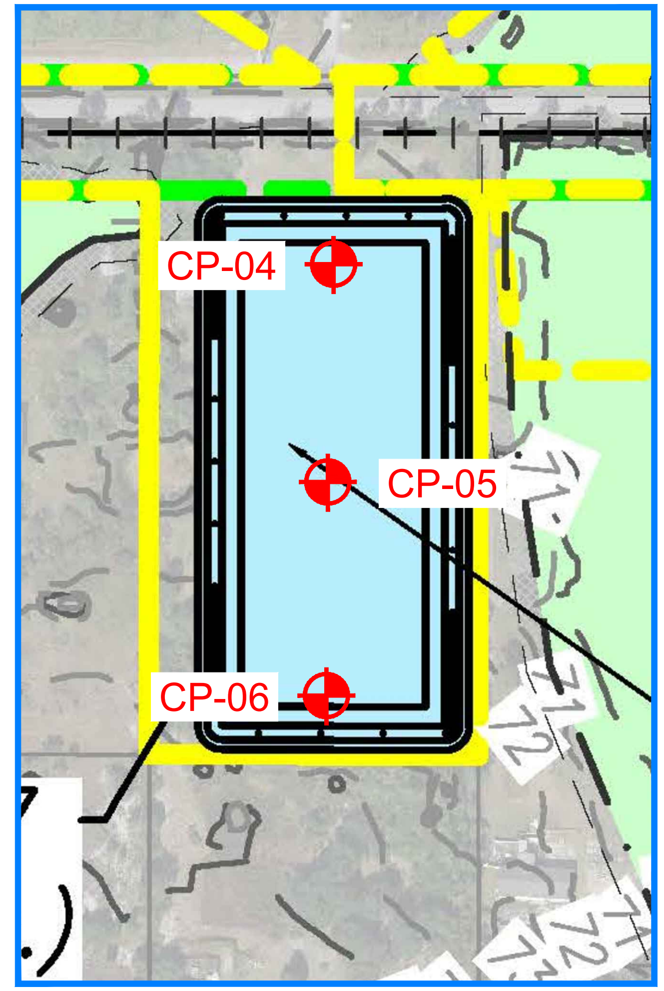

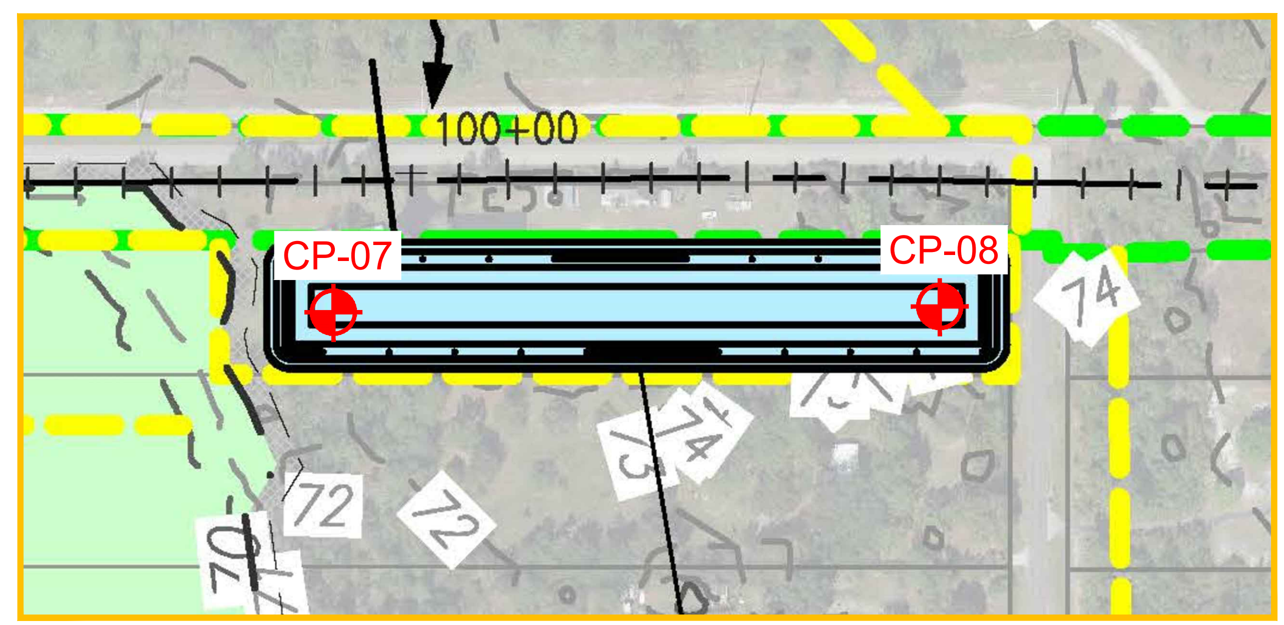

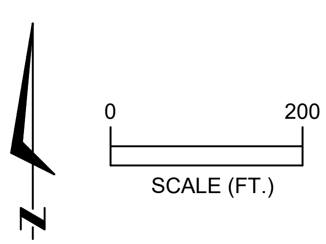

LEGEND

APPROX. STANDARD PENETRATION TEST BORING LOCATION (SPT) PERFORMED 4/16/2021

BORINGS NOT PERFORMED PER CLIENT'S REQUEST

THIS DRAWING CREATED USING PLAN PROVIDED BY CLIENT.

21-0230-01

FOR: POULOS & BENNETT

DRAWN BY: N.F. DATE: 4 - 19 - 2021
CHECKED BY: G.P. DATE: 04.26.2021
REPORT NO: 1861197 SCALE: AS SHOWN
PROJECT NO: 0130.1700290.0013

LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING - PONDS
OSCEOLA COUNTY, FLORIDA

BORING LOCATION PLAN

UNIVERSAL ENGINEERING SCIENCES

PAGE NO: B-2

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BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1861197
PAGE:	B-2.1

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING - PONDS
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CP-01** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 5.5
DATE OF READING: 4/16/2021
EST. SHGWT (ft): 2.5
DATE STARTED: 4/16/21
DATE FINISHED: 4/16/21
DRILLED BY: ORL - JB/WR
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose dark brown silty fine SAND & some organics [SM]						
	X	4-4-4	8	▽								
	X	3-3-2	5			-- very loose						
5	X	2-1-2	3	▼			12	30				9
						Very loose dark brown fine SAND with silt [SP-SM]						
	X	1-1-1	2									
						-- brown	6	22				
	X	1-1-2	3			-- loose						
10	X	2-3-3	6									
						-- medium dense, dark red brown						
15	X	6-11-11	22									
						-- light brown						
20	X	8-13-14	27									
25	X	5-7-10	17									
						BORING TERMINATED AT 25.0 FEET						

W-11590.GPJ

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BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1861197
PAGE:	B-2.2

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING - PONDS
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CP-04** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED

G.S. ELEVATION (ft): N.S. DATE STARTED: 4/16/21
WATER TABLE (ft): 4.0 DATE FINISHED: 4/16/21
DATE OF READING: 4/16/2021 DRILLED BY: ORL - JB/WR
EST. SHGWT (ft): 1.0 TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	PI	K (FT/ DAY)	ORG. CONT. (%)
0						Medium dense grey brown fine SAND with silt and trace organics [SP-SM]						
				▽								
	X	4-7-7	14			-- dark brown						
	X	7-6-7	13	▼								
5	X	6-5-7	12									
	X	4-5-9	14					28				3
	X	4-5-7	12									
10	X	5-5-8	13									
15	X	13-22-25	47			-- dense	6	24				
20	X	15-19-23	42									
25	X	12-12-13	25			-- medium dense						
						BORING TERMINATED AT 25.0 FEET						

W-11590.GPJ

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BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1861197
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING - PONDS
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CP-05** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 5.0
DATE OF READING: 4/16/2021
EST. SHGWT (ft): 2.0

DATE STARTED: 4/16/21
DATE FINISHED: 4/16/21
DRILLED BY: ORL - JB/WR
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose dark brown fine SAND [SP]						
	X	3-4-4	8	▽								
	X	3-5-6	11			Medium dense light brown fine SAND with silt [SP-SM]						
5	X	5-7-12	19	▼		-- brown	6	18				
	X	9-12-11	23			-- dark brown						
	X	8-9-12	21									
10	X	10-12-12	24									
15	X	41-50/4"	50/4"			-- very dense						
20	X	50/4"	50/4"									
25	X	12-14-17	31			-- red brown						
						BORING TERMINATED AT 25.0 FEET						

W-11590.GPJ

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PROJECT NO.: 0130.1700290.0013
REPORT NO.: 1861197
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PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING - PONDS
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CP-06**
SHEET: **1 of 1**
SECTION:
TOWNSHIP:
RANGE:

CLIENT: POULOS & BENNETT
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 4.0
DATE OF READING: 4/16/2021
EST. SHGWT (ft): 1.0
DATE STARTED: 4/16/21
DATE FINISHED: 4/16/21
DRILLED BY: ORL - JB/WR
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose grey brown fine SAND [SP]						
		2-2-3	5									
						Loose dark brown silty fine SAND with trace organics [SM]		23				5
		3-4-5	9									
5						Medium dense dark brown fine SAND with silt [SP-SM]						
		7-7-8	15									
		9-9-10	19				6	21				
		7-8-9	17									
10		9-9-11	20									
						-- loose, dark red brown						
15		3-4-5	9									
						-- medium dense, red brown						
20		5-9-10	19									
						-- light brown						
25		9-13-13	26			BORING TERMINATED AT 25.0 FEET						

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PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1861197
PAGE:	B-2.5

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING - PONDS
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CP-07** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 4.0
DATE OF READING: 4/16/2021
EST. SHGWT (ft): 1.0

DATE STARTED: 4/16/21
DATE FINISHED: 4/16/21
DRILLED BY: ORL - JB/WR
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Loose grey brown fine SAND [SP]						
				▽								
	X	4-3-4	7									
	X	3-4-5	9	▼		Loose dark brown fine SAND with silt [SP-SM]						
5	X	3-3-4	7			-- brown						
	X	3-3-4	7									
	X	2-3-2	5			-- dark brown	6	23				
10	X	3-3-3	6									
15	X	14-21-18	39			-- dense						
20	X	13-20-21	41									
25	X	9-12-14	26			-- medium dense, brown						
						BORING TERMINATED AT 25.0 FEET						

W-11590.GPJ

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BORING LOG

PROJECT NO.:	0130.1700290.0013
REPORT NO.:	1861197
PAGE:	B-2.6

PROJECT: LIMITED GEOTECHNICAL EXPLORATION
CYRILS DRIVE ROADWAY WIDENING - PONDS
OSCEOLA COUNTY, FLORIDA

BORING I.D.: **CP-08** SHEET: **1 of 1**
SECTION: TOWNSHIP: RANGE:

CLIENT: POULOS & BENNETT
LOCATION: SEE BORING LOCATION PLAN
REMARKS: SHGWT = SEASONAL HIGH GROUNDWATER TABLE, N.S. = NOT SURVEYED

G.S. ELEVATION (ft): N.S.
WATER TABLE (ft): 4.0
DATE OF READING: 4/16/2021
EST. SHGWT (ft): 1.0

DATE STARTED: 4/16/21
DATE FINISHED: 4/16/21
DRILLED BY: ORL - JB/WR
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N BLOWS / FT	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT/ DAY)	ORG. CONT. (%)
0						Very loose grey brown fine SAND [SP]						
		2-1-2	3									
		2-1-2	3									
						Loose dark red brown fine SAND with silt [SP-SM]						
5		3-4-5	9									
		3-3-4	7									
		2-3-5	8									
							6	21				
10		3-4-5	9									
						-- dense						
15		14-17-20	37									
						-- very dense						
20		30-50/5"	50/5"									
						-- red brown						
25		27-50/5"	50/5"			BORING TERMINATED AT 25.0 FEET						

W-11590.GPJ

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KEY TO BORING LOGS

SYMBOLS AND ABBREVIATIONS

SYMBOL	DESCRIPTION
N-Value	No. of Blows of a 140-lb. Weight Falling 30 Inches Required to Drive a Standard Spoon 1 Foot
WOR	Weight of Drill Rods
WOH	Weight of Drill Rods and Hammer
	Sample from Auger Cuttings
	Standard Penetration Test Sample
	Thin-wall Shelby Tube Sample (Undisturbed Sampler Used)
RQD	Rock Quality Designation
▼	Stabilized Groundwater Level
▽	Seasonal High Groundwater Level (also referred to as the W.S.W.T.)
NE	Not Encountered
GNE	Groundwater Not Encountered
BT	Boring Terminated
-200 (%)	Fines Content or % Passing No. 200 Sieve
MC (%)	Moisture Content
LL	Liquid Limit (Atterberg Limits Test)
PI	Plasticity Index (Atterberg Limits Test)
NP	Non-Plastic (Atterberg Limits Test)
K	Coefficient of Permeability
Org. Cont.	Organic Content
G.S. Elevation	Ground Surface Elevation

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE GRAINED SOILS More than 50% retained on the No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels and gravel-sand-silt mixtures
			GC	Clayey gravels and gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS 5% or less passing No. 200 sieve	SW**	Well-graded sands and gravelly sands, little or no fines
			SP**	Poorly graded sands and gravelly sands, little or no fines
		SANDS with 12% or more passing No. 200 sieve	SM**	Silty sands, sand-silt mixtures
			SC**	Clayey sands, sand-clay mixtures
FINE-GRAINED SIOLS 50% or more passes the No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diamicaceous fine sands or silts, elastic silts
			CH	Inorganic clays or clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
			PT	Peat, muck and other highly organic soils

*Based on the material passing the 3-inch (75 mm) sieve
** Use dual symbol (such as SP-SM and SP-SC) for soils with more than 5% but less than 12% passing the No. 200 sieve

RELATIVE DENSITY
(Sands and Gravels)
Very loose – Less than 4 Blow/Foot
Loose – 4 to 10 Blows/Foot
Medium Dense – 11 to 30 Blows/Foot
Dense – 31 to 50 Blows/Foot
Very Dense – More than 50 Blows/Foot

CONSISTENCY
(Silts and Clays)
Very Soft – Less than 2 Blows/Foot
Soft – 2 to 4 Blows/Foot
Firm – 5 to 8 Blows/Foot
Stiff – 9 to 15 Blows/Foot
Very Stiff – 16 to 30 Blows/Foot
Hard – More than 30 Blows/Foot

RELATIVE HARDNESS
(Limestone)
Soft – 100 Blows for more than 2 Inches
Hard – 100 Blows for less than 2 Inches

MODIFIERS

These modifiers Provide Our Estimate of the Amount of Minor Constituents (Silt or Clay Size Particles) in the Soil Sample
Trace – 5% or less
With Silt or With Clay – 6% to 11%
Silty or Clayey – 12% to 30%
Very Silty or Very Clayey – 31% to 50%

These Modifiers Provide Our Estimate of the Amount of Organic Components in the Soil Sample
Trace – Less than 3%
Few – 3% to 4%
Some – 5% to 8%
Many – Greater than 8%

These Modifiers Provide Our Estimate of the Amount of Other Components (Shell, Gravel, Etc.) in the Soil Sample
Trace – 5% or less
Few – 6% to 12%
Some – 13% to 30%
Many – 31% to 50%

APPENDIX C

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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical-engineering study conducted for a civil engineer may not fulfill the needs of a constructor — a construction contractor — or even another civil engineer. Because each geotechnical- engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client. No one except you should rely on this geotechnical-engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply this report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical-engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

Geotechnical Engineers Base Each Report on a Unique Set of Project-Specific Factors

Geotechnical engineers consider many unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk-management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical-engineering report that was:

- not prepared for you;
- not prepared for your project;
- not prepared for the specific site explored; or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical-engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light-industrial plant to a refrigerated warehouse;
- the elevation, configuration, location, orientation, or weight of the proposed structure;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical-engineering report is based on conditions that existed at the time the geotechnical engineer performed the study. *Do not rely on a geotechnical-engineering report whose adequacy may have been affected by*: the passage of time; man-made events, such as construction on or adjacent to the site; or natural events, such as floods, droughts, earthquakes, or groundwater fluctuations. *Contact the geotechnical engineer before applying this report to determine if it is still reliable.* A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ — sometimes significantly — from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide geotechnical-construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are Not Final

Do not overrely on the confirmation-dependent recommendations included in your report. *Confirmation-dependent recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations *only* by observing actual subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's confirmation-dependent recommendations if that engineer does not perform the geotechnical-construction observation required to confirm the recommendations' applicability.*

A Geotechnical-Engineering Report Is Subject to Misinterpretation

Other design-team members' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Constructors can also misinterpret a geotechnical-engineering report. Confront that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing geotechnical construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical-engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make constructors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give constructors the complete geotechnical-engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise constructors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure constructors have sufficient time* to perform additional study. Only then might you be in a position to give constructors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and constructors fail to recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Environmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform an *environmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical-engineering report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk-management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold-prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, many mold- prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical- engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; *none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.*

Rely, on Your GBC-Member Geotechnical Engineer for Additional Assistance

Membership in the Geotechnical Business Council of the Geoprofessional Business Association exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project. Confer with you GBC-Member geotechnical engineer for more information.

GEOTECHNICAL BUSINESS COUNCIL
of the Geoprofessional Business Association

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@geoprofessional.org www.geoprofessional.org

CONSTRAINTS & RESTRICTIONS

The intent of this document is to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of exploration. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

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ENGINEERING SCIENCES

September 14, 2021
Revised November 12, 2021

Poulos and Bennett
2602 E. Livingston Street
Orlando, Florida 32803

Attention: Mr. Richard Bobletz, P.E.
rbobletz@poulosandbennett.com

Reference: **Roadway Underdrain Evaluation**
Cyrils Drive Roadway Widening
Osceola County, Florida
UES Project No. 0130.1700290.0013
UES Report No. ***1898849v2***

Dear Mr. Bobletz:

At your request, Universal Engineering Sciences (UES) has completed the roadway underdrain evaluation for the above-referenced project based on the provided plan and profile sheets for the site located in Osceola County, Florida. Our findings, together with our assumptions and conclusions, are presented in the following paragraphs.

1.0 PROJECT DESCRIPTION

The proposed project consists of improvements to the Cyrils Drive and Narcoossee Road intersection in Osceola County, Florida. UES has previously issued a Geotechnical Report for this project (UES Report No. 1765631.V3, dated February 1, 2021). The results of the previous exploration were used for this analysis.

2.0 ROADWAY UNDERDRAIN EVALUATION

In accordance with Osceola County Engineering Standards, the required separation between the estimated seasonal high water table and the bottom of the base course (limerock) is 24 inches. If this separation criterion is not met by grading, roadway underdrains are required. Where the estimated seasonal high water table will be greater than 24 inches below the bottom of the base course, underdrains will not be required.

Based on the Roadway Plan and Profile sheets provided to us by Poulos & Bennett, LLC (Cyrils Drive / Narcoossee Road to Asher Road – Road Widening, Sheet No. 15 through 33, dated August 31, 2021) a comparison was made between the finished pavement grades and the plot of the estimated seasonal high groundwater elevation contours in order to determine those areas of the proposed pavements where the estimated seasonal high groundwater elevation will be within 24 inches of the estimated bottom of the base course elevation. Accounting for the thickness of the proposed roadway base course and surface course, the required seasonal high water table separation, and the approximate roadway cross-slope, underdrains will be required where the estimated seasonal high water table occurs within approximately 3.2 feet (3'-2") of the finished pavement surface grades, based on the roadway sections provided by Poulos & Bennett.

After review of the borings drilled by UES and completed for UES report No. 1765631.V3 we can confirm that the plotted estimated seasonal high water (ESHW) line within the plans provided to us by Poulos & Bennett is consistant with our anticipated levels from our previous exploration.

3.0 RECOMMENDATIONS

For all areas where the estimated seasonal high water table is expected to form within 24 inches of the bottom of the base course, underdrains will be required. The following table presents the pavement sections where underdrains are recommended along both sides of the roadway.

TABLE I
RECOMMENDED MINIMUM UNDERDRAIN LOCATIONS

Roadway	From Station	To Station
Cyrils Drive	12+60	18+60
Approximate Total Length of Roadway Underdrain, linear feet (includes both sides of roadways)		1200

The remaining proposed pavement grades shown on the provided plan and profile sheets were found to be at least 3.2 feet above the estimated seasonal high water table.

However, UES typically recommends that the minimum separation between the estimated seasonal high groundwater table and the bottom of the base course be 12 inches for Soil Cement or RCA (Recycled Concrete Aggregate); or 18 inches for Limerock. Therefore, if RCA base course were to be used in lieu of limerock, the required separation would occur when the groundwater is at least 2.2 feet from the surface of the pavement.

All of the proposed pavement grades shown on the provided plan and profile sheets were found to be at least 2.2 feet above the estimated seasonal high water table.

Please note that if Osceola County accepts reducing the separation from 24-inches to 12-inches, then based on our analysis (assuming RCA base course), underdrains will not be required for the Cyrils Drive improvements.

4.0 UNDERDRAIN RECOMMENDATIONS

If Osceola County deems underdrains to be necessary then, we recommend the following underdrain design guidelines to provide adequate separation between the pavement grades and the estimated seasonal high groundwater levels. Underdrain and cleanout details have been attached for your use.

1. Roadway underdrains should be constructed with a minimum 6-inch diameter underdrain pipe, wrapped with filter fabric (ADS “Drainguard,” or equivalent) or smooth wall HDPE pipe without filter sock.

2. Underdrains should be constructed along both sides of the roadways for the portions requiring underdrains to provide separation between the bottom of the base course and the seasonal high groundwater level. UES notes that constructing beneath curbing is acceptable and will not impact the performance of the roadway or curbing.

3. The bottom of the underdrain piping should be placed a minimum of 24-inches below the bottom of base course.

4. The underdrains should be constructed in a trench a minimum of 18-inches wide, with the underdrain centered in the trench. Further, the underdrain trench should extend 6-inches below the invert of the underdrain piping.

5. Backfill placed in the underdrain trench should consist of "clean" filter sand meeting FDOT specifications for filter sand (FDOT Specification 902-4). Filter sand backfill should extend to 12 inches above the top of the underdrain pipe. Backfill above the FDOT filter sand may consist of clean native material, provided these materials contain less than 10 percent soil fines.

6. Prior to the placement of underdrain piping or filter sand backfill, the perimeter of the underdrain trench should be lined with filter fabric (Mirafi 140N, or equivalent) to minimize the potential for intrusion of soil fines from the surrounding subgrade. The filter fabric should completely line the perimeter of the underdrain trench and overlap a minimum of 12 inches at the top of the filter sand backfill. In addition, the top of the filter sand shall be covered with 10-mil polyethylene or 70 lb. felt prior to placing the compacted backfill and topsoil, as shown in the attached underdrain detail.

7. Underdrains should be routed to a positive outfall.

8. Underdrains should include capped and sealed inspection and clean-out ports extending to the ground surface at spacing no greater than 300 feet, at every bend or 45 degrees or greater, and at the terminus of each underdrain segment. We also recommend that a maintenance program be established to flush and inspect the underdrains on a periodic basis. Please note that without a proper maintenance program, the intended performance of the underdrains may be compromised.

9. We recommend installing landscape drains along all medians, landscape areas and along all roadways where irrigation is present to protect the underdrains from excess fines deposits. Please understand that landscape drains are functionally different than roadside underdrains, in that it is intended mostly to handle or capture excess irrigation that could migrate laterally onto the pavement components and eventually compromise the roadway underdrain.

10. We further recommend that all underdrains be installed under the full-time observation of a representative of UES.

5.0 CLOSURE

We appreciate the opportunity to be working with you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully Submitted,
UNIVERSAL ENGINEERING SCIENCES, LLC
Certificate of Authorization No. 549

Luke Shafer, E.I.
Geotechnical Staff Engineer

RICARDO C. KIRIAKIDIS LICENSE No. 70602 STATE OF FLORIDA PROFESSIONAL ENGINEER

Ricardo C. Kiriakidis L., Ph.D., P.E.
Date: 01/12/2021
Geotechnical Department Manager
Florida Registration No. 70602

APPENDIX H
MEETING MINUTES

POULOS & BENNETT

Poulos & Bennett, LLC ● 2602 E. Livingston Street ● Orlando, Florida 32803 ● (407) 487-2594 ● www.poulosandbennett.com

PROJECT STATUS MEETING #1 MEETING MINUTES

Cyrils Road Widening from Narcoossee to Absher
Final Design
August 3, 2021

Attendees:
Steve Kane, Osceola County
Sally Myers, Osceola County
Lance Bennett, P&B
Dave Kelly, P&B
Christy Baxter, P&B
Alice Brantley, P&B
Richard Bobletz, P&B

Discussion

1. Maintain access to Split Oak area at the existing gate.
2. Provide mailboxes according to Osceola County specs
3. Add RW assistance to current supplemental agreement
4. 50% submittal for RW locked in to proceed with acquisition
    a. If we can keep the number of parcels with takes to 15-20 it will shorten the RW acquisition process because the County can accomplish the task instead of bringing on board a Consultant (the current number of parcels that require takes is 16 excluding Carter)
    b. Legal & sketches – want to make sure SFWMD is good so recommend getting through min 1 round of comments before getting surveys done & row maps
    c. P&B confirm scope on sketch & descriptions & ROW maps.
    d. Challenges currently – schedule on title work. 4 months from ROW matrix to ROW inspection & notice to owner.
        i. Confirm Title – what are we getting and time frames? Lance
        ii. Attorney – David Schonce, Whiterwheil both have a conflict with
        iii. Title – Stuart title
5. Osceola Engineering – P&B followed up on proposal,
6. Sally to provide scope/deliverables that will be needed for row acquisition assistance
7. Nov 21 –May 23 row acquisition schedule, no advertisement of property without row
8. Phasing of plans (submit 50% plans), may be a way to get to original schedule date???
9. Use future meeting to hash through design questions/utilities/storm/road geometry/etc. this can be a working session.
10. Flanking inlets at low points - yes
11. Need supplemental proposal & schedule prior to meeting on the 17th & 19th

POULOS & BENNETT

Poulos & Bennett, LLC ● 2602 E. Livingston Street ● Orlando, Florida 32803 ● (407) 487-2594 ● www.poulosandbennett.com

PROJECT STATUS MEETING #2 MINUTES

Cyrils Road Widening from Narcoossee to Absher
Final Design
August 18, 2021

Attendees:
Steve Kane, Osceola County
Sally Myers, Osceola County
Lance Bennett, P&B
Dave Kelly, P&B
Christy Baxter, P&B
Alice Brantley, P&B
Richard Bobletz, P&B

- Add Permit Submittal Date to Agenda for next meeting
- Pond 108 is an easement and not RW
- Profile is raised in some areas so pedestrians can see over back yard privacy fences. Steven Kane was OK with elevated sidewalk. His biggest concern is not impacting HOA tract or lots.
- Additional Geotech input may be needed at existing back yard pool. Looks like it is 30 ft from existing sidewalk, proposed design sidewalk is elevated 1-2 ft. Sta. 52+00 sidewalk approx. 5 ft off R/W. Pipe trench concern with pipe at pool.
  ACTION ITEM: Richard to coordinate with Universal to determine approach to preserve pool.
- Lennar sidewalk – The Bridgewalk development is proposing a trail. County wants P&B to coordinate with Lennar for right of entry to put trail between RW and borrow pit. P&B to reach out to Lennar, if favorable response then County can take from there.
  ACTION ITEM: Richard to coordinate with Lennar.
- Conservation Easements appear (per Property Appraiser) to extend into existing RW. May need to be modified. Is it possible to get easement amended to allow for Trail? May be an option. Need surveyor to confirm legal description.
  ACTION ITEM: Richard to reach out to Surveyor (Atlantic) to determine if CE are within RW.
- Review 50% plans at next County status meeting (8/31)
- Schedule
  - Submit 50% plans on 8/20
    - Plan and Profile with secondary
    - Cross Sections
    - Limits of Construction on Plans
    - Confirm construction limits of secondary pipe trench. Don't want trench box for 2 miles of roadway
    - RW Matrix – submit with 50% plans if possible. Otherwise, no later than 60% plans.
    - Colorized exhibit with RW impacts by type. May have to come after 50% submittal. Steve Kane wants it to be at least part of 60% submittal.
  - Receive County comments by 8/27
  - SFWMD Pre-Application Meeting 9/1
  - Submit 60% plans on 9/27
  - Carter – early acquisition properties

- Variable – fill slope easement may change after 60% but the rest is pretty solid
- County title work takes 3-4 months
- Utility coordination – send 30% for markups of where utilities are located. Want finalized utility relocation by 90%
  ACTION ITEM: Richard to send 30% plans to Utility Companies

PROJECT STATUS MEETING #3 MINUTES
Cyrils Road Widening from Narcoossee to Absher
Final Design
August 31, 2021

Attendees (telephone call):
Steve Kane, Osceola County
Richard Bobletz, P&B

- Gravity Wall offset from RW. Provide at least 3’ of offset from the RW to the Gravity Wall. This is to avoid the existing WM that is about 10’ inside the RW.
- Relocate Fire Hydrants to the 4.5’ grass space between the curb and trail. Review TWA criteria for fire hydrant placement.
- For the Trail at the first curve, the RW required that the trail move in toward the curb about 1.0’ maximum. Steve was OK with moving the trail in and not providing a handrail.
  ACTION ITEM: P&B to provide documentation in 60% submittal.
- The Conservation Easement is not within the roadway RW as confirmed by Atlantic Surveying.
- P&B to provide a RW and Easement need table to the County for use in RW Mapping.

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PROJECT STATUS MEETING #4 MINUTES
Cyrils Road Widening from Narcoossee to Absher
Final Design
September 14, 2021

Attendees:
Steve Kane
Sally Myers
Dave Kelly
Lance Bennett
Alice Brantley
Richard Bobletz

The following is a summary of the discussion:

- The County does not allow 2:1 front slopes due to maintenance concerns. Options to consider are a 10’ wide trail with 2’ offset from the back of curb. Steve K stated that “provide a 2’ area between grass and curb minimum and we will overlook handrail requirements here”. The walls and railings will also not work for maintenance. Provide a variation to eliminate the handrails as required by Greenbook.

  ACTION ITEM: P&B to provide sections to show Tavistock of these options using 3:1 front slopes so they can provide input on which one to use. The walls and railings will also not work for maintenance.

- We are not opposed to grading within wetland area east of Absher as long as we are not violating a conservation easement. We want to get rid of 1000 foot of wall. Run under assumption we will be getting an easement and grading from station108-118.

  ACTION ITEM: Christy mentioned that the ACOE permit had expired. The original ACOE permit for Phase 1 expires until May 15, 2023.

- It was confirmed that the left turn at sta. 79+00 and the driveway was eliminated from the plans.

- Steve K. mentioned that title work has been ordered but would take several months.

- Steve K asked if there was a signal included in the plans? P&B replied that there was not a signal in our current scope.

  ACTION ITEM: Steve K said he would talk to Kathy Lee about possibly adding a signal.

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PROJECT STATUS MEETING #5 Minutes

Cyrils Road Widening from Narcoossee to Absher

Final Design

October 26, 2021

- Design Status and Issues
  - Pavement Design (black base vs RCA in 1 ft base clearance areas)-making change in typicals to RCA in areas with 1' of base clearance.
  - Sump condition cross culvert- reviewed and we will be taking this culvert out. There is not enough water currently and no culvert currently so we can not justify placing a pipe here. County is ok with this explanation.
  - Wall along north side east of Absher outside of CE areas- currently we show a wall. Guidance from the county is to do whatever is most restrictive and get rid of most of the wall and they will approve that.
  - 60% Plans Comment Responses- we need to get Geotech on the walls. Contractor will not be responsible for the Geotech, Universal is to provide this before our 90% submittal. County to call us 10/27 to understand comment 30 & 25.

- RW Status and Issues
  - RW Survey Coordination- We need to review the row takes asap. 1st sent on 9/8.

- Permitting Status and Issues
  - ACOE
    Preparing response to comments. Submit week of 11/1. Austin saying, they can't submit until 11/23. November at least, but trying to get it sooner.

  - SFWMD
    P&B Application signed; Drainage Report & Plans ready
    Flood Study complete 10/15
    OEI application submittal date unknown no one is getting a response from Brock at OEI.

- Utility Coordination
  - Setting up first Coordination Meeting with all Utilities- we will be doing a virtual meeting for everyone.
  - Separate meeting with OUC to review poles- we want to make sure we are still ok with how we are tying in with OUC.
  - Coordinate with TECO to get as-built of the gas main
  - TWA needs to be tracked separately than highway plans because county will not be paying for this. Bid it not embedded in the same cost as this road plan set but as a standalone.

- Sub Status
  - Osceola Engineering
    Coordination with OEI ongoing

  - Surveyor
    Additional wetland survey at Comp Storage Pond site

  - Geotechnical
    Roadway Geotech Investigation Complete
    Geotech for structures

  - Environmental
    ACOE permit comment response
    Submit SFWMD permit application 11/1

  - Landscape
    Kick-off LA meeting 10/27 at 4pm

  - Traffic
    MOT design underway

- Scope and Contract
  - Supplemental Agreement complete
  - Add Signals to scope- county to ask if this should be included.

- Schedule
  - Current Activities
    Utility Coordination
    Complete SFWMD Permit Applications
    Complete ACOE Response to Comments

  - Upcoming Activities
    Respond to County 60% comments
    Submit SFWMD permit application for Pond E-1 and Comp Pond 11/1
    Submit ACOE permit application responses
    Soft digs for Utility coordination- we are to let county know when we are out doing soft digs so that they can let homeowners know.

  - County Review Status
    60% Plans Review Complete; comments received

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PROJECT STATUS MEETING #6 Minutes

Cyrils Road Widening from Narcoossee to Absher
Final Design
November 9, 2021

Attendees:
Steve Kane
Sally Myers
Jeremy Crowe
Dave Melton
Stephanie Mandello
Lance Bennett
Christy Baxter
Alice Brantley
Richard Bobletz

- Design Status and Issues
  - A General Note will be added to the plans that the Contractor shall provide a Standard Issue new mailbox for each property along Cyrils Drive.

- RW Status and Issues
  - RW Exhibit and Table sent and being reviewed. Title Review has been ordered for Carter properties. All other Title searches will be by Shutts-Bowen.

- Permitting Status and Issues
  - ACOE
    Preparing response to comments. Submit 11/24
    ACOE no longer accepting SFWMD permit as water quality certification. Dave Melton did not know when this would be resolved. Need to monitor to minimize impacts to the project schedule.

  - SFWMD
    OEI application submittal date unknown. No one is getting a response from Broc at OEI. P&B considering submitting permit before OEI submits their permit. Steve Kane said he preferred that we wait until OEI submits before we submit. We need OEI to send us their calcs before we can submit to SFWMD.

  - Sovereign Lands Determination
    Submit the application to SFWMD and let them generate a comment in the RAI.
    Steve Kane asked if this would be a lease or part of the permit
    Add this to the meeting agenda going forward
    ACTION ITEMS: P&B to add this to future agendas.

- Utility Coordination
  - Setting up first Coordination Meeting with all Utilities- we will be doing a virtual meeting for everyone.
  - Separate meeting with OUC to confirm fill around poles is acceptable.
  - Coordinate with TECO to get as-built of the gas main
  - TWA needs to be tracked separately than highway plans because county will not be paying for this. Bid it not embedded in the same cost as this road plan set but as a standalone.
  - Steve Kane stated that emails from utilities stating that they have no facilities are sufficient. Add to final documentation of utility coordination.

- Sub Status
  - Osceola Engineering
    Coordination with OEI ongoing

  - Surveyor
    Additional wetland survey at Comp Storage Pond site

  - Geotechnical
    Roadway Geotech Investigation Complete
    Geotech for structures

  - Environmental
    ACOE permit comment response
    Submit SFWMD permit application 11/1

  - Landscape
    Kick-off LA meeting 10/27 at 4pm
    ACTION ITEMS: Foster Conant to submit back to Development Review with a layout of the landscaping proposed by the next bi-weekly meeting with the County.

  - Traffic
    MOT design underway
    Jeremy Crowe with TMC described the MOT approach for the proposed 3 phases of construction.

- Scope and Contract
  - Steve Kane stated that signals will not be included in this project since there is not enough traffic generated in the near term to justify adding signals.
  - Steve Kane to arrange to meet with reviewers to go over outstanding comments.
    ACTION ITEMS: P&B to send comment responses.

- Schedule
  - Current Activities
    Utility Coordination

Complete SFWMD Permit Applications
Complete ACOE Response to Comments

- Upcoming Activities
  Respond to County 60% comments
  Submit SFWMD permit application for Pond E-1 and Comp Pond
  Submit ACOE permit application responses
  Soft digs for Utility coordination
  ACTION ITEMS: P&B to let county know when we are out doing soft digs so that they can let homeowners know.

- County Review Status
  60% Plans Review Complete; comments received

PROJECT STATUS MEETING #6 Minutes
Cyrils Road Widening from Narcoossee to Absher
Final Design
November 23, 2021

Attendees:
Steve Kane, Osceola County
Rick Conant, Foster Conant
Jennifer Miller, Foster Conant
Lance Bennett, P&B
Christy Baxter, P&B
Alice Brantley, P&B
Richard Bobletz, P&B

- Design Status and Issues
  - Landscaping Conceptual Layout
    Rick Conant described the conceptual approach to landscaping (see attached drawings). Steve did not like adding the walls on the south side and suggested that FC add existing green space along the north and south sides.
    ACTION ITEMS: Foster Conant to add existing green space to layout and P&B to forward to Tavistock for review and comment.
  - Richard described the signing at each intersection with ONE WAY signs. This configuration is required by GREEN BOOK but is an unusual approach and the concern is that motorists won't understand the signage.
    ACTION ITEMS: P&B to send the Green Book reference and the intersection signing to the County for review.

- RW Status and Issues
  - Steve mentioned that the easement shown along the borrow pit that crosses the Carter property that would be used to access the borrow pit and outfall structure for maintenance is not acceptable to the Carter family. Steve asked that we remove this easement and use the existing driveway on the north side of the Zuni intersection.
    ACTION ITEM: P&B to revise the plans and RW summary table.

- Permitting Status and Issues
  - ACOE
    We have received the response to comments from Austin. Submit 11/24

  - SFWMD
    The County will continue to coordinate with OEI to finalize the Developers Agreement to include Cyrils drainage. Steve mentioned that he expects to get an agreement by next week ((12/1).

  - Sovereign Lands Determination
    Austin to submit request to FDEP.

- Utility Coordination
  - Setting up first Coordination Meeting with all Utilities- we will be doing a virtual meeting for everyone.
  - Separate meeting with OUC to confirm fill around poles is acceptable.
  - Coordinate with TECO to get as-built of the gas main
  - TWA meeting held. Continuing coordination.

- Sub Status
  - Osceola Engineering
    Coordination with OEI ongoing

  - Surveyor
    No additional wetland survey at this time

  - Geotechnical
    Roadway Geotech Investigation Complete
    Geotech for structures beginning

  - Environmental
    ACOE permit comment response
    Submit SFWMD permit application after OEI submittal

  - Landscape
    FC to update Conceptual Plans as discussed above.

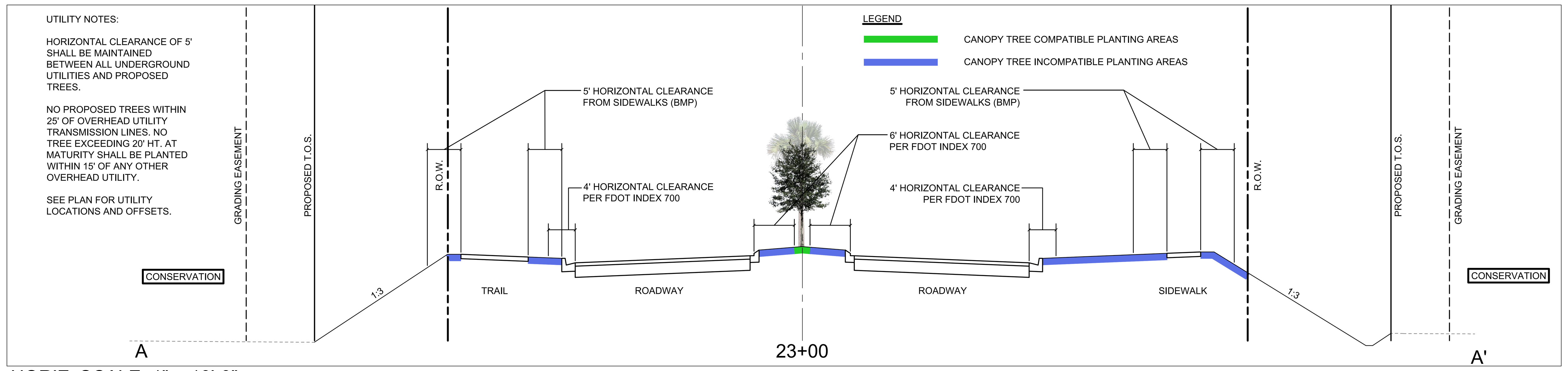
  - Traffic
    MOT design underway

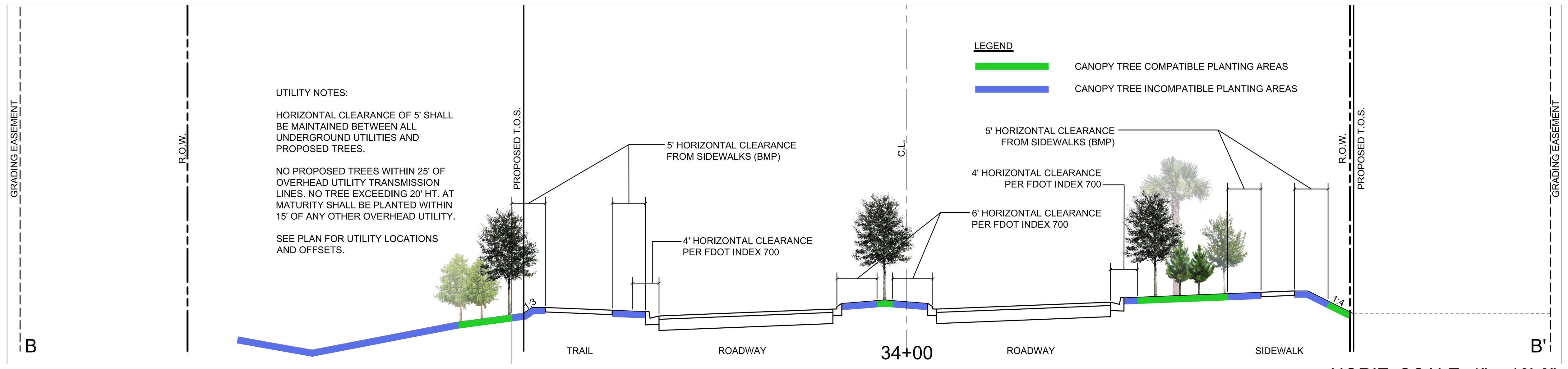
- Scope and Contract
  - No updates.

- Schedule
  - Current Activities
    Utility Coordination
    Complete SFWMD Permit Applications
    Complete ACOE Response to Comments

  - Upcoming Activities
    Submit SFWMD permit application for Pond E-1 and Comp Pond
    Submit ACOE permit application responses
    Soft digs for Utility coordination

  - County Review Status
    60% Plans Review Complete; comments received

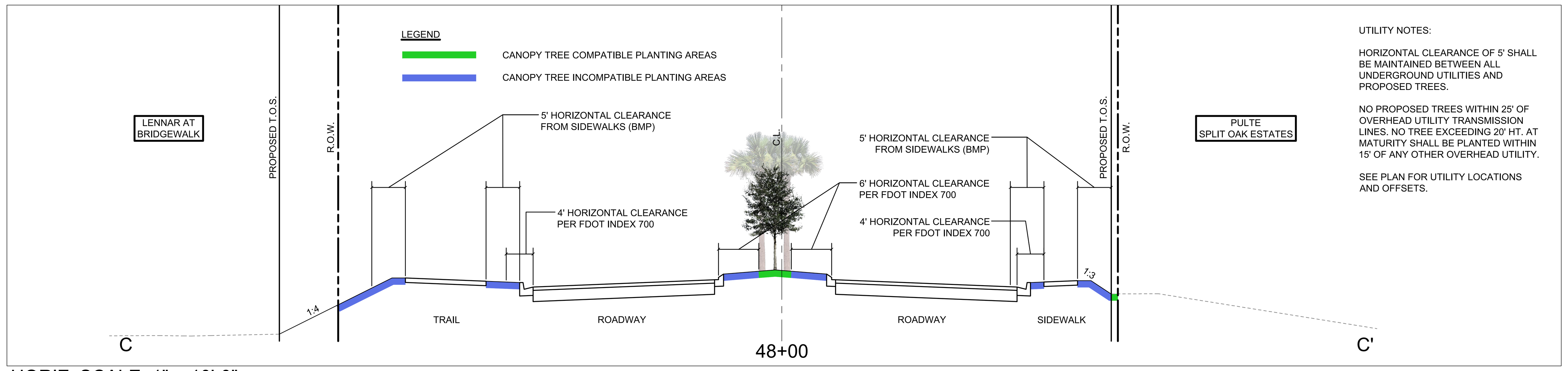


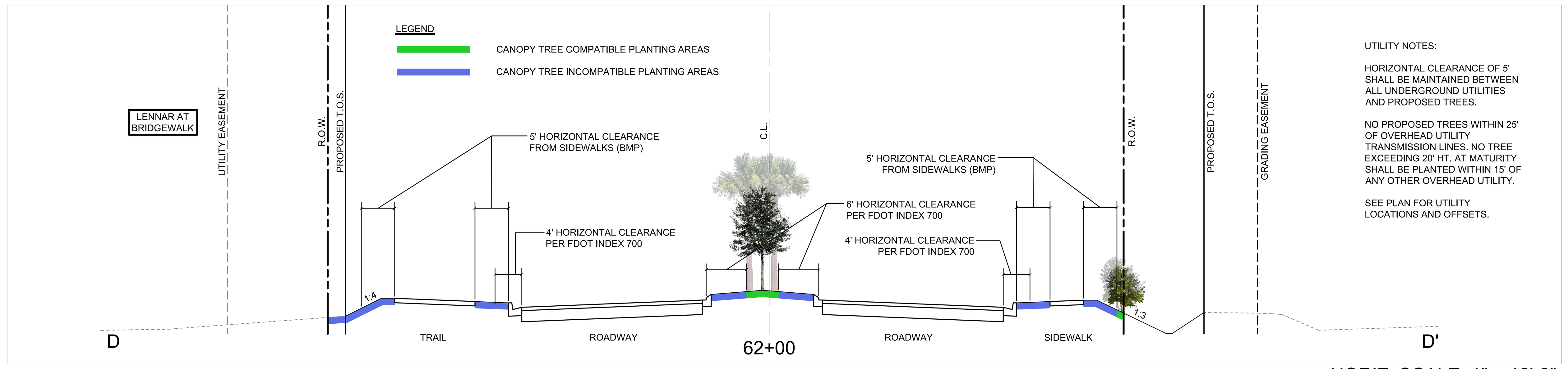


HORIZ. SCALE: 1" = 10'-0"

HORIZ. SCALE: 1" = 10'-0"

SCALE: 1" = 60'-0"





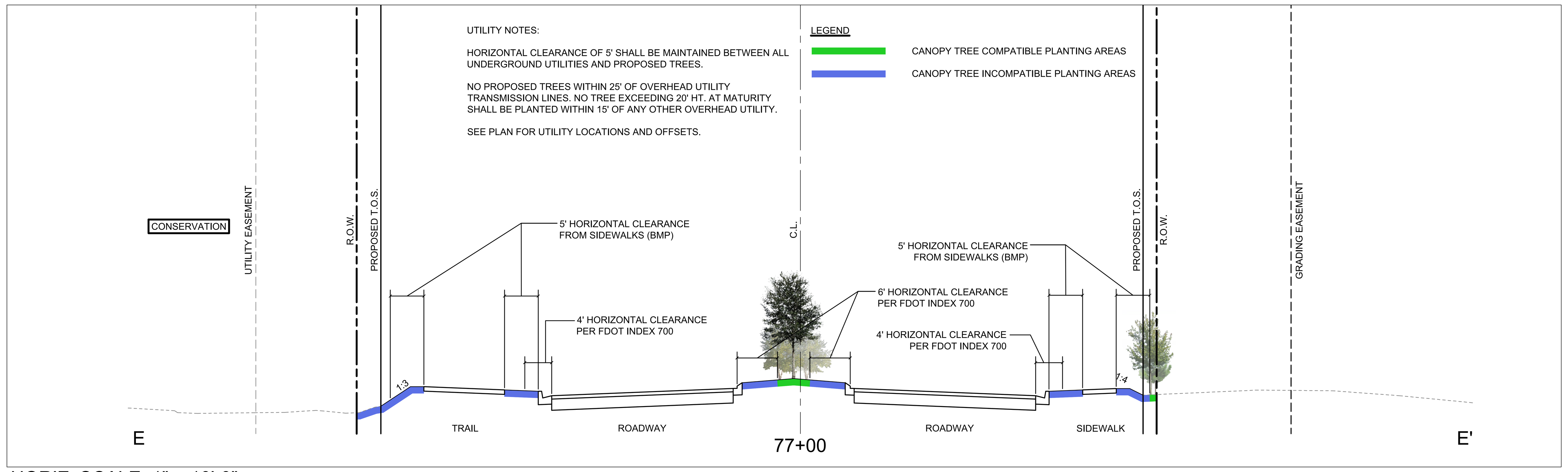
HORIZ. SCALE: 1" = 10'-0"

HORIZ. SCALE: 1" = 10'-0"

SCALE: 1" = 60'-0"

CYRILS DRIVE - NARCOOSSEE ROAD TO ABSHER DRIVE
LANDSCAPE OPPORTUNITIES EXHIBIT

SHEET 1
(FULL SCALE AT 36X48)



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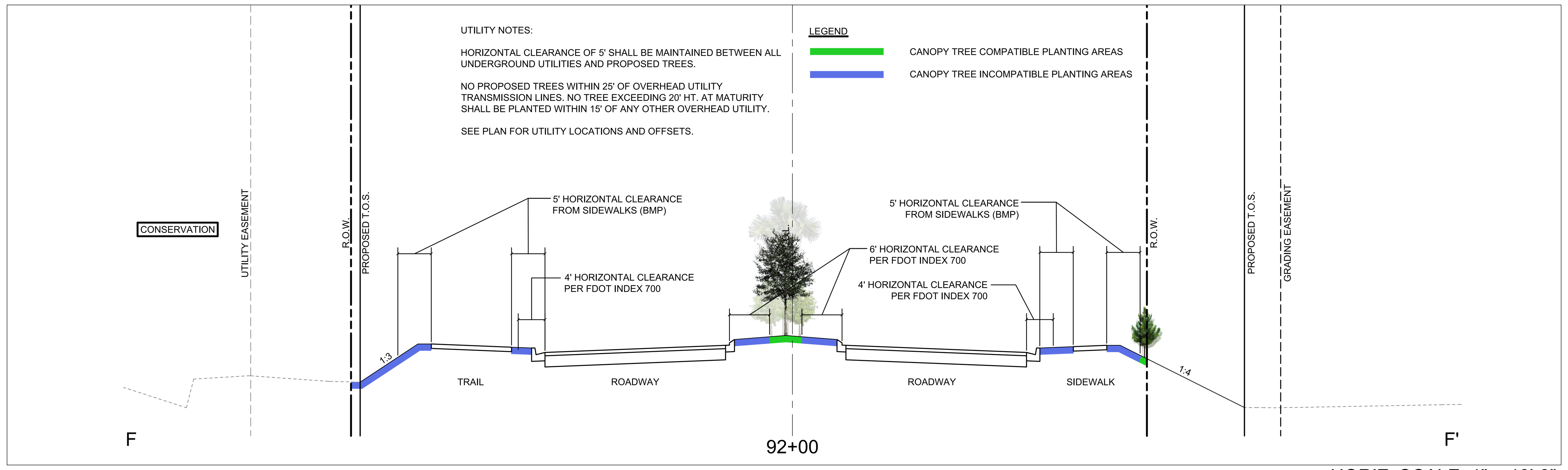
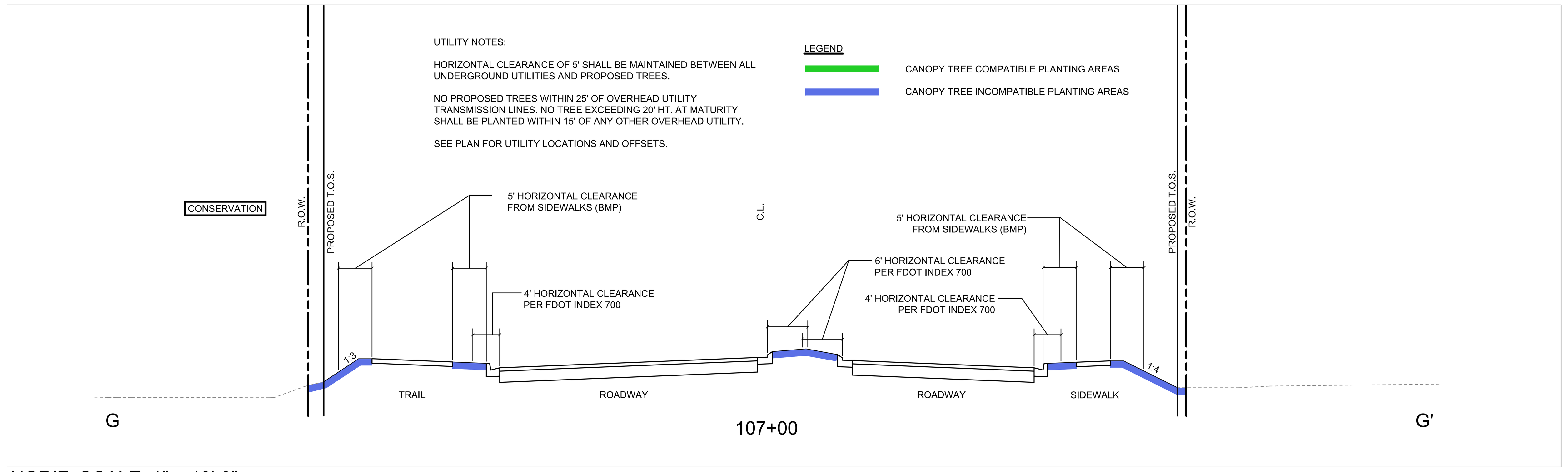


HORIZ. SCALE: 1" = 10'-0"

SCALE: 1" = 60'-0"



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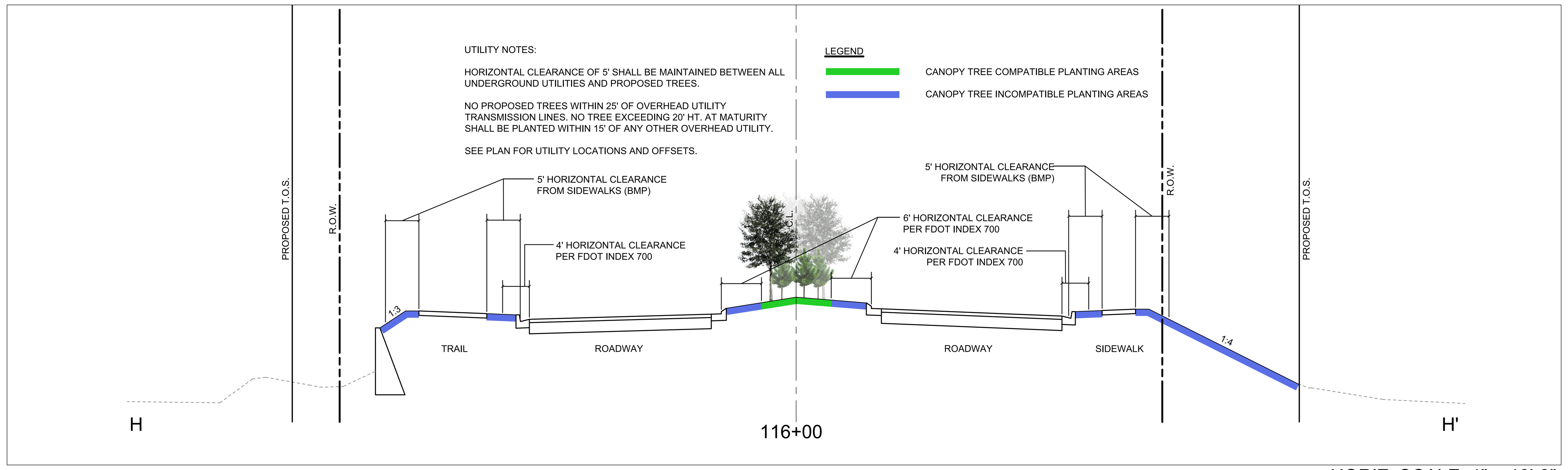


HORIZ. SCALE: 1" = 10'-0"

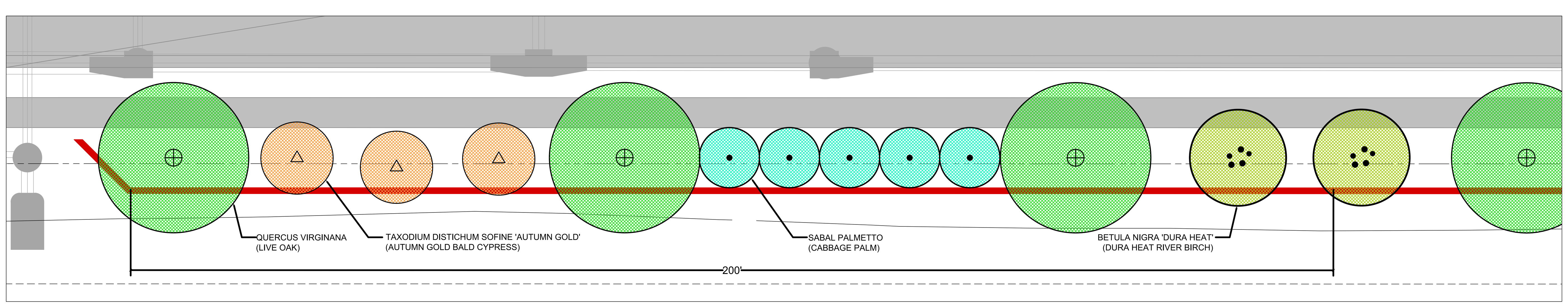
SCALE: 1" = 60'-0"

CYRILS DRIVE - NARCOOSSEE ROAD TO ABSHER DRIVE
LANDSCAPE OPPORTUNITIES EXHIBIT

SHEET 2
(FULL SCALE AT 36X48)

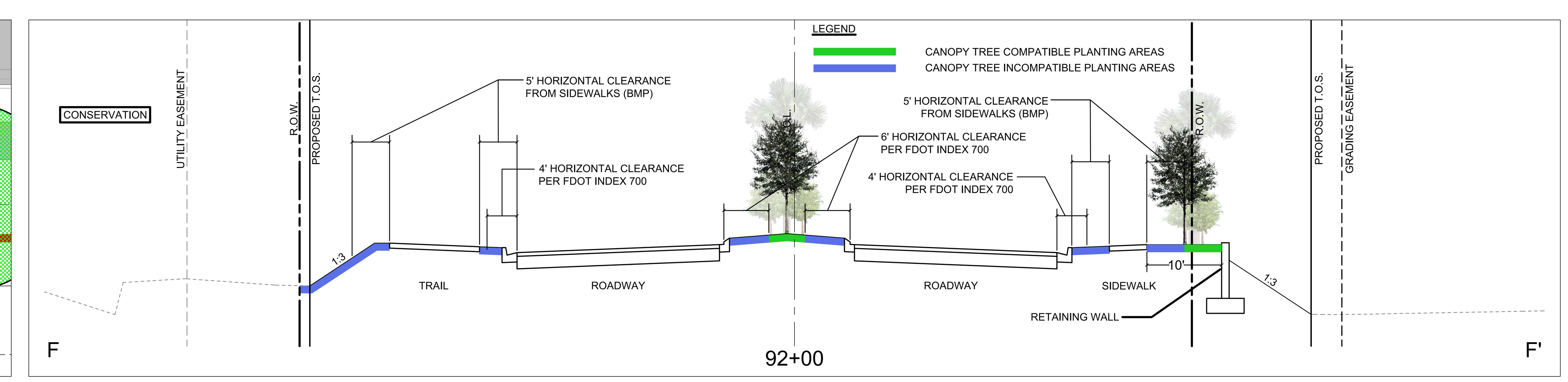
CYRILS DRIVE - NARCOOSSEE ROAD TO ABSHER DRIVE
CONCEPTUAL CANOPY TREE PLAN

SCALE: 1" = 60' - 0"
(FULL SCALE AT 36X48)



TYPICAL RETAINING WALL PLAN ENLARGEMENT

SCALE: 1" = 10'-0"



TYPICAL RETAINING WALL SECTION

HORIZONTAL SCALE: 1" = 10'-0"

CYRILS DRIVE - NARCOOSSEE ROAD TO ABSHER DRIVE
RETAINING WALL AND GRADING OPPORTUNITIES EXHIBIT

SCALE: 1" = 60' - 0"
(FULL SCALE AT 36X48)

TREES

QUERCUS VIRGINIANA
LIVE OAK

ACER RUBRUM 'FLORIDA FLAME'
FLORIDA FLAME RED MAPLE

BETULA NIGRA 'DURA HEAT'
DURA HEAT RIVER BIRCH

TAXODIUM DISTICHUM
BALD CYPRESS

PINUS ELLIOTTI DENSA
DENSA SLASH PINE

SABAL PALMETTO
CABBAGE PALM

UNDERSTORY, SHRUBS AND GROUNDCOVERS

ILEX X ATTENUATA 'EAGLESTON'
EAGLESTON HOLLY

ILEX VOMITORIA PENDULA
WEEPING YAUPON HOLLY

MYRICA CERIFERA
WAX MYRTLE

HAMELIA PATENS 'COMPACTA'
DWARF FIREBUSH

VIBURNUM OBOVATUM 'MRS. SCHILLER'S DELIGHT
DWARF WALTER'S VIBURNUM

ILEX VOMITORIA 'NANA'
DWARF YAUPON HOLLY

TRIPSACUM FLORIDANA
DWARF FAKAHATCHEE GRASS

MUHLENBERGIA CAPILLARIS
PINK MUHLY GRASS

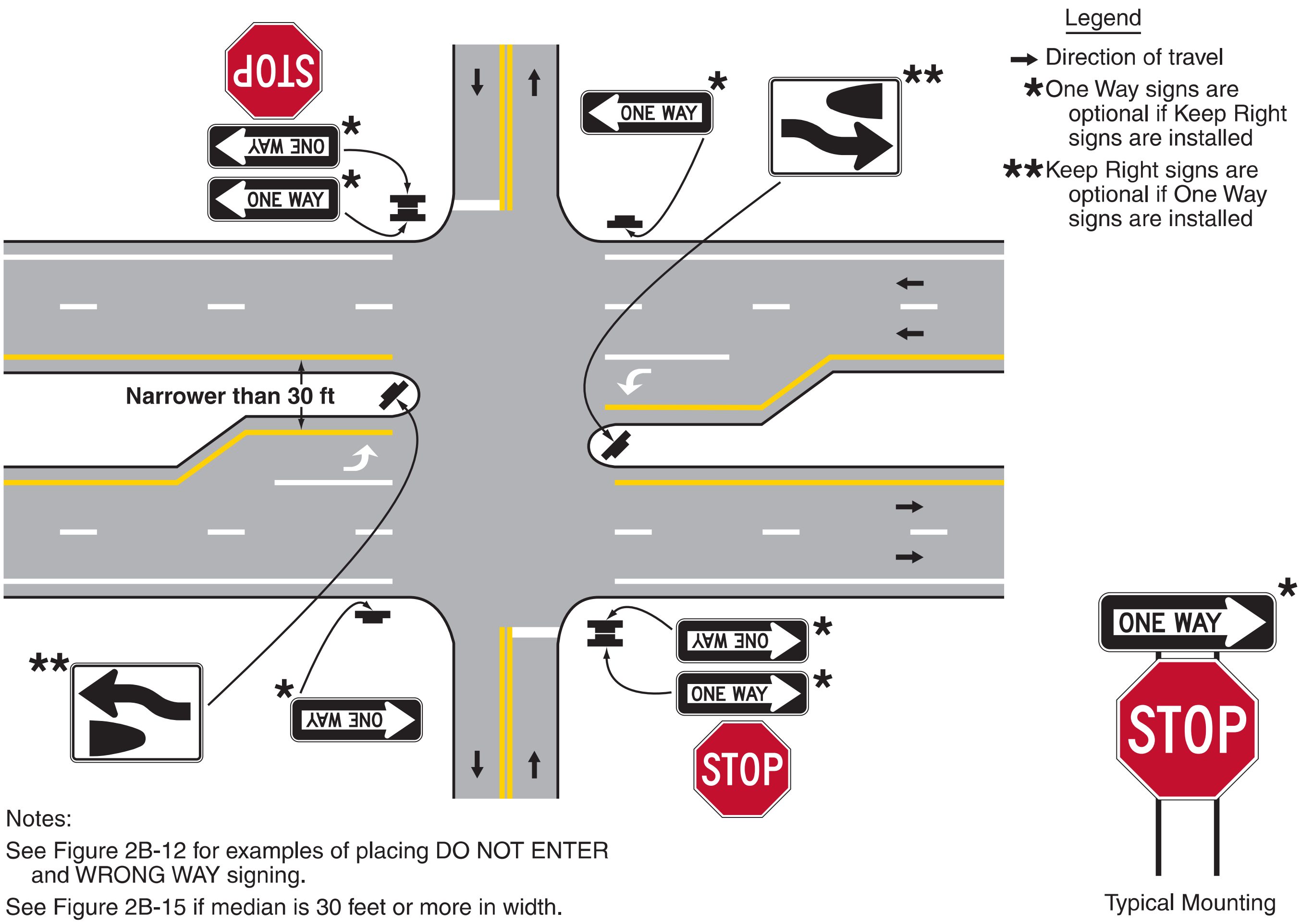
ZAMIA FLORIDANA
COONTIE

JUNIPERUS CHINENSIS 'PARSONII'
PARSON'S JUNIPER

SABAL MINOR
DWARF PALMETTO

CYRILS DRIVE - NARCOOSSEE ROAD TO ABSHER DRIVE
PLANT PALETTE

Figure 2B-16. ONE WAY Signing for Divided Highways with Median Widths Narrower Than 30 Feet



Notes:

See Figure 2B-12 for examples of placing DO NOT ENTER and WRONG WAY signing.

See Figure 2B-15 if median is 30 feet or more in width.

D. Lane-use arrow pavement markings may be placed on the exit ramp and crossroad near their intersection to indicate the permissive direction of flow.

E. Freeway entrance signs (see Section 2D.46) may be used.

Guidance:

04 *On interchange entrance ramps where the ramp merges with the through roadway and the design of the interchange does not clearly make evident the direction of traffic on the separate roadways or ramps, a ONE WAY sign visible to traffic on the entrance ramp and through roadway should be placed on each side of the through roadway near the entrance ramp merging point as illustrated in Figure 2B-19.*

Option:

05 At locations where engineering judgment determines that a special need exists, other standard warning or prohibitive methods and devices may be used as a deterrent to the wrong-way movement.

06 Where there are no parked cars, pedestrian activity or other obstructions such as snow or vegetation, and if an engineering study indicates that a lower mounting height would address wrong-way movements on freeway or expressway exit ramps, a DO NOT ENTER sign(s) and/or a WRONG WAY sign(s) that is located along the exit ramp facing a road user who is traveling in the wrong direction may be installed at a minimum mounting height of 3 feet, measured vertically from the bottom of the sign to the elevation of the near edge of the pavement.

Support:

07 Section 2B.41 contains further information on signing to avoid wrong-way movements at at-grade intersections on expressways.

Meeting Minutes

Date: December 13, 2021

Project: Cyrils Drive Widening

Discussion: Cyrils Biweekly County Meeting

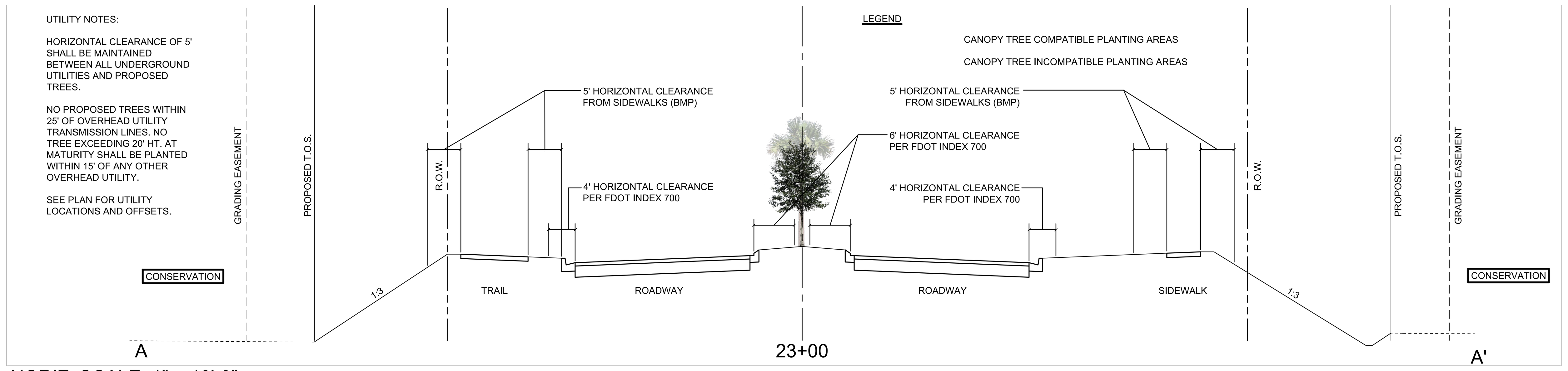
Project No.: 17-042

Attendees:
Steve Kane, Orange County
Carmello Nieves, OUC
Mike Galloway, OUC
Ashleigh Schneider, AAG
Dave Melton,
Christy Baxter, P&B
Alice Brantley, P&B
Richard Bobletz, P&B

This meeting is to coordinate the widening of Cyrils Drive from Narcoossee Road to Absher Road:

- Re-establish survey baseline & control
- OUC utility
    - Low wire is OUC, it is communication 2nd from bottom
- Carmello will be doing lighting for Cyrils. No impact to right-of-way. Needs CAD files for design. All coordination to go through OUC.
- Contact Development Services
- Mike & Carmello to be names on Plans.
- Chuck Easterling
    - Send the poles over for lighting to Carmello.

David Byrnes – Centurylink 407 814 5379 david.r.byrnes@centurylink.com
Ceasar Rivera - Comcast 407 321 5944 ceasar_rivera@comcast.com



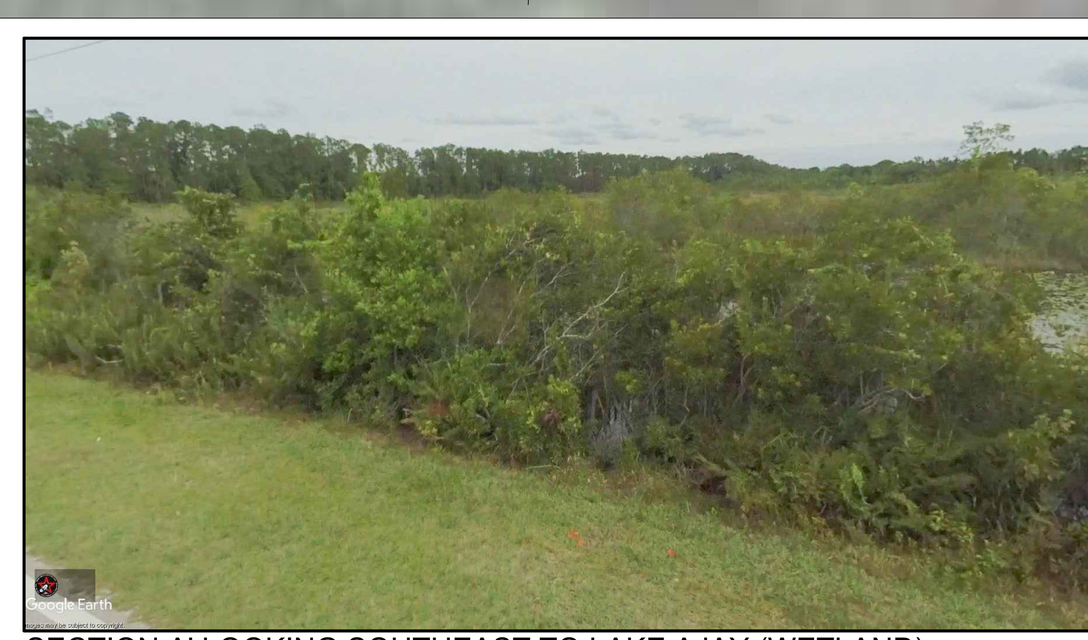
HORIZ. SCALE: 1" = 10'-0"


SECTION A LOOKING NORTHEAST TO LAKE AJAY


SECTION B LOOKING NORTHEAST

EXISTING VEGETATION LEGEND

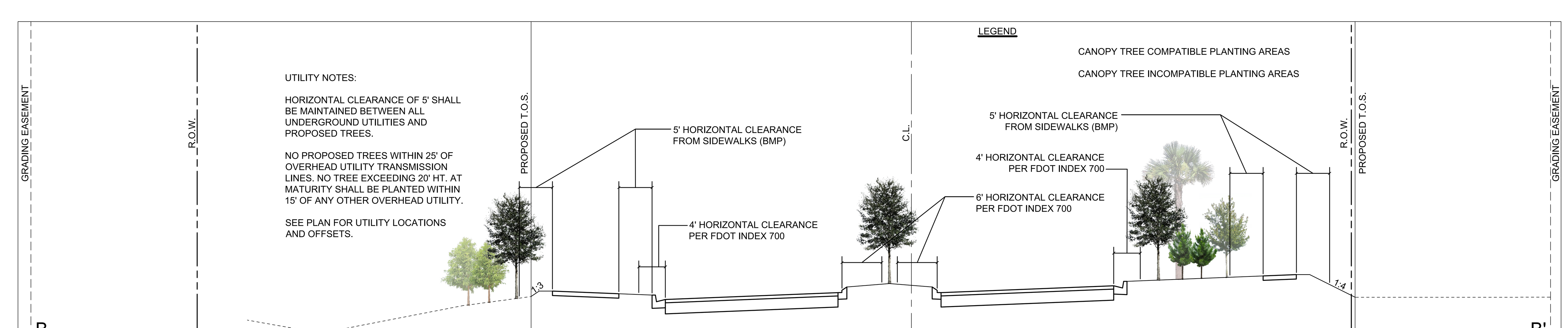
- CONSERVATION AREA - FORESTED UPLAND
- CONSERVATION AREA - WETLAND
- EXISTING TREE CANOPY ON PRIVATE PROPERTY
- RECENTLY PLANTED SUBDIVISION BUFFERS ON PRIVATE PROPERTY
- WETLAND ON PRIVATE PROPERTY


SECTION A' LOOKING SOUTHEAST TO LAKE AJAY (WETLAND)


SECTION B' LOOKING SOUTHEAST

PROPOSED CANOPY TREE LEGEND

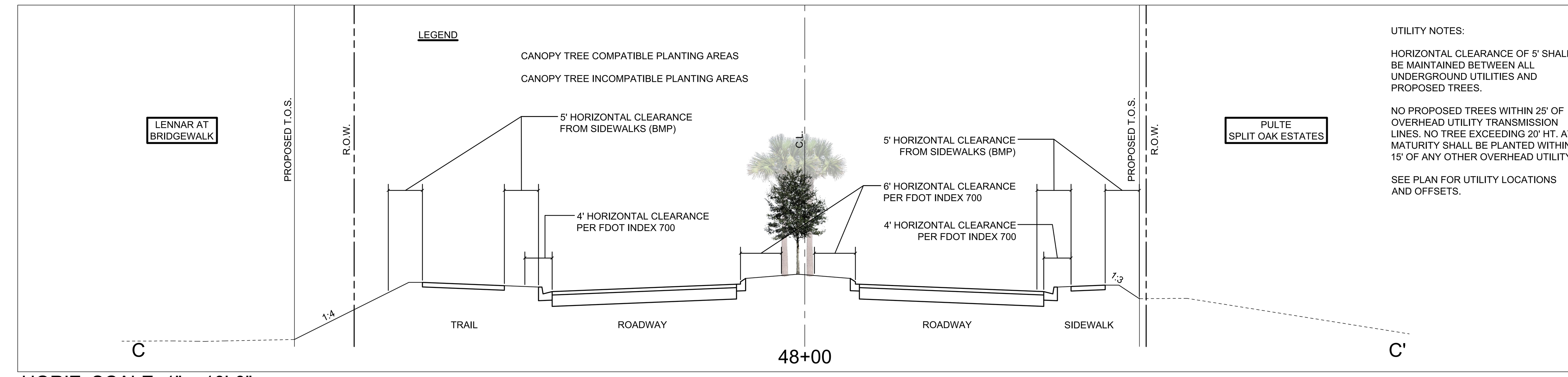
- QUERCUS VIRGINIANA (LIVE OAK)
- ACER RUBRUM 'FLORIDA FLAME' (FLORIDA FLAME RED MAPLE)
- BETULA NIGRA 'DURA HEAT' (DURA HEAT RIVER BIRCH)
- TAXODIUM DISTICHUM SOFINE 'AUTUMN GOLD' (AUTUMN GOLD BALD CYPRESS)
- PINUS ELLIOTTI DENSA (DENSA SLASH PINE)
- SABAL PALMETTO (CABBAGE PALM)



HORIZ. SCALE: 1" = 10'-0"

CYRILS DRIVE - NARCOOSSEE ROAD TO ABSHER DRIVE
CONCEPTUAL CANOPY TREE PLAN

SHEET 1
SCALE: 1" = 60' - 0"
(FULL SCALE AT 36X48)



HORIZ. SCALE: 1" = 10'-0"

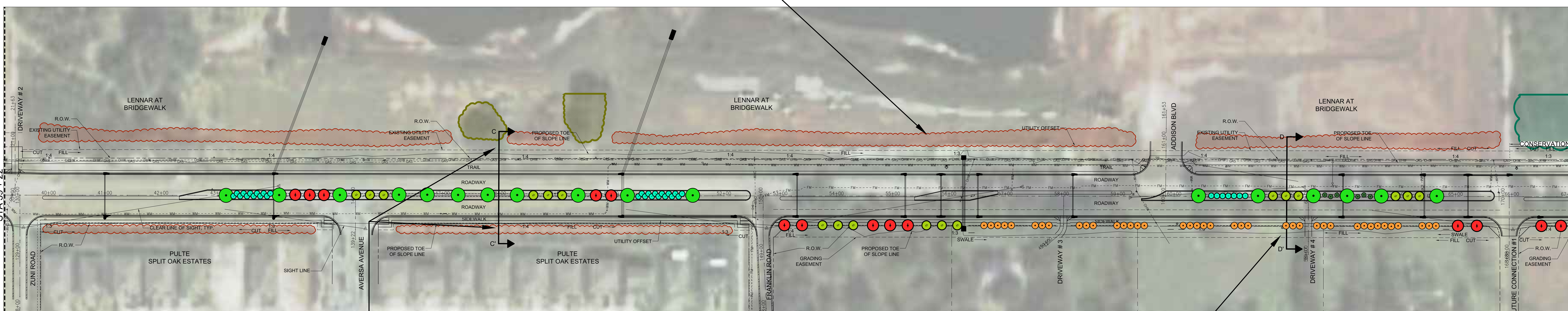
FRONTAGE OF LENNAR AT BRIDGEWALK LOOKING NORTHEAST FROM FRANKLIN RD

EXISTING VEGETATION LEGEND

- CONSERVATION AREA - FORESTED UPLAND
- CONSERVATION AREA - WETLAND
- EXISTING TREE CANOPY ON PRIVATE PROPERTY
- RECENTLY PLANTED SUBDIVISION BUFFERS ON PRIVATE PROPERTY
- WETLAND ON PRIVATE PROPERTY

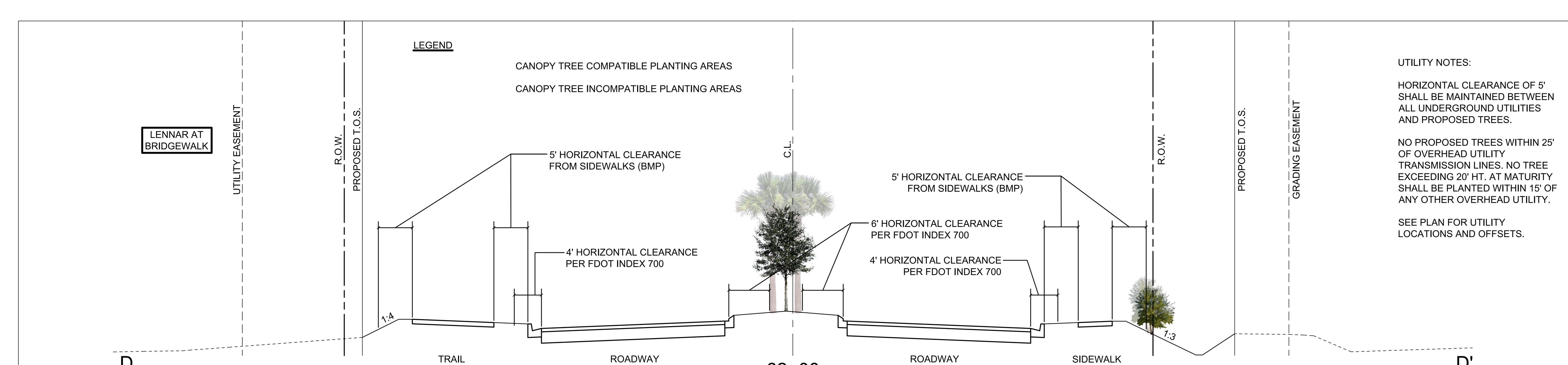
PROPOSED CANOPY TREE LEGEND

- QUERCUS VIRGINIANA (LIVE OAK)
- ACER RUBRUM 'FLORIDA FLAME' (FLORIDA FLAME RED MAPLE)
- BETULA NIGRA 'DURA HEAT' (DURA HEAT RIVER BIRCH)
- TAXODIUM DISTICHUM SOFINE 'AUTUMN GOLD' (AUTUMN GOLD BALD CYPRESS)
- PINUS ELLIOTTI DENSA (DENSA SLASH PINE)
- SABAL PALMETTO (CABBAGE PALM)



SECTION C LOOKING NORTHEAST

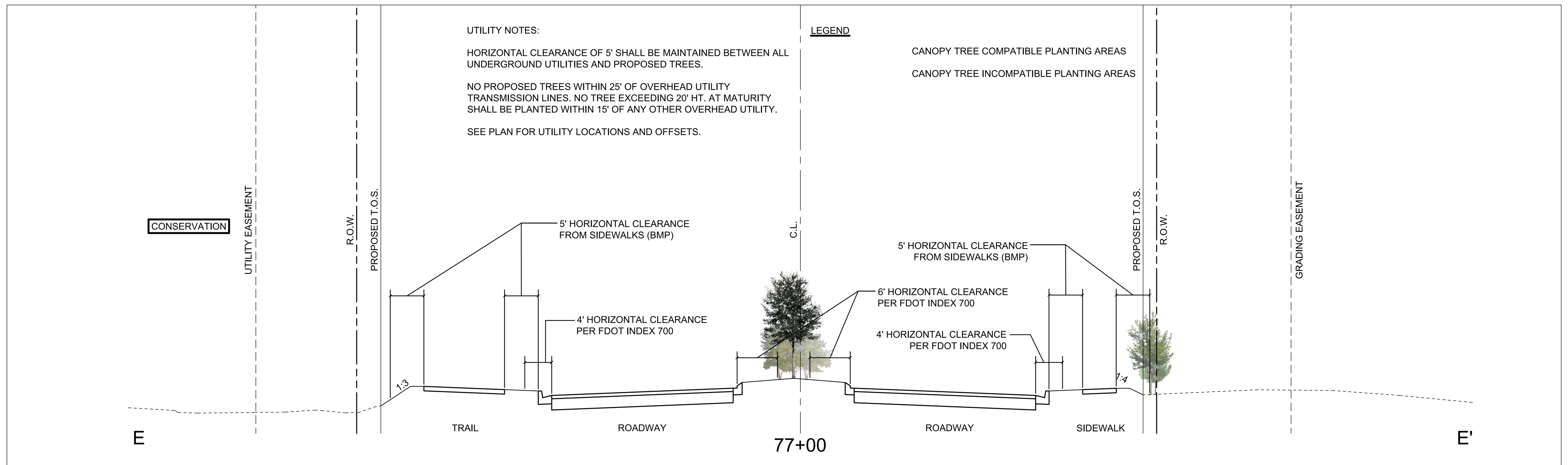
SECTION D' LOOKING SOUTHEAST



HORIZ. SCALE: 1" = 10'-0"

CYRILS DRIVE - NARCOOSSEE ROAD TO ABSHER DRIVE
CONCEPTUAL CANOPY TREE PLAN

SHEET 2
SCALE: 1" = 60' - 0"
(FULL SCALE AT 36X48)



HORIZ. SCALE: 1" = 10'-0"

SECTION E LOOKING NORTHEAST

SECTION F LOOKING NORTHEAST

SECTION E' LOOKING SOUTHEAST

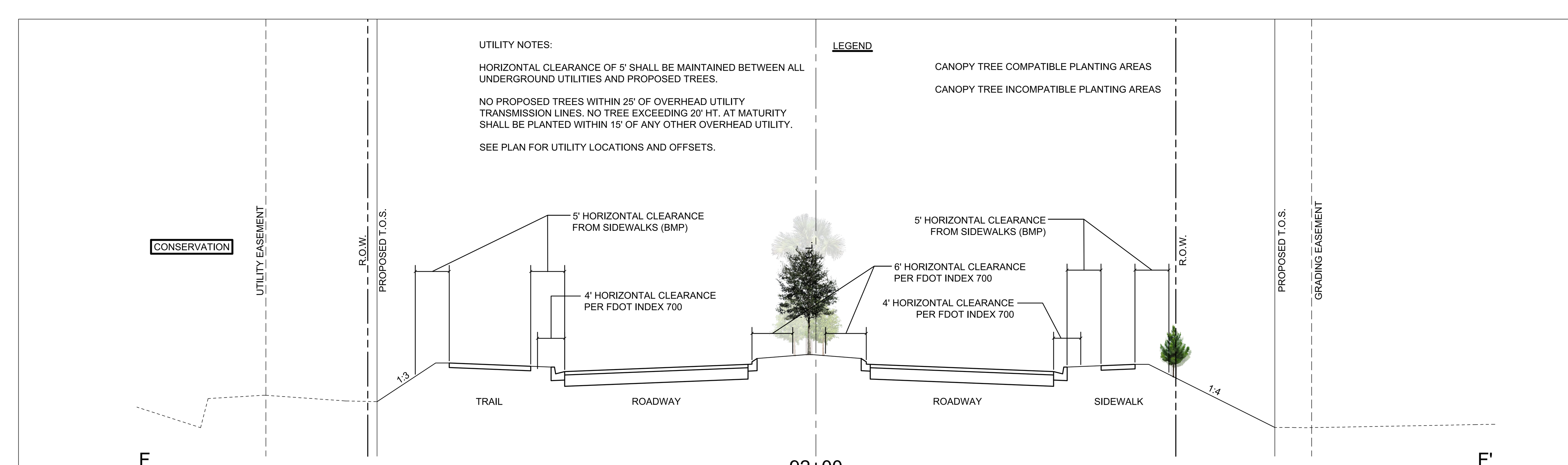
SECTION F' LOOKING SOUTHEAST

EXISTING VEGETATION LEGEND

- CONSERVATION AREA - FORESTED UPLAND
- CONSERVATION AREA - WETLAND
- EXISTING TREE CANOPY ON PRIVATE PROPERTY
- RECENTLY PLANTED SUBDIVISION BUFFERS ON PRIVATE PROPERTY
- WETLAND ON PRIVATE PROPERTY

PROPOSED CANOPY TREE LEGEND

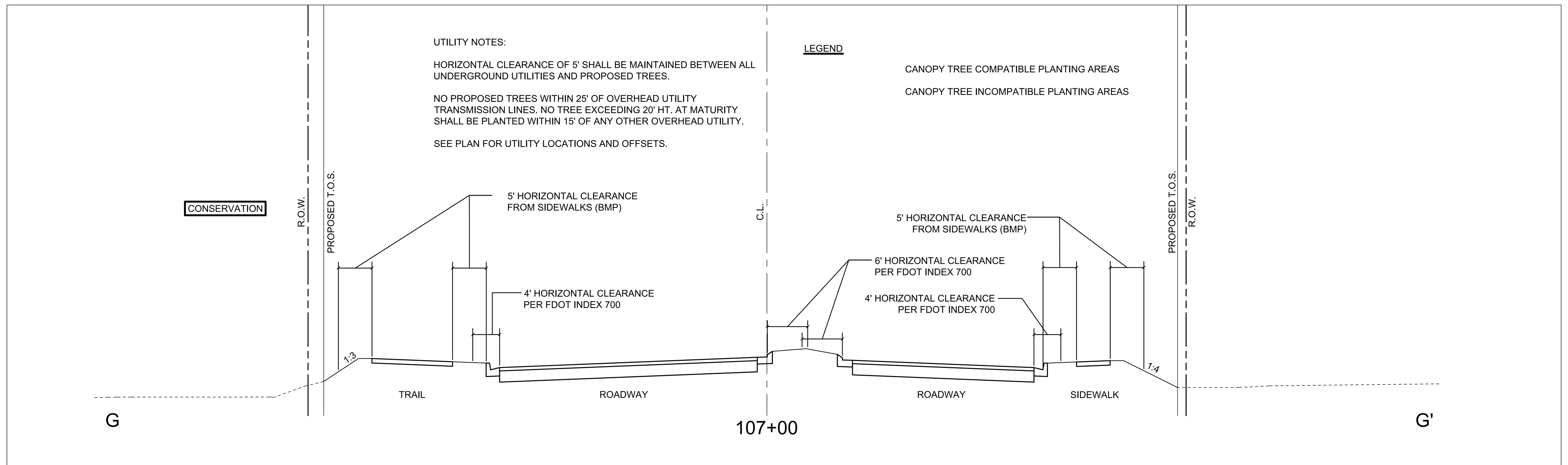
- QUERCUS VIRGINIANA (LIVE OAK)
- ACER RUBRUM 'FLORIDA FLAME' (FLORIDA FLAME RED MAPLE)
- BETULA NIGRA 'DURA HEAT' (DURA HEAT RIVER BIRCH)
- TAXODIUM DISTICHUM SOFINE 'AUTUMN GOLD' (AUTUMN GOLD BALD CYPRESS)
- PINUS ELLIOTTI DENSA (DENSA SLASH PINE)
- SABAL PALMETTO (CABBAGE PALM)



HORIZ. SCALE: 1" = 10'-0"

CYRILS DRIVE - NARCOOSSEE ROAD TO ABSHER DRIVE
CONCEPTUAL CANOPY TREE PLAN

SHEET 3
SCALE: 1" = 60' - 0"
(FULL SCALE AT 36X48)



HORIZ. SCALE: 1" = 10'-0"

SECTION H LOOKING NORTHEAST

EXISTING VEGETATION LEGEND

- CONSERVATION AREA - FORESTED UPLAND
- CONSERVATION AREA - WETLAND
- EXISTING TREE CANOPY ON PRIVATE PROPERTY
- RECENTLY PLANTED SUBDIVISION BUFFERS ON PRIVATE PROPERTY
- WETLAND ON PRIVATE PROPERTY

PROPOSED CANOPY TREE LEGEND

- QUERCUS VIRGINIANA (LIVE OAK)
- ACER RUBRUM 'FLORIDA FLAME' (FLORIDA FLAME RED MAPLE)
- BETULA NIGRA 'DURA HEAT' (DURA HEAT RIVER BIRCH)
- TAXODIUM DISTICHUM SOFINE 'AUTUMN GOLD' (AUTUMN GOLD BALD CYPRESS)
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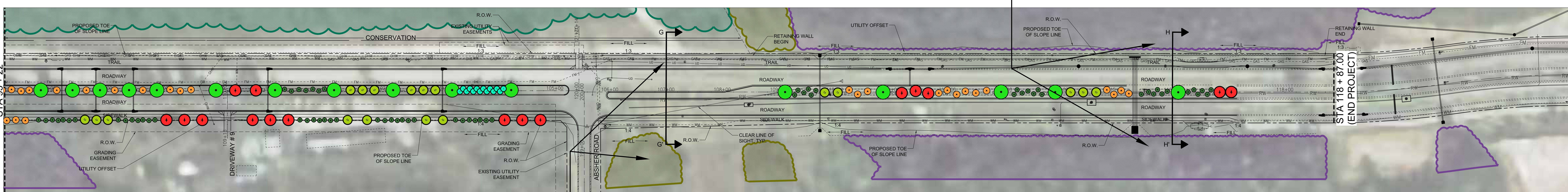
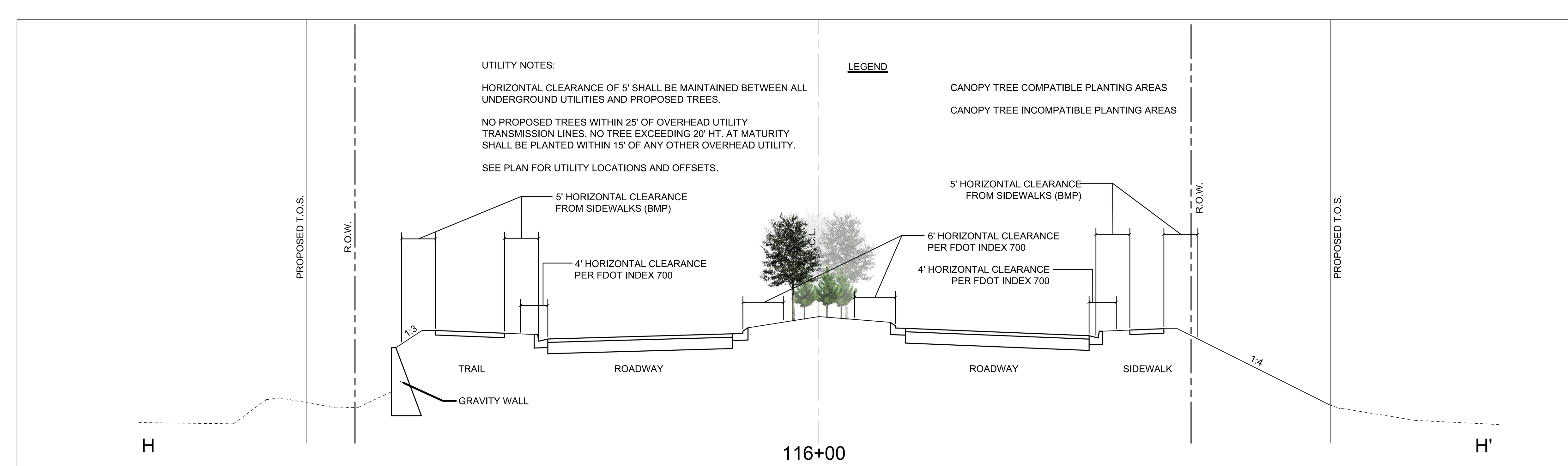


SECTION G LOOKING NORTHEAST



HORIZ. SCALE: 1" = 10'-0"

CYRILS DRIVE - NARCOOSSEE ROAD TO ABSHER DRIVE
CONCEPTUAL CANOPY TREE PLAN

SHEET 4
SCALE: 1" = 60' - 0"
(FULL SCALE AT 36X48)

Meeting Minutes

Date: January 4, 2022

Project: Cyrils Drive Widening

Discussion: Cyrils Biweekly County Meeting

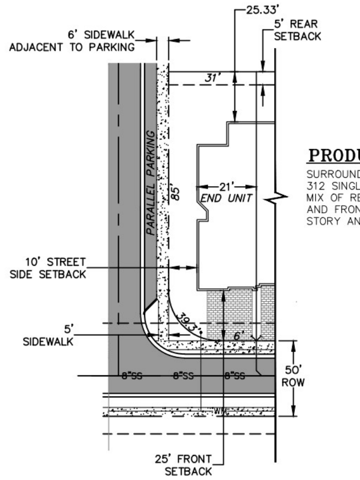
Project No.: 17-042

Attendees:
Steve Kane, Osceola County
Sally Myers, Osceola County
Randy Austin, Austin Environmental
Ashleigh Schneider, American Acquisition Group
Jeremy Crowe, TMC
Stephanie Mandello, TMC
Dave Kelly, P&B
Christy Baxter, P&B
Alice Brantley, P&B
Richard Bobletz, P&B

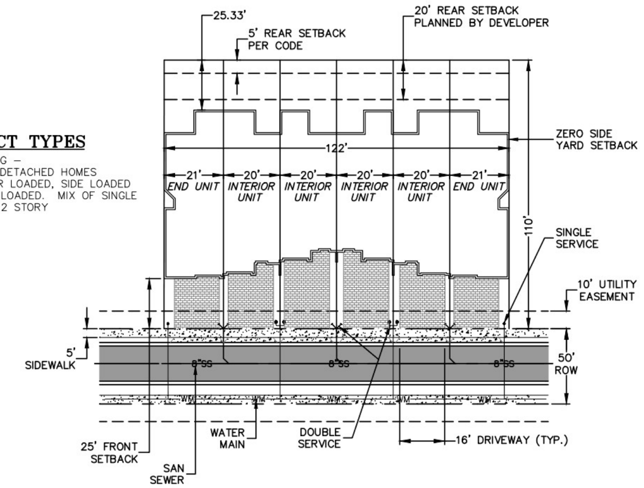
This meeting is to coordinate the widening of Cyrils Drive from Narcoossee Road to Absher Road:

- The Landscaping plans were submitted but no comments yet.
  ACTION ITEM: Steve to request review comments from Richard Keck.
- Maintenance of Traffic
  - Jeremy discussed the status of the MOT
  - Traffic counts have been obtained and the Lane Closure Analysis will be submitted with the 90% plans
  - For the areas of the muck removal, two options were presented.
    - Surcharge the muck. Steve's concern was that this would require additional RW and/or impact the wetlands more than currently anticipated.
    - The second options would be to provide temporary sheet pile wall.
  - Steve preferred the sheet pile wall option. We would need to provide the parameters needed for the contractor to design and construct the sheet pile wall.
  -
- Ashleigh then presented a proposed site plan for the property just east of Franklin. The site plan identified 116' of proposed RW for Cyrils (our plans require 119' of RW).
  ACTION ITEM: Steve will coordinate with Josh and Jose in Development Review to get the property owner to make the proposed RW 119'.
- The State Submerged Lands request was submitted to FDEP. They responded that the person responsible for these has changed. Randy Austin mentioned that they forwarded the request to the new person.

- P&B to send the updated Utility Matrix with the 90% Plans.
- Steve said that we can submit the Landscape plans already submitted with the 90% submittal.
- Steve then mentioned that the Architect for the Weber Albert L property (near the east end of the project) called him to discuss the roadway project and how much RW they needed to dedicate in their plans for a church on the property.
- Ashleigh stated that letters to the landowners will be going out this week.
  ACTION ITEM: Send out Letters to the Landowners
- Ashleigh asked if the property callout for the 827 parcels was correct. Alice stated that the graphic was correct and the matrix was incorrect.
  ACTION ITEM: P&B to update matrix
- Steve stated that Lennar (Borrow Pit) will install portions of the outfall pipes into the borrow pit. Steve mentioned that he is coordinating with Osceola Engineering about the permit fees required and how the application should be split.



TYPICAL CORNER LOT LAYOUT
NOT TO SCALE



TYPICAL LOT LAYOUT
NOT TO SCALE

PRODUCT TYPES
SURROUNDING –
312 SINGLE DETACHED HOMES
MIX OF REAR LOADED, SIDE LOADED AND FRONT LOADED. MIX OF SINGLE STORY AND 2 STORY

SITE DATA

TOTAL AREA = 9.51 ACRES
PROPOSED DEVELOPMENT = TOWNHOMES
PARCEL ID = 28–19–31–300–0100–0000
28–19–31–300–0110–0000
CURRENT ZONING = AC
PROPOSED ZONING = LDR
CURRENT FLU = LDR
PROPOSED FLU = LDR
MINIMUM LOT WIDTHS = 20 FT
MINIMUM LOT DEPTHS = 110 FT
PROPOSED LOTS = 72 LOTS
PROPOSED DENSITY = 7.57 UNITS / ACRE
MINIMUM LOT AREA = 6,000 SF
LOT SIDE SETBACKS = 0 FT
LOT FRONT SETBACK = 25 FT FOR GARAGES
LOT REAR SETBACK = 5 FT / CODE. 20 FT PLANNED
STREET SIDE SETBACK = 10 FT
MAX BLDG HEIGHT = 35 FT (2 STORIES)

DRAINAGE/UTILITY NOTES:

1. WATER, RECLAIM WATER AND SEWER SERVICES TO BE PROVED BY TWA.
2. UTILITY EASEMENTS TO BE DEDICATED TO OSCEOLA COUNTY, ALL UTILTIY LINES WITHIN THE EASEMENT TO BE OWNED AND MAINTAINED BY OSCEOLA COUNTY AND/OR UTILITY PROVIDER.

RECREATION AREA

TOTAL AREA = 9.51 ACRES
REC AREA = 1 ACRE / 50 DU
72 UNITS / 50 = 1.44 ACRES REQUIRED
25% POND AREA
= 1.48 AC X 0.25 = 0.37 ACRES
5,500 SF CLUBHOUSE = 1.10 ACRES
TOTAL = 1.47 ACRES PROVIDED

PARKING SPACES:

3 BEDROOM UNITS:
4.5 PARKING SPACES PER UNIT REQ'D
72 X 4.5 = 324 SPACES REQUIRED

PARKING PROVIDED:

SPACES WITHIN LOTS	(GARAGE & DRIVEWAY)	288	SPACES
8'x20' PARALLEL	(ON–STREET	17	SPACES
10'x18' REGULAR	(PARKING LOT)	29	SPACES
12'x18' ADA (H.C.)	(PARKING LOT)	1	SPACE

TOTAL 335 SPACES PROVIDED

TRACT TABLE

TRACT	SIZE	DESCRIPTION	OWNERSHIP/MAINT.
TRACT A	0.41 ACRES	ROW DEDICATION	OSCEOLA COUNTY
TRACT B	0.38 ACRES	ROW DEDICATION	OSCEOLA COUNTY
TRACT C	1.56 ACRES	ROW	OSCEOLA COUNTY
TRACT D	1.49 ACRES	POND	HOA
TRACT E	0.20 ACRES	OPEN SPACE	HOA
TRACT F	0.03 ACRES	LIFT STATION	HOA
TRACT G	0.10 ACRES	LANDSCAPE BUFFER	HOA
TRACT H	0.10 ACRES	LANDSCAPE BUFFER	HOA
TRACT I	0.04 ACRES	OPEN SPACE	HOA
TRACT J	0.42 ACRES	OPEN SPACE	HOA
TRACT K	0.37 ACRES	OPEN SPACE	HOA
TRACT L	0.29 ACRES	PARKING	HOA
TRACT M	0.27 ACRES	RECREATION/AMENITY	HOA
TRACT N	0.05 ACRES	RECREATION	HOA
	3.80 ACRES	TOWNHOME LOTS	FEE SIMPLE
TOTAL	9.51 ACRES		

OPEN SPACE REQUIRED = 20%
9.51 – TRACTS A&B (.79 AC)
8.72 x 0.20 = 1.74 ACRES

OPEN SPACE PROVIDED:
TRACT D(25%) + TRACTS E, G–K, M, N
1.92 ACRES PROVIDED = 22%

NOTES:
1. SAWCUT EXISTING PAVEMENT AT A CLEAN EDGE AT PAVEMENT CONNECTION AND TIE INTO EXISTING PAVEMENT AND LEVEL ALL FINISH COURSE AS NECESSARY TO MAINTAIN UNIFORM ROADWAY CROWN AND TRAVEL LANES.
2. ALL STRIPING WITHIN COUNTY ROW SHALL BE THERMOPLASTIC PAINT AND ALL SIGNS SHALL BE HIGH INTENSITY SIGNS PER FDOT DESIGNS STANDARDS MANUAL 2018 EDITION AND MUTCD WHICHEVER IS MORE STRINGENT.
3. SITE IS EXPECTED TO BALANCE. NO SIGNIFICANT IMPORT/EXPORT EXPECTED.

GRAPHIC SCALE
50 0 25 50 100 200
(IN FEET)
1 inch = 50 ft.

LEGEND

PROPOSED ROW
PROPOSED DRAINAGE INLET
PROPOSED CURB INLETS
PROPOSED CURB
SITE BOUNDARY LINE
EXISTING EDGE OF PVT
DRAINAGE PIPE
PROPOSED EASEMENT
SAN — SANITARY MAIN
WM — WATER MAIN
RCW — RECLAIM WATER MAIN
FM — FORCE MAIN
STORM MANHOLE
SANITARY MANHOLE
CONCRETE SIDEWALK
(TYP.) TYPICAL — H.C. HANDICAP
S.W. SIDEWALK — U.E. UTILITY EASEMENT
R25' 5' RADIUS — D.E. DRAINAGE EASEMENT
LF LINEAR FEET — DRAINAGE MES
SF SQUARE FEET — FIRE HYDRANT
WATER SERVICE (DOUBLE/SINGLE)
RECLAIM SERVICE (DOUBLE/SINGLE)
SANITARY SERVICE (DOUBLE/SINGLE)

SOILS LEGEND

22 MYAKKA FINE SAND 0 TO 2 PERCENT SLOPES
34 POMELLO FINE SAND 0 TO 5 PERCENT SLOPES
44 TAVARES FINE SAND 0 TO 5 PERCENT SLOPES

SEWER SERVICE DEMANDS							
LAND USE	UNIT	GPD/UNIT	# UNITS	ADD (GPD)	ADD (GPM)	MDD (GPM)	PHF (GPM)
TOWNHOMES	DWELLING UNIT	276	72	19,872	13.8	27.6	55.2

WATER SERVICE DEMANDS							
LAND USE	UNIT	GPD/UNIT	# UNITS	ADD (GPD)	ADD (GPM)	MDD (GPM)	PHF (GPM)
TOWNHOMES	DWELLING UNIT	255.5	72	18,396	12.8	25.6	51.1

SERVICE DEMANDS EACH UNIT

SEWER	1ST BEDROOM	138 GPD
	ADDITIONAL BEDROOMS	69 GPD
WATER	1ST BEDROOM	127.5 GPD
	ADDITIONAL BEDROOMS	64 GPD

SPEED LIMITS

ROAD NAME	POSTED SPEED LIMIT	TYPE	EX ROW	PROP ROW
FRANKLIN ROAD	30	LOCAL ROAD	46.5'	60'
LEON TYSON ROAD	30	LOCAL ROAD	60'	60'
CYRILS DRIVE	45	LOCAL ROAD	60'	116'

TRAFFIC GENERATION

ITE CODE	LAND USE	# UNITS	DAILY		PM PEAK HOUR	
			RATE	TRIPS	RATE	TOTAL
230	RESIDENTIAL TOWNHOMES	72	6.62	477	0.52	38

CALCULATED PER ITE TRIP GENERATION MANUAL, 9TH EDITION

SCHOOL DEMANDS

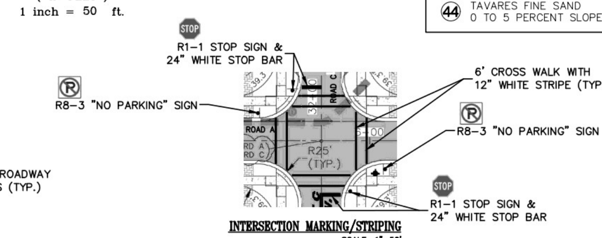
AGE	UNITS	RATE	CHILDREN
ELEMENTARY	72	0.249	18
MIDDLE	72	0.114	9
HIGH	72	0.124	9
			36

SIGN LEGEND

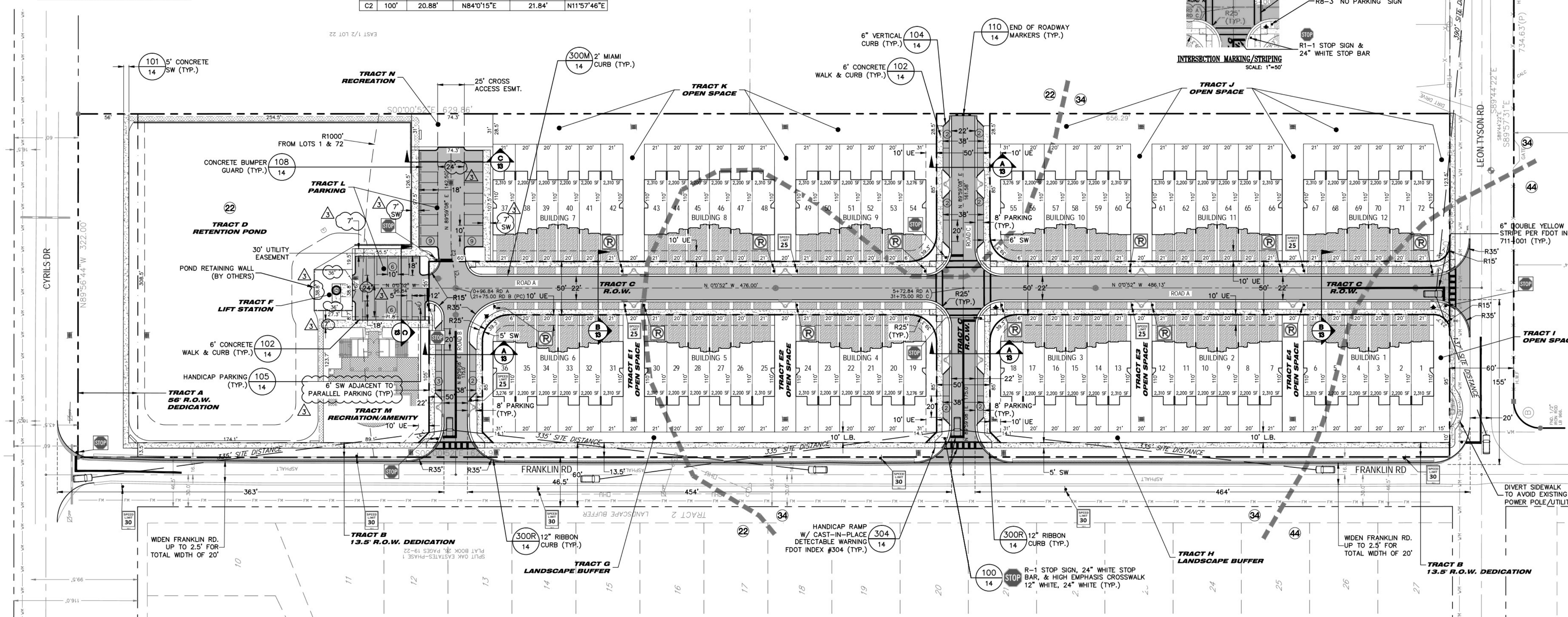
STOP R1–1
R2–1
SPEED LIMIT 25 R8–3

CURVE TABLE

ID	RADIUS	ARC LENGTH	CHORD BEARING	CHORD LENGTH	DELTA
C1	100'	20.88'	N84°0'15"E	21.84'	N11°57'46"E
C2	100'	20.88'	N84°0'15"E	21.84'	N11°57'46"E



INTERSECTION MARKING/STRIPING
SCALE: 1"=50'



SDP20-0126
PS20-00006

CA 30526

CIVIL ENGINEERS
LAND PLANNERS

1614 White Dove Drive
Winter Springs, Florida 32708
Tel: (407) 405-7819
KIM@CYCORPENGINEERS.COM

Project Manager:	K. FISCHER
Engineer:	KTC
Technician:	FCC

FRANKLIN VILLAS

CONSTRUCTION PLANS
OSCEOLA COUNTY

REVISIONS

	Description	Date	By
1	PER TWA/SFWMD/OSCEOLA COMMENTS	1/8/21	KF
2	PER OSCEOLA COUNTY	3/5/21	KF
3	PER OSCEOLA COUNTY	4/15/21	KF

SITE PLAN

Date: SEPTEMBER 2020

Scale: 1" = 50'

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KIM FISCHER LICENSE No. 56942 STATE OF FLORIDA PROFESSIONAL ENGINEER
9/21/20
K. FISCHER, P.E.# 56942
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Sheet Number:

APPENDIX I
MISCELLANEOUS

Richard Bobletz

From: Ricardo Kiriakidis L. Ph.D.,P.E. <rkiriakidis@universalengineering.com>
Sent: Wednesday, August 25, 2021 11:26 AM
To: Richard Bobletz
Cc: 17-042 Cyrils Widening; Megan Dearrigoitia; Alice Brantley
Subject: RE: Cyrils from Narcoossee to Absher

Hello Richard,
Technically if you are more than 2:1 slope away from the pool thee should be no influence. However, if you don't have the clearance or if you are worried about the vibrations, you can always recommend they use a trench box
Let me know

Thanks

Ricardo Kiriakidis L. Ph.D.,P.E.
Geotechnical Department Manager
Orlando Geotechnical

3532 Maggie Blvd
Orlando, Fl 32811
p 407-423-0504 Ext 23126 | f 407-423-3106 | c 407-765-1606

UNIVERSAL ENGINEERING SCIENCES

From: Richard Bobletz <RBobletz@poulosandbennett.com>
Sent: Monday, August 23, 2021 6:19 PM
To: Ricardo Kiriakidis L. Ph.D.,P.E. <rkiriakidis@universalengineering.com>
Cc: 17-042 Cyrils Widening <17-042CW@poulosandbennett.com>; Megan Dearrigoitia <MDearrigoitia@universalengineering.com>; Alice Brantley <abrantley@poulosandbennett.com>
Subject: Cyrils from Narcoossee to Absher

Hi Ricardo, Megan,

For our Cyrils project, there is an existing pool at the SW quadrant of Cyrils and Franklin (see aerial attached).
Per the plan/profile attached, we are showing a 48" RCP that comes close to the pool and is fairly deep (10'+).
Is there anything we should include in the plans to protect the pool when constructing the storm pipe?
Our construction will, of course, stay within the RW. Should we recommend non-vibratory compaction? Any other recommendations?

Thanks.

Richard Bobletz, PE

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