

CFX Contract Number: 001844 CFX Project Number: 429-309

## PRELIMINARY ENGINEERING REPORT

# DANIEL WEBSTER WESTERN BELTWAY SR 429 / BINION ROAD INTERCHANGE PROJECT DEVELOPMENT AND ENVIRONMENT STUDY

Submitted By: Signature

Gregory S. Seidel, P.E. The Balmoral Group, LLC January 31, 2023



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## **1.0 - Project Information**

Project Name:	State Road (SR) 429/Binion Road Interchange	
Projects Limits:	The study area runs along the vicinity of South Binion Road and Boy Scout Road at SR 429. Currently, drivers must enter and exit SR 429 by traveling approximately three miles north to just north of US 441 at the SR 429 Connector Road interchange or travel three miles south to the interchange at Ocoee Apopka Road.	
County:	Orange	
Proposed Activity:	Evaluating a proposed half interchange (northbound on- ramp and southbound off-ramp) expressway connection from Binion Road to SR 429 to provide enhanced access and mobility to southwest Apopka. Analyze intersection improvements and access management modifications along the proposed interchange.	
Responsible Agency:	Central Florida Expressway Authority (CFX)	
Planning Organization:	CFX	
Phase:	Project Development & Environment (PD&E) Study	

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## 1.0 - Project Location Map

## 1.0 - Project Background & Description

## **Background**

In August 2022, CFX began a Project Development and Environment (PD&E) Study of the State Road 429/Binion Road Interchange. The study is evaluating a proposed half interchange (northbound on-ramp and southbound off-ramp) expressway connection from Binion Road to SR 429 to provide enhanced access and mobility to southwest Apopka.

## **Study Description**

The study area runs along the vicinity of South Binion Road and Boy Scout Road at SR 429. Currently, drivers must enter and exit SR 429 by traveling approximately three miles north to just north of US 441 at the SR 429 Connector Road interchange or travel three miles south to the interchange at Ocoee Apopka Road. The 6-month study will analyze intersection improvements and access management modifications along the proposed interchange.

## Study Goals

The goals of the SR 429/Binion Road Interchange PD&E Study include:

- Identify transportation mobility options and programs that could meet future demand.
- Enhance mobility of the area's growing population and economy by providing additional transportation infrastructure.
- Provide consistency with local plans and policies.
- Promote regional connectivity.

## <u>Scope</u>

The CONSULTANT will prepare a **Preliminary Engineering Report (PER)** with the required supporting engineering reports in accordance with the PD&E Manual for review and comment by CFX and the GEC. All data collection and documentation efforts should be performed in accordance with the CFX PD&E Guidance for a Level 1 PEIR.

# 4.0 Engineering Preliminary Engineering Report

## **4.0 – Preliminary Engineering Report (PER)**

## **General Overview**

The purpose of the SR 429 / Binion Road Interchange Project Development and Environment (PD&E) Study is to develop a proposed improvement strategy that is technically sound, environmentally sensitive and publicly acceptable. Emphasis has been placed on the development, evaluation and documentation of engineering and environmental studies including data collection, conceptual design, environmental analyses, project documentation and the preparation of a Preliminary Engineering Report.

The Central Florida Expressway Authority (CFX) is presently evaluating the feasibility to provide an Interchange at Binion Road along SR 429, a strategic transportation investment aimed at supporting existing and future growth in the Apopka area. The primary objectives of this transportation improvement project are to expand regional connectivity in Orange County and accommodate the expected increase in traffic due to population and employment growth within the study area, while being consistent with accepted local and regional plans. As such, the proposed improvements include the construction of a half interchange that provides connection to a re-aligned Binion Road / Boy Scout Road intersection.

An **Existing Conditions Technical Memorandum**, under separate cover, was previously submitted to CFX and reviewed for the project, covering each of the disciplines involved in this PD&E Study.

# 4.C – Roadway Analysis

## 4.C – Roadway Analysis

## **4.C.1 – EXISTING CONDITIONS**

## **Existing Roadway Network**

The existing roadway network under evaluation is comprised of two county roads and one limited access facility. The primary roadways in the study area are detailed below:

- SR 429 six-lane divided expressway providing Orange and Osceola counties with an alternate north-south route to heavily travelled I-4.
- Binion Road (Orange County Road 437) Two-lane, two-way roadway connecting residential subdivisions and single-family homes to other roadway collectors in the area as well as connecting travelers to US 441 in the north and Ocoee Apopka Road in the South. Binion Road crosses over SR 429 just south of the project limits.
- Boy Scout Road (un-numbered County Road) Two-lane, two-way roadway connecting residential subdivisions and single-family homes to Binion Road in the west and Ocoee Apopka Road (CR 437A) in the east. CR 437A is currently in the final planning stages of being widened from Harmon Road to Hawthorne Avenue and will facilitate connectivity to the interchange via Boy Scout Road.

## **Roadway Design Controls**

The design controls are functional classification, context classification, and design speed. These three elements establish the geometric and operational characteristics and criteria of the roadway. The functional classification is based on vehicular travel characteristics and the degree of access provided to adjacent properties. Context Classification establishes design criteria based on environmental conditions and the surrounding land use in order to harmonize the roadway characteristics and features with the intended land uses (i.e. existing and planned). Design Speed is a principal design control that regulates the selection of many of the project standards and criteria used for design. **Tables 1, 2** and **3** list out the classifications and design speed as determined by the consultant using all available data and documentation.

Roadway Name	Urban or Rural	Functional Class	Divided or Undivided
SR 429	Urban	Principal Arterial Expressway	Divided
Binion Road	Rural	Collector	Undivided
Boy Scout Road	Rural	Collector	Undivided

Roadway Name	FDOT Context Class
SR 429	N/A (Limited Access)
Binion Road	C3R Suburban Residential
Boy Scout Road	C3R Suburban Residential

#### Table 2 - Roadway Context Classification

N/A = not applicable; separate criteria for limited access facilities

Roadway Name Design Speed (mph) Posted Speed (mph)					
SR 429	70	70			
Binion Road	50^	45			
Boy Scout Road	50^	45			

#### Table 3 - Roadway Speeds

<sup>^</sup> 50 mph is utilized for Binion Road due to the signalized intersection and the land use transformation to single-family residential land uses.

### **Access Classification**

Under Florida Statutes 335.18 the legislature authorized FDOT to develop rules to administer the "State Highway System Access Management Act". These rules regulate access to the state highway system in order to preserve the functional integrity of the system. FDOT uses seven access classifications numbered one thru seven as defined in Rule 14-97. In general, as the access classification increases so does the number of access points and connections to the facility. On the other hand, speed is inversely related, and as the access classification increases the speed on the facility decreases. **Table 4** lists access classification for the roadways under consideration.

Roadway Name Access Classification				
SR 429	Access Class 1, Area Type 3			
Binion Road	Access Class 4			
Boy Scout Road	Access Class 4			

#### **Table 4 - Access Classification**

## **Existing Roadway Characteristics**

The following sections discuss the characteristics of primary roadways in the study area. SR 429 features were determined using CFX 429-153 Contract Plans. Binion Road and Boy Scout Road features were determined using information and measurements collected from site visits and Orange County's Property Appraisers website. **Tables 5** through **8** summarize the existing roadway characteristics.

Table 5 - Typical Section

Roadway Name	No. of Lanes (Lane Width, ft)	Median Width (ft)	Paved Shldr Width (ft)	Curb and Gutter (Yes or No)	Roadside Ditch/ Swale (Yes or No)	Sidewalk/ Shared Use Path (Yes or No)	Bicycle Facility (Yes or No)	Buffer Width (ft)	Right- of-Way Width (ft)
SR 429	6 (12)	64	10	No	Yes	No	No	N/A	357-903
Binion Road	2 (11)	0	0-7^	No	Yes	Yes	No	20- 60 <sup>^</sup>	80- 120
Boy Scout Road	2 (11)	0	0	No	No	No	No	20	60^

^ Field measurements

## **Pavement Condition**

#### Table 6 - Existing Roadway Pavement Conditions Pavement Type Pavement **Roadway Name Pavement Description** Condition SR 429 Good/Fair Asphalt No discernable improvements Majority of pavement has been **Binion Road** Asphalt Good/Fair resurfaced and/or widened Boy Scout Road Fair/Poor No discernable improvements. Asphalt

## **Horizontal Alignment**

## **Table 7 - Horizontal Alignment**

Roadway Name	Alignment Straight or Curved	Deflection Angle	No. of Curves	Curve Radius (ft)	Curve Length (ft)	Alignment Description
SR 429	Both	N/A	2	4000'	1994.81'	Superelevated e = 0.052
Binion Road	Straight	N/A	0	N/A	N/A	Alignment values based on imagery
Boy Scout Road	Straight	N/A	0	N/A	N/A	Alignment values based on imagery

Notes: Evaluation limits based on proposed concept

## **Horizontal Stopping Sight Distance**

Based on information collected from site visits as well as existing aerial imagery there were no horizontal obstructions to sight distance. There are no known intersection related sight distance issues.

## Vertical Alignment

Roadway Name	Alignment Flat or Rolling	No. of Curves	Max. Grade (%)	Alignment Description
SR 429	Flat	0	0.7%	Grade based on Contract Plans
Binion Road	Flat	0	3.0%	Grades based on 1-ft contours generated from GIS
Boy Scout Road	Flat	0	1.8%	Grades based on 1-ft contours generated from GIS.

#### Table 8 - Vertical Alignment

Notes: Evaluation limits based on proposed concept.

Proposed ramp geometry follows:

- Ramp C; 3.9% maximum grade (FDM Table 210.10.1 maximum grade = 6% for 45 mph)
- Ramp D; 4.5% maximum grade (FDM Table 210.10.1 maximum grade = 7% for 40 mph)

## Vertical Stopping Sight Distance

Based on information collected from the site visit as well as contours generated from GIS there were no existing obstructions to either vertical sight distance or intersection sight distance for existing conditions.

### **Cross Slope & Superelevation**

Field measurements of Binion Road cross slopes vary from 0.3% to 7%. Field measurements of Boy Scout Road cross slopes vary from 1.4% to 2.5%. SR 429 is superelevated at 5.2% within the project limits.

#### Intersections

Only one intersection exists within the study area; Boy Scout Road terminates at Binion Road. Proposed improvements will introduce entrance and exit ramps from SR 429 that will connect with a realignment of the existing intersection. **Table 9** lists the types of intersection configurations and lane types.

Roadway Name	No. of Intersections	Type of Intersection	Unsignalized Intersections	Traffic Control			
SR 429	N/A	N/A	N/A	N/A			
Binion Road	1	T Intersection	Boy Scout Road	No control; no left turn storage lane			
Boy Scout Road	1	T Intersection	Binion Road	Stop Control; Single lane			

#### Table 9 - Intersections

## Crash Data Analysis

Crash data was reviewed for the primary roads identified. The 2017-2022 crash period was selected due to the irregularity of traffic during 2020 as a result of the pandemic. Crash data has been collected from the Signal4 Analytics database. Crash data was evaluated based on environmental conditions, lighting conditions, road surface conditions, severity and frequency, and weather. The results are located in the **Existing Conditions Technical Memorandum**, under separate cover.

## 4.C.2 – PROJECT DESIGN CONTROLS & CRITERIA

The following table outlines the design controls and criteria that were used to develop the proposed concepts and should be utilized during final design. It is expected that the proposed alternatives will require additional refinement to the attached concept plans. An example would be the shoulder width on Ramp D which could increase for stopping sight distance in the bridge and wall sections.

		<u>EXPRESSWAY</u>	
DESIGN ELEMENT	MAINLINE	RAMPS	CROSSROADS/COLLECTORS (BOY SCOUT RD AND BINION ROAD)
HORIZONTAL ALIGNMENT			
A. MAX. CURVE, DEGREES	3° 30'	RAMP C = 10° 15' RAMP D = 13° 15'	8° 15'
B. MAX. SUPERELEVATION	0.10	0.10	0.10 RURAL
DESIGN SPEED	70 MPH	RAMP C = 45 MPH RAMP D = 40 MPH	50 MPH
CREST	506 FDOT	RAMP C = 98 FDOT	84 GREENBOOK
MINIMUM K-VALUE	247 AASHTO	RAMP D = 70 FDOT	
		44 TO 61 AASHTO	
SAG	206 FDOT	RAMP C = 79 FDOT	96 GREENBOOK
MINIMUM K-VALUE	181 AASHTO	RAMP D = 64 FDOT	
		64 TO 79 AASHTO	

	EXPR	CROSSROADS/COLLECTORS		
		244420	(BOY SCOUT RD AND	
	MAINLINE	RAMPS	BINION ROAD)	
CROSS SECTIONS				
A. LANE WIDTHS	12 FT	12 FT DUAL LANES	12 FT LANES	
		15 FT SINGLE LANES		
B. SHOULDER WIDTHS	3-LANE OR MORE	1-LANE RAMP	2-LANE	
RIGHT	12 FT (10 FT PAVED)	6 FT (4 FT PAVED)	8 FT	
LEFT	12 FT (10 FT PAVED)	6 FT (2 FT PAVED)	8 FT	
		2-LANE RAMP		
RIGHT		12 FT (10 FT PAVED)		
LEFT		8 FT (4 FT PAVED)		
BRIDGE		1-LANE RAMP		
RIGHT		6 FT		
LEFT		6 FT		
		2-LANE RAMP		
RIGHT		10 FT		
LEFT		6 FT		
C. CROSS SLOPES				
1. TRAFFIC LANES	2% (4-LANE)	2%	2%	
	3% OR TBD (6-LANE)			
2. BRIDGE LANES	2% TYP. (NO BREAK)			
3. LEFT SHOULDER	5%	5%	2-6%	
4. RIGHT SHOULDER	6%	6%	2-6%	
LATERAL OFFSET	FDM TABLE 215.2.2	FDM TABLE 215.2.2	20 FT - GREENBOOK	
VERTICAL CLEARANCE				
A. OVER ROADWAY	16.5 FT	16.5 FT	16 FT – GREENBOOK	
B. OVERHEAD SIGNS	17.5 FT	17.5 FT	17.5 FT	

## **4.C.3 – DESIGN CONCEPT ALTERNATIVES**

The proposed SR 429 & Binion Road Interchange will form a partial interchange on SR 429, providing access to/from the north only. The ramps will be tolled and terminate at the intersection of Binion Road and Boy Scout Road. Due to right-of-way constraints a concept has been developed in which the southbound SR 429 off-ramp flies over the SR 429 mainline. To accommodate the geometrics for the flyover ramp, Boy Scout Road will need to be realigned to the south as it intersects with Binion Road. Design Concept Alternatives were developed for the ramp terminal intersection at Binion Road: Alternative #1 – Signalized Intersection and Alternative #2 – Roundabout Intersection. Both concepts utilize an offset of the existing Binion Road/Boy Scout Road intersection to allow for the SR 429 northbound on-ramp and southbound SR 429 off-ramp due to Right of Way constraints. **Section 4.H – Traffic Analysis** provides detailed Traffic & Operational Analysis for Intersection Alternative #1 & #2. Both alternatives also depict All Electronic Tolling (AET) points on the SR 429 on/off ramps.

A single-lane flyover is proposed for the southbound SR 429 Off-Ramp (Ramp D) at the proposed interchange of SR 429 and Binion Road. **Section 4.G – Structural Analysis** provides Typical Sections, detailed analysis and cost estimates.

## Alternative #1 - Signalized Intersection

The traditional signal-controlled intersection has been evaluated as shown on **Figure 1**. Binion Road makes use of north and south approaches to the intersection, the eastern approach is Boy Scout Road, and SR 429 on/off ramps utilize the western approach.

The intersection features dedicated left and right turn lanes for the Boy Scout Road approach. Both Binion Road approaches, and the SR 429 off-ramp approach have dedicated left turn lanes.

The estimated cost for Alternative # 1 – Signalized Intersection is \$28.9 Million. A preliminary Engineer's Estimate is provided in **Appendix A** for cost breakdown.



#### Figure 1 - Alternative 1 - Signalized Intersection

## Alternative # 2 - Roundabout Intersection

A roundabout concept was also evaluated, as depicted on **Figure 2**. Roundabouts improve safety by promoting lower speeds and reducing conflict points. Rural intersection crashes tend to result in severe injuries due to high speeds and roundabouts are known to reduce crashes (68% overall reduction and 88% reduction in injury crashes.

A Single-Lane Roundabout alternative with a 148' inscribed circle diameter and an 18' circulatory roadway width has been evaluated. Binion Road makes use of north and south legs of the roundabout, the eastern leg is Boy Scout Road, and SR 429 on/off ramps utilize the western leg. A slip-lane is recommended for the SR 429 Off-Ramp access to the roundabout which will provide free-flow access to southbound Binion Road and mitigate traffic backups onto the SR 429.

The estimated cost for Alternative # 2 – Roundabout Intersection is \$28.1 Million. A preliminary Engineer's Estimate is provided in **Appendix B** for cost breakdown.





## 4.C.4 - PREFERRED ALTERNATIVE

The Preferred Alternative is addressed in the Level 1 PEIR, under separate cover.

## 4.D - Drainage

## 4.D. - Drainage

## **4.D.1 – EXISTING CONDITONS**

## Hydrology

The study area, shown on **Figure 3**, consists of open basins part of the Lake Fuller Outlet and Pumping Station Watershed that are within the jurisdiction of the St. Johns River Water Management District (SJRWMD) and ultimately discharge west to Lake Apopka. The project is located within the Marshall Lake Drain WBID 2854 and Zellwood Farms WBID 2841 neither of which are listed as impaired. The study area is also within the Lake Apopka Hydrologic basin and is required to meet additional criteria related to total phosphorous loads in post development discharge. In lieu of any phosphorous loading criteria the CFX 429-153 project was able to follow Outstanding Florida Water (OFW) criteria and it will need to be verified during the design phase if the same applies for this project. Permitting for this section of SR 429 has historically been coordinated through the Florida Department of Environmental Protection (FDEP).

Along SR 429, the project limits fall within one 32.10 acre (ac) open basin, Basin 201-A. Basin 201-A includes SB and NB SR 429 and extends from south of the Binion Road overpass, to just north of the bridge that goes over Lust Road. Basin 201-A is mainly comprised of open channels and a closed storm sewer system that conveys runoff to Pond 201-A. Pond 201-A discharges north to Floodplain Compensation Pond 1 (FPC-1). Pond 201-A, an online dry retention facility, and FPC- 1 were originally constructed in 2006 as part of the 429 SR 414 (Maitland Boulevard) extension and SR 429 realignment, CFX Project No. 429-201, and permitted under FDEP Permit 262296-001 for the six-lane condition. Pond 201-A, is proposed to be modified under CFX Project No. 429-153, where SR 429 is proposed to be widened from West Road to SR 414 to the six-lane condition. Pond 201-A was designed but not permitted for the required 4.36 ac-ft for the 8-lane condition and will be constructed to provide 6.64 ac-ft of water quality treatment. As part of the 429-153 project, Pond 201-A is being lowered a foot and underdrain is proposed to help with recovery. Pond 201-A is currently under construction. During a field visit performed September 20, 2022 the existing condition of the outfall structure, and Pond 201-A was unable to be verified and will likely be altered per the construction. The structures and pipes that were outside of the construction zones along SR 429 and Boy Scout Road and that were able to accessed appeared to be in good working condition.

East of SR 429, west of Binion Road, and south of Boy Scout Road runoff sheet flows northeast along Binion Road and across Boy Scout Road. North of Boy Scout Road and between SR 429 and Binion Road is currently under residential construction for both the Binion Reserve, south of the BFE 68.9 FT NAVD 88 floodplain, and Ivy Trails, north of the same floodplain. Both developments discharge to dry retention treatment ponds that ultimately discharge to the floodplain. The BFE 68.9 FT NAVD 88 floodplain located between SR 429 and Binion Road is upstream of CD-1.

Runoff from Binion Road on the east side sheet flows offsite without treatment to the BFE 69.1 FT NAVD 88 floodplain on the east side of Binion, with the crown of Binion Road being the drainage divide.



### Figure 3 – Study Area Conditions

South and north of Boy Scout Road and east of Binion Road is the location of the planned development of The Ridge PD. The permitted but unconstructed 336.8 ac site consists of seven parcels that will be developed in three phases for residential, multi-family, office, commercial, industrial, and Lake/Recreational land uses. The stormwater system will consist of seven dry retention ponds and two wet detention ponds. Dry retention Pond P-6 is located at the southeast corner of Binion Road and Boy Scout Road and is a potential joint-use treatment facility. See the following **Table 11** for a Summary of the Existing Treatment Facilities.

Treatment Facility	Treatment Method	Treatment Criteria	Basin Area (ac)	Required Treatment (ac-ft)	Provided Treatment (ac-ft)	Discharge Location	Special Criterial	Comments
Pond 201A	On-Line Dry Retention with Underdrai n	1.25" Over Impervious Area + 0.5" Over Drainage Basin for On- line	32.10	3.84 for 6- lane condition and 4.36 for future 8- lane condition	6.64	Floodplain Comp 1	Lake Apopka Basin (Additional 50% of on- line TV for OFW)	Permitted under FDEP 262296-001
P-6	Dry Retention	4" Over Drainage Basin for Lake Apopka	29.01	9.67	12.92	Existing Residential home on the north side of Boy Scout Rd – Ultimately the 69.1 BFE FT NAVD 88 floodplain	Lake Apopka Basin	Permitted under SJRWMD 171240-1 (not yet constructed)

## **Table 11 - Summary of Existing Treatment Facilities**

Existing FDEP and SJRWMD Permits for the project corridor were researched to obtain stormwater and environmental design information. These are summarized in **Table 12**.

Project Name	Permit No.	Date Issued	Description
SR 414 (Maitland Blvd) Ext (US 441 to SR 429) & SR 429 Realignment	FDEP 262296- 001	12/15/2006	Ponds Designed for the 6-lane condition. Permit covers 429-201, 429-200, 414-210 and 414-211
CFX 429-153: 429 Widening from West Road to SR 414 - Stormwater Conveyance	FDEP 253197- 002- El	6/23/2021	An individual permit that authorized the stormwater conveyance system to route the runoff from two additional lanes to the existing SWMS.
Ivy Trails (Transfer)	SJRWMD 169565-3	7/8/2022	Individual Permit; Currently Under Construction;
Binion Reserve	SJRWMD 147625-3 (Transfer)		Pending RAI Response; Individual Permit; Currently Under Construction; 19.2 AC residential, single-family subdivision development
The Ridge PD – Mass Grading	SJRWMD 171240-1	3/1/2022	Individual Permit; Construction and operation of a stormwater management system for a 337.20 AC project

## Table 12 - ERP Summary

## Floodplains

The Federal Emergency Management Agency (FEMA) has determined the 100-year floodplain limits in the vicinity of the project limits in the form of Flood Insurance Rate Maps (FIRM). In **Figure 3**, the 100-year floodplain limits are presented from Orange County Unincorporated Areas panel 12095C012H and the City of Apopka panel 12095C012OH, both effective 9/24/2021. The 100-year floodplain crosses the SR 429 right-of-way in the location of the cross drain that connects the floodplain on either side of the road. At this location, the existing culvert conveys runoff from east to west to Lake Apopka. On the upstream end of CD-1 the established Base Flood Elevation (BFE) is 68.9 FT NAVD88. The downstream end of CD-1 discharges directly into FPC-1. The same FPC-1 that Pond 201-A discharges to. An 18" and 24" pipe connects FPC-1 to the 100- year floodplain Zone AE on the west side of the project, where the BFE is 68.3 FT NAVD88. FPC-1 is permitted to compensate for the impacts from the 429-201 project where the seasonal high- water level was determined to be 64.00 FT NAVD88 and the BFE at the time was 69.09 FT NAVD88. There are no regulatory floodways within the study corridor.

## 4.D.2 - DRAINAGE DESIGN CRITERIA

Stormwater management for water quality treatment and runoff attenuation will be evaluated using existing and proposed dry retention stormwater management facilities. Floodplain compensation estimates used the cup-for-cup method. The design of the stormwater facilities will comply with the standards set forth by CFX, SJRWMD, FDEP, Orange County, City of Apopka, and FDOT. Several existing permits and previous hydraulic studies were used to assist in making assumptions to establish the Seasonal High Ground Water Table (SHGWT), 100-year floodplain elevations, and existing on-site storage and treatment.

It is suggested that the Pre-Application meeting is held early in the design phase to confirm methodology and applicable criteria for finalizing pond and floodplain compensation design prior to developing final roadway geometry.

## **Treatment Volume**

As previously stated the project corridor is within the SJRWMD. Since the FDEP typically follows the water management district's criteria, SJRWMD will govern. The required dry retention treatment volume is considered the greater of 1) one-half inch of runoff over the drainage area or 2) the total runoff of 1.25 inches times the impervious area. (For on-line retention an additional one-half inch of runoff from the drainage area over that volume specified for off-line treatment is required.

Because all of the project ponds indirectly discharge to Lake Apopka Outstanding Florida Water (OFW) criteria needs to be met. An additional fifty percent of the required treatment volume must be provided.

## Attenuation

Offsite discharge rate is limited to rates not causing adverse impacts to existing offsite properties, and: a) Historic discharge rates; or b) Rates determined in previous Agency permit actions; or c) Rates specified in District criteria. The project is an open basin and the local government criteria using the 25-year/24-hour storm event with Orange County distribution will govern. (Section 13.2 SJRWMD ERP Applicant's Handbook Volume II).

## 4.D.3 – DESIGN CONCEPT ALTERNATIVES

The alternatives for the 429-309 project introduces a new SR 429 southbound off-ramp, Ramp D, that is proposed through the existing permitted Pond 201-A and the existing floodplain compensation pond (FPC-1). The intersection connection to Boy Scout Road cuts through *The Ridge* PD's Proposed Pond P-6. A preliminary drainage analysis was performed to determine if the impacted existing facility can accommodate the additional area brought to the pond. A Ramp D typical section that consists of barrier wall and MSE wall on either side of the ramp for a width of 31 feet was utilized for the analysis. The proposed drainage patterns will follow the existing/historic drainage patterns as close as possible.

Pond locations outside of the Limited Access (LA) right-of-way (R/W) have been identified and are shown on **Figure 4**. These locations are being coordinated with the City of Apopka.



Figure 4 – Pond Locations Outside LA R/W

## Basin 201-A

The northbound SR 429 on-ramp (Ramp C) and northbound SR 429 off-ramp (Ramp D) will add an additional 1.23 acres of additional area and 3.05 acres of additional impervious area to Basin 201-A. Proposed Basin 201-A extends to the ramp terminus at South Binion Road. A preliminary routing analysis was performed and for the purposes of comparison, the FLMOD distribution was used to compare to the results of the 429-153 project. The analysis was based on no modifications being made to Pond 201-A and the Pond 201-A outfall structure, outside of the reduction of storage from Ramp D going through the Pond. The 6-lane condition (currently under construction) was analyzed in addition to the 8-lane condition.



#### Figure 5 – Proposed Interchange Ramp Location

The following summary tables show that the peak stage of the pond for the 25-year 24-hour storm event is greater than a foot below the top of berm for the 6-lane condition and 3.4 feet below the low edge of pavement elevation of 77.07 FT NAVD88 along SR 429. The Ramp D proposed profile should be looked at during the Design Phase in relation to the peak stages as it is was assumed that all of Ramp D would be brought to Pond 201-A. The post-development discharge for the 6-lane and 8-lane condition is less than the pre-permitted discharge and the required treatment volume for the proposed and future 8-lane condition is provided. The 8-lane condition does not consider future impacts to the Pond 201-A from widening to 8-lanes. A recovery analysis for either condition was not performed. The existing underdrain layout is impacted by the proposed Ramp D and would need to be revised to meet recovery. See **Figure 5** above and the following summary **Tables 13 & 14**.

			TUNIC	19. 9411114	y or water	Quality	cutiliti				
		429-153 Permitted Conditions					429-309				
Pond	Facility Type	Basin Area (AC)	Curve Number 6-Lane 8-Lane	Required Water Quality Volume 6-Lane 8-Lane (AC-FT)	Water Quality Volume Provided when construction is complete (AC-FT)	Total Volume Provided in Pond when construction is complete (AC-FT)	Basin Area (AC)	Curve Number 6-Lane 8-Lane	Required Water Quality Volume 6-Lane 8-Lane (AC-FT)	Water Quality Volume Provided (AC-FT)	Total Volume Provided in Pond (AC-FT)
Pond 201-A	On-line Dry Retention with Underdrain	32.1	73.3 83	3.84 4.36	6.64	16.64	33.33	77 86	4.61 6.09	6.35	15.87

### Table 13: Summary of Water Quality Treatment for Pond 201-A

### Table 14: Summary of Routing Analysis for Pond 201-A

			429-153 Pei	mitted Condition		429-309			
Pond	Facility Type	Peak Stage (25YR-24HR) FT NAVD 88 6-Lane 8-Lane	Peak Stage (100YR-24HR) FT NAVD 88 6-Lane 8-Lane	Pre-permitted outflow to tailwater (25YR-24HR) CFS	Post-permitted outflow to tailwater (25YR-24HR) CFS 6-Lane 8-Lane	Peak Stage (25YR-24HR) FT NAVD 88 6-Lane 8-Lane	Peak Stage (100YR-24HR) FT NAVD 88 6-Lane 8-Lane	Inflow to Tailwater (25YR-24HR) CFS 6-Lane 8-Lane	Back of Top of Berm FT NAVD 88
Pond 201-A	On-line Dry Retention with Underdrain	73.28(1) 73.75(2)	73.98(1) 74.38(2)	20.25(3)	8.65(2)	73.64 74.12	74.34 74.69	7.79 11.82	75.00
1 Found from	m rocroating 10	DD model and	running docign c	torm avant					

1. Found from recreating ICPR model and running design storm event

2. Per the SR 429 Widening from West Road to SR 414 100% Drainage Design Report dated May 2021

3. Per the 429-153 Stormwater Report the pre-development peak discharge rate was taken from SR 429/414 Maitland Blvd Extension 429-201 Stormwater

Management Report dated April 2011. (I-485 M&N Report)

## **Floodplains**

Impacts to the 100-year floodplain pond, FPC-1, are anticipated from the construction of Ramp D. Floodplain encroachments should not cause adverse impact will either be mitigated for in floodplain compensation sites and treatment/attenuation pond sites or calculations will be provided showing no increase to the floodplain elevations. Using the stage storage provided in the 429-153 project for the floodplain compensation pond, it was determined there would be a reduction in storage from 64.00 FT NAVD88 to 68.3 FT NAVD88 (the current BFE) of 2.64 AC-FT.



Adding a wall, as shown in the Figure 6, on the western end of the floodplain compensation pond reduces the impacts in storage to only be 0.74 AC-FT. Additional floodplain mitigation locations within the existing Limited Access (LA) R/W were not identified as part of this analysis.



#### Figure 6

## 4.D.4 - PREFERRED ALTERNATIVE

The Preferred Alternative is addressed in the Level 1 PEIR, under separate cover.

## 4.E – Utilities & Railroad Analysis

## 4.E – Utilities & Railroad Analysis

## 4.E.1 – UTILITY & RAILROAD ASSESSMENT OVERVIEW

## **Railroad Facilities**

There are no railroad facilities within the study area or in close proximity to the study area.

## **Purpose of Utility Assessment**

This Utility Assessment has been assembled to provide information on existing and planned utilities within the study limits. This assessment contains information on the names of utility companies, aerials denoting the location of major existing and proposed facilities, descriptions of the identified utilities, project coordination efforts, potential impacts, and, where known, information on the cost of relocation.

## **Existing Roadway Facilities**

There is a mixture of roadways with different functional classifications within the project study area. Listed below are the local roadways within the project study area affected by the different build alternatives:

Binion Road is a two-lane undivided roadway in Orange County, and is oriented North-South. There are several large residential subdivisions connecting to Binion Road and several single-family residential homes. Within the study limits, Boy Scout Road intersects Binion Road at a T-intersection. Just south of Boy Scout Road is a bridge over the CFX owned and maintained SR 429. Binion Road is currently being widened for operational improvements which include a right turn auxiliary lane and a left turn storage lane at Boy Scout Road. Existing right-of-way is being maintained.

Boy Scout Road is a two-lane undivided roadway in Orange County, and is oriented East-West. The roadway terminates at its westerly end with Binion Road and at its easterly end with Ocoee Apopka Road. Several single residential homes connect to the road and one large subdivision is also connected. Improvements are scheduled for Boy Scout Road to provide a left turn storage lane at Binion Road. Existing right-of-way is being maintained.

### **Proposed Roadway Improvements - Alternative Alignments Analysis**

The proposed SR 429 & Binion Road Interchange will form a partial interchange on SR 429, providing access to/from the north only. The ramps will be tolled and will terminate at the Binion Road and Boy Scout Road intersection. Due to right-of-way constraints on SR 429, a concept was developed in which the southbound ramp flies over the SR 429 mainline. To accommodate the geometrics for the flyover ramp, Boy Scout Road will need to be realigned to the south as it intersects with Binion Road. Two configurations were developed for the ramp terminal intersection at Binion Road: a signalized and a roundabout intersection (see **Figures 8 & 9**). Each of the alternatives would require relocation of utilities along the new Boy Scout Road alignment, and the Preferred Alternative will determine the utility relocation requirements, based on the type of intersection preferred. The utility impacts and intersection-related utility relocations will be determined at Final Design and will be coordinated with the identified Utility Agency.





## **4.E.2 – EXISTING CONDITIONS**

## **Existing Utility Agency Owner (UAO) Assessment**

The UAO's in the study area were determined using a variety of sources. First, a Sunshine 811 Design Ticket was made to identify the utility providers and operators registered in the area. Next, a site visit was performed to visually identify marked utilities and the providers. These utility providers were then contacted to establish the proper personnel to assist with locating and identifying existing and planned utilities in the area. Lastly, plans, permits and/or mapping of the utilities were requested for review including any right-of-way or easement agreements along the affected corridors. UAO dispositions will be requested and documented at a later date as part of the design phase for this project. Cost and scheduling estimates associated with any relocation efforts will be documented as part of the design phase. The UAOs identified on the project are summarized in **Table 15**. The responses and other correspondence from the UAOs are provided in the **Utility Assessment Technical Memorandum**, under separate cover. A description of all existing and planned utilities per UAO is listed below.

Utility Owner	Contact	Email/ Phone	FACILITIES	
CenturyLink	TBD	relocations@lumen.com	Buried Copper (Telephone)	
City of Apopka	Vladimir Simonovski	vsimonovski@apopka.net	Reclaimed Water, Water, Sewer	
Duke Energy Distribution	TBD	defdistributiongov@duke-energy.com	Electric	
Lake Apopka Natural Gas District	Mingo Colon	mcolon@langd.org	Gas	
MCI	Tim Cole	timothy.cole@verizon.com	Fiber, Communication Lines	

Table	15 -	List	of	Utility	Contact	Information
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## CenturyLink

CenturyLink has facilities on Binion Road and Boy Scout Road. They have an underground copper line for telephone service. Along Binion Road, their service line is located on the west side of the road. There is also a crossing just south of Boy Scout Road. Along Boy Scout Road, the service line runs on the south side, and has several crossings that service the residential homes and subdivisions.

## Lake Apopka Natural Gas District (LANGD)

LANGD has facilities along Binion Road. They have a 6" Poly Gas Main located on the east side of the road. A crossing exists on the east leg of Boy Scout Road. A 10" steel casing is proposed around the 6" gas main at the SR 429 overpass as well as just beyond the overpass for both directions. Installation began November 11, 2022.

## **City of Apopka**

Within the study area, the City of Apopka Public Works owns and maintains the water, sewer and reclaimed water facilities. Along Binion Road, the water line is a 16" DIP, and the sewer line is a 12" PVC. Both are located on the east side of the road. The reclaimed water line varies from a 30" PVC, 30" DIP, and 36" DIP, and is located on the west side of the road. The water and sewer lines cross just north of the SR 429 overpass and run adjacently with the reclaimed water line under the SR 429 to the south. Similarly, the water and sewer line and reclaimed water line also run east along Boy Scout Road, the reclaimed water line is a 16" PVC, and the sewer line is an 8" PVC. Both lines are located on the south side of the road. Operational improvements are planned for both Binion Road and Boy Scout Road which will add left turn storage lanes and right turn auxiliary lanes at the intersection. Public works have begun to relocate utilities within the existing right-of-way and have moved the utilities immediately adjacent to the right-of-way as part of the planned roadway improvements.

## **Duke Energy (Distribution)**

Duke Energy is the electric service provider for this area. They have aerial and underground facilities on both Binion Road and Boy Scout Road. Along Binion Road, service poles carry overhead electric lines and are located on the west side of the road. There is also underground electric on the west side that crosses Binion Road just north of the intersection. Along Boy Scout Road, service poles and overhead electric exist on the south side of the road. These facilities service nearby residential homes using both aerial and ground transformers. These service points would need to be addressed prior to any relocation efforts.

### MCI

MCI has facilities along Binion Road and Boy Scout Road. For the most part MCI shares Duke Energy's service poles. Their facilities start at the intersection and continue northward and eastward. They have an underground crossing through the intersection which run between pull boxes and ultimately lead to the risers attached to the service poles. Future relocation efforts involving MCI are dependent on Duke Energy's relocations.

## 4.E.3 – UTILITIES ASSESSMENT

### **Utility Impacts**

Given the build alternatives, utility relocation is anticipated for all five utility providers. Cost and scheduling as well as any UAO dispositions and agreements pertaining to the relocation of any facilities will be further investigated as part of the design phase for this project. An estimated relocation length of each utility is included in the cost estimate. Listed providers in **Table 15** should be contacted as part of the ongoing utility coordination efforts.

## **4.F – Environmental Analysis**

## **4.F - Environmental Analysis**

## **4.F.1 – EXISTING CONDITONS**

A review was conducted of existing conditions related to Environmental Resources for the project. The full **Environmental Assessment Technical Memorandum** can be found under separate cover.

### Wetlands and Other Surface Waters

An assessment of wetlands and surface waters was conducted within the project study area utilizing the 2014 St. Johns River Water Management District (SJRWMD) Florida Land Use Cover and Forms Classification System (FLUCFCS) and the National Wetland Inventory (NWI) GIS datasets. The project study area contains five (5) potential wetlands, primarily adjacent to SR 429 (**Figure 10**). Due to the hydrologic connections of the onsite wetlands, these wetlands may fall under the jurisdiction of the SJRWMD and FDEP.

## Water Resources

There are no aquatic preserves or Outstanding Florida Waters (OFWs) within the project study area. A review was conducted of existing conditions related to natural resources for the project. The project will meet all applicable SJRWMD criteria related to water quality. The project is currently a non-federal action receiving no federal monies; therefore, concurrence from the EPA is not required according to the Safe Drinking Water Act. Best Management Practices (BMPs) to control erosion, sediment release, and storm water runoff to minimize adverse impacts on surface water resources will be implemented during design, permitting and construction. Determination has been made that there are no USACE retained waters (**Figure 10**).

## **Floodplains**

Approximately 23 acres of the  $\pm$ 156-acre project site (14.7%) are classified as being within the Federal Emergency Management Agency (FEMA) Flood Zone AE, within the Special Flood Hazard Areas, where an established Base Flood Elevation (BFE) has been determined (**Figure 11**). The remaining approximately 133 acres of the project site are classified as being within FEMA Flood Zone X, areas of minimal flood hazard. There are no FEMA Regulatory Floodway within the project study area (**Figure 11**).


Figure 10 - National Wetlands Inventory



Figure 11 - FEMA Flood Map

### 4.G - Structures Analysis

### **4.G – Structures Analysis**

### **4.G.1 – EXISTING CONDITONS**

There are three existing bridges within the project limits:

- Bridge No. 750731 Binion Road over SR 429
- Bridge No. 750733 NB SR 429 over Lust Road
- Bridge No. 750732 SB SR 429 over Lust Road

Bridge information pertinent to the study was compiled from National Bridge Inventory Data and field verified. A description of each bridge is provided below.

### Binion Road over SR 429 (Bridge No. 750731)

The existing bridge was constructed in 2012 and consists of two spans with prestressed concrete girders and a concrete deck superstructure. Span lengths consist of 174.9 feet and 176.5 feet for a total length of 351.4 feet. The vertical clearance over SR 429 is 17.375 feet. The conceptual plans for Ramp D of the new Interchange would provide vertical clearance of approximately 20 feet over SR 429. The existing bridge provides two travel lanes with shoulder and sidewalk on each side. The sidewalk is separated from the travel lanes and shoulder by a barrier wall. The total width of the deck from edge to edge is 54.5 feet. The inspection report dated October 2018 states that the bridge has a sufficiency rating of 98.3. The inspection report also indicated that the deck, superstructure, and substructure have an overall rating of Very Good (8 out of 9).

### NB SR 429 over Lust Road (Bridge No. 750733)

The existing bridge was constructed in 2012 and consists of a single span with prestressed concrete girders and a concrete deck superstructure. The total length is 78.4 feet. The vertical clearance over Lust Road is 17.25 feet. The existing bridge carries NB traffic on SR 429 with three travel lanes and inside and outside shoulders. The total width of the deck from edge to edge is 59.1 feet. The inspection report dated January 2017 states that the bridge has a sufficiency rating of 97.6. The inspection report also indicated that the deck, superstructure, and substructure have an overall rating of Very Good (8 out of 9).

### SB SR 429 over Lust Road (Bridge No. 750732)

The existing bridge was constructed in 2012 and consists of a single span with prestressed concrete girders and a concrete deck superstructure. The total length is 78.4 feet. The vertical clearance over Lust Road is 18.16 feet. The existing bridge carries NB traffic on SR 429 with three travel lanes and inside and outside shoulders. The total width of the deck from edge to edge is 59.1 feet. The inspection report dated January 2017 states that the bridge has a sufficiency rating of 97.6. The inspection report also indicated that the deck and superstructure have an overall rating of Good (7 out of 9) and Very Good (8 out of 9) for the substructure.

### 4.G.2 – STRUCTURES ANALYSIS & COST ESTIMATE

### **Structures - Ramp D**

The southbound off ramp at the proposed interchange of SR 429 and Binion Road is a single-lane flyover with the following typical section: 6-ft wide inside and outside shoulders and one 15-ft wide lane. The design is a 2-span continuous, curved and skewed, steel girder bridge with an overall bridge length of 307 ft along the bridge centerline. The minimum radius for the bridge is 713 ft and can be accommodated utilizing steel I-girders or steel box girders.



Figure 12 - Ramp D Bridge Typical Sections

The following **Table 15** provides data for both the I-girder and box girder structure option.

Ramp D Preliminary B	ridge Design Inforr	Comments	
Length	307	ft	from Ramp D profile sheet
Width	29.67	ft	from typical section and FDM 260. (2) 1.33 ft wide traffic barriers
Structure Depth	5.0	ft	Assumes 2-span continuous bridge ~ 153.5 ft each. Follows AASHTO Table 2.5.2.6.3-1 for continuous girder - rounded to nearest ft
Total Area	9107.46	SF	
I- Girder Cost per Sqft	\$ 230.00	USD/SF	Cost based on SDG 9.3 - Steel Girder - High Range
Box Girder Cost per Sqft	\$ 276.00	USD/SF	Cost based on SDG 9.3 - Steel Box Girder - High Range with 15% increase for curved alignment
I-Girder Bridge Cost	\$ 2,094,716.26	USD	
Box Girder Bridge Cost	\$ 2,513,659.51	USD	

Table 15 - SR 429 Ramp D Preliminary Bridge Design Information

## 4.H - Traffic Analysis

### **4.H – Traffic Analysis**

### 4.H.1 – BACKGROUND

As part of the 2045 Central Florida Expressway Authority (CFX) Master Plan stakeholder outreach efforts, the City of Apopka asked CFX to consider a new interchange on SR 429 connecting to Binion Road. In early 2021, the City of Apopka reviewed a new 365-acre mixed-use development project called The Ridge at Lake Bronson, located between Ocoee Apopka Road and Binion Road near the system-to-system interchange of SR 429, SR 414, and SR 451. The City also has 29 other recently approved and planned developments within the vicinity of the SR 429 corridor. These developments will increase population, employment, and traffic in the area. A direct access to SR 429 is expected to reduce congestion on local roads and relief adjacent interchanges. The proposed interchange is located less than a mile north of SR 414 in west Orange County. It will include ramps to and from the north of SR 429 only, that will terminate at the Binion Road and Boy Scout Road intersection.

In Summer 2022, CFX initiated a Project Development and Environment (PD&E) study for the proposed partial interchange. This Project Traffic Analysis Memorandum is prepared to support the PD&E study. It provides existing conditions data, future traffic forecasts, and operational analysis results for the 2022 existing, 2025 opening and 2045 design year conditions.

The detailed Traffic Analysis Memo and data is provided as **Appendix C**.

### 4.H.2 – EXISTING CONDITIONS

### Signalization

As SR 429 is a limited access facility there are no existing signals or intersections located within the study area.

Currently the intersection of Binion Road and Boy Scout Road is a 3-way unsignalized intersection. The intersection is currently controlled by a STOP sign (R1-1) located on the eastern leg on the intersection, Boy Scout Road.

### **Traffic Signs**

Within the study area along SR 429 there is one (1) overhead sign structure (structure no. 75A141) that includes one (1) guide sign that provides advance information for the lane assignment at the approaching SR 414/SR 429 interchange (**Figure 13**). In addition, there are two (2) existing multi post signs on SR 429. Currently, there are no existing regulator or overhead signs within the vicinity of the project limits along Binion Road.

#### Figure 13 - Traffic Sign Inventory



### Traffic – Crash Data

Crash data is provided in the **Existing Conditions Technical Memorandum**, under separate cover.

### **Roadway Facilities**

### SR 429

SR 429 is a north-south, limited-access tolled facility that forms a portion of the belt route system around the Orlando metro area. This facility begins at I-4 to the south, close to Champions Gate, and ends at US 441 to the north in South Apopka. SR 429 is designated as Wekiva Parkway north of US 441. The final link in the Central Florida Beltway - the extension of the Wekiva Parkway - is being built in stages by CFX and FDOT. The Wekiva Parkway extension is scheduled to be completed in 2023. CFX owns and operates most of the existing SR 429 corridor, including the segment within the project location. FTE owns and operates the portion of SR 429 from I-4 to Seidel Road.

The SR 429 mainline south of Ocoee Apopka Road and north of US 441 has two 12-foot lanes and 10-foot inside and outside shoulders in each direction. The segment between Ocoee Apopka Road and SR 414 has two 12-foot lanes, one auxiliary lane, and 10-foot inside and outside shoulders in each direction. From SR 414 to US 441, the SR 429 mainline has three 12-foot lanes and 10-foot inside and outside shoulders in each direction. The posted speed limit within the study area is 70 mph. SR 429 forms a diamond interchange with Ocoee Apopka Road, a system-to system connection with SR 414 and a diamond interchange with US 441 via a connector road.

### **Binion Road**

Binion Road is a two-lane, undivided rural collector which runs north-south. It serves mostly residential uses. It starts on the west side of Ocoee Apopka Road, runs north, and ends at the intersection with Pickford Circle/Lake View Drive. The posted speed limit within the study area is 40 mph.

### **Boy Scout Road**

Boy Scout Road is an east-west local road that terminates at Binion Road at a T-intersection. It is a two-lane road with a posted speed of 45 mph within the study area.

### **Existing Traffic Data and Operations**

Traffic volumes for SR 429 at Forest Lake mainline plaza and tolled ramps at Ocoee Apopka Road for 2022 were obtained from transaction data. Traffic data for non-tolled ramps were obtained from the Florida Traffic Online web application. Traffic data for Binion Road was obtained from the Orange County Traffic Counts web application for 2021. To calculate the 2022 existing Annual Average Daily Traffic (AADT) and peak hour volumes, an analysis was conducted for the daily counts and the four highest consecutive 15-minute periods in the morning and evening. Seasonal and axle adjustment factors were applied to the data where necessary. Growth rates estimated from historical data were used where applicable. A summary of the 2022 existing traffic and LOS indicated that there are no capacity concerns in the area under existing conditions.

The analysis also provides the final 2022 existing year peak hour volumes in the AM and PM conditions at the Binion Road and Boy Scout Road intersection. Typical peak hour traffic is low at the intersection. The results show that all movements are currently operating at an acceptable LOS C or better in both the AM and PM peak hours.

### 4.H.3 – FUTURE TRAFFIC CONDITIONS ANALYSIS

### **Traffic Forecasts**

The data shows that traffic will primarily be diverted from the Ocoee Apopka Road and US 441 ramps to/from the north of SR 429 to the proposed Binion Road ramps. A small diversion is expected from the SR 414 ramps to/from the north and there will be a small amount of induced trips due to the proposed ramps.

Generally, the 2045 DDHV at the Binion Road and Boy Scout Road intersection are expected to be low in the future during typical peak hours, even with the new SR 429 ramps to and from the north.

### **Ramp Terminal Intersection Analysis Alternatives**

The proposed SR 429 and Binion Road interchange will form a partial interchange on SR 429, providing access to/from the north only. The ramps will be tolled and will terminate at the Binion Road and Boy Scout Road intersection. Due to right-of-way constraints on SR 429, a concept was developed in which the southbound ramp flies over the SR 429 mainline. To accommodate the geometrics for the flyover ramp, Boy Scout Road will need to be realigned to the south as it intersects with Binion Road. Two configurations were developed for the ramp terminal intersection at Binion Road: a signalized and a roundabout intersection.

The detailed concepts were used for analysis of Alternative 1 for the signalized intersection (**Figure 14**) and Alternative 2 for the roundabout intersection (**Figure 15**). The proposed configuration for the roundabout includes a right-turn bypass lane for the SR 429 off-ramp and a wide circulatory lane and apron to properly accommodate trucks.



Figure 14 - Alternative - Proposed Lane Geometry & Storage Lengths



Figure 15 - Alternative 2 - Proposed Lane Geometry & Storage Lengths

### **Future Intersection Operations Analysis**

Future operations analysis was conducted for the proposed Binion Road and Boy Scout Road/SR 429 Ramps intersection alternatives using the 2025 and 2045 design hour volumes to verify operations in the opening and design years.

The results show that all movements are expected to operate at an acceptable LOS C or better in 2025 for the signalized intersection alternative and LOS A for the roundabout alternative. The overall LOS is B for the signalized intersection and A for the roundabout intersection. In the 2045 design year, all movements are expected to operate at an acceptable LOS C or better for both the signalized and roundabout intersection alternatives. The overall LOS for the intersection is also C or better. Although traffic operations are similar for both alternatives, delays are lower for the roundabout when compared to the signal. The roundabout alternative also has fewer conflict points and is deemed safer than the signalized alternative.

### 4.H.6 – TRAFFIC ANALYSIS CONCLUSION

The proposed SR 429 and Binion Road partial interchange is being considered to provide new access by adding ramps to and from the north. The Binion Road interchange will provide additional local access between SR 414 and US 441 and allow trips that need to navigate the local street system to access SR 429 to points north including US 441, SR 46, and the Wekiva Parkway. The analysis showed that traffic will primarily be diverted from the Occee Apopka Road and US 441 ramps to/from the north of SR 429 to the proposed Binion Road ramps. A small diversion is expected from the SR 414 ramps to/from north and there will be a small amount of induced trips due to the proposed ramps.

Two intersection configurations were developed for the ramp terminal: a signalized and a roundabout intersection. Both intersection alternatives are expected to operate at an acceptable LOS C or better in the 2045 design year. However, the roundabout alternative has fewer conflict points and is deemed safer than the signalized alternative. Both intersection configurations were presented to the City of Apopka and CFX for feedback on a preferred alternative.

# 4.I - Lighting Analysis

### 4.I – Lighting Analysis

### **4.I.1 - EXISTING CONDITIONS**

Existing roadway lighting is located north of the existing S. Binion Road bridge. The existing lighting located along SR 429 within the study area includes ten (10) lighting poles with the following characteristics: 50' standard light poles with HPS Cobra Heads.

Currently, there is no existing roadway lighting along Binion Road or Boy Scout Road.

### 4.I.2 - ROADWAY LIGHTING ANALYSIS

Based on the data and the analysis performed, roadway lighting is automatically warranted for the proposed on/off ramps.

Per Section 231.4 of the FDOT Design Manual (FDM), interchanges that are on the interstate highway system must be lighted to assure consistency and to meet driver expectations. Since all the existing interchanges along SR 429 are already lighted, the driver expectation is that the proposed Binion interchange would also be lighted. Additionally, roadway lighting can reduce the apprehension of drivers using the elevated exit ramp and provide a better delineation of the proposed on/off ramp. Due to the shape of the proposed elevated ramp under deck lighting should be reviewed and coordinated during the design phase.

### **Alternative 1 – Signalized Intersection**

For added safety the signalized intersection should be lighted to meet the latest edition of the FDOT Green Book design values. Transition lighting is implemented to allow the drivers' eyes to adjust from the non-illuminated to the illuminated ramps and intersection. This gradual lighting adjustment is accomplished by adding additional light poles for approximately 200-ft past the signalized intersection. The design team will have to coordinate with the City of Apopka if the City will be willing to maintain the proposed lighting system at the signalized intersection.

A preliminary Cost Estimate is included in **Appendix A**.

### Alternative 2 – Roundabout Intersection

Per Section 213.11 of the FDM, roadway lighting is required for the circulatory roadway of the roundabout and at least 200-ft in advance of the splitter islands. The proposed roadway lighting will improve visibility for drivers approaching the roundabout and provide advance visibility of the key conflict areas to improve users' perception of the layout and other users of the roundabout.

A preliminary Cost Estimate is included in **Appendix B**.

## 4.K - Intelligent Transportation Systems Analysis

### **4.K Intelligent Transportation Systems (ITS) Analysis**

### **4.K.1 - EXISTING CONDITIONS**

The ITS configuration along SR 429 includes backbone Fiber Optic Cable (FOC) and electrical service wires that are buried on the southbound shoulder for the entire limits of the analysis area. There is a single ITS device located at MM 31.4 that includes closed circuit television (CCTV) and two Microwave Vehicle Detection System (MVDS) devices, as shown on **Figure 16**.

Currently, there are no ITS devices located along Binion Road or Boy Scout Road.



Figure 16

### 4.K.2 - INTELLIGENT TRANSPORTATION SYSTEMS (ITS) ANALYSIS

To increase the safety of the traveling public, the SR 429 southbound off ramp and northbound on ramp proposed ITS infrastructure will include ITS equipment consistent with CFX's overall ITS vision for the future. The safety aspect of ITS equipment consists of its ability to monitor traffic and provide incident management and travel information to travelers within SR 429. The future design team should consider the following ITS elements for the proposed SR 429 and Binion Road interchange:

**Wrong-Way Vehicle Detection and Warning Equipment**: The wrong-way driving equipment includes wrong-way LED warning system that gives wrong-way drivers a visible real-time indication prior to entering the CFX roadway system. When activated, the wrong-

way signs flash with high intensity LEDs. The wrong way driving system utilizes radar and an HD camera to detect, analyze and confirm oncoming or outgoing vehicles. When an event occurs, the information collected sends an alert notification and event package containing a configurable sequence of images, video and other data to the local Regional Transportation Management Center (RTMC) so that the RTMC can deploy the necessary safety protocol. The proposed system will monitor the SR 429 off ramp 24 hours a day without interfering with other traffic detection systems. The Wrong Way equipment is included in the provided cost estimate.

**Data Collection Sensor (DCS)**: DCS's are used in travel time analysis by the detecting transponders located in the traveling vehicles. The DCS will be installed at the on/off ramps and will collect accurate travel time information to be disseminated to the traveling public via existing DMS signs. Installing DCS at the on/off ramps is an effective way to control traffic congestion by analyzing and predicting traffic flow.

**Traffic Monitoring Sites (TMS)**: TMS are proposed at all ingress and egress points of the SR 429 to provide vehicular traffic data consisting of vehicle volume and speed. With detailed stats on driver speeds, CFX will be better equipped to ascertain which roads need further speed control devices or traffic enforcement and which road drivers tend to obey speed limits on.

**Power Distribution System and Fiber Connections**: For this study it was assumed one power service per HUB location will be needed. The future design firm shall be responsible for verifying the proposed locations and determining available power sources and voltages needed to operate all the proposed ITS equipment. Additionally, it will be necessary to coordinate with Utility Companies for the power connection. Disconnects, service meters and 6" thick maintenance pads are to be installed at all locations. The CFX fiber infrastructure mainly runs along the east side of the roadway adjacent to the right-of-way line. The design team will have to design the connections between the existing fiber line to the proposed ITS elements.

The Preferred Alternative may result in impacts to some of the existing ITS System along SR 429 and will require replacement or relocation of the existing CCTV and TMS equipment located at MP 31.4.

An ITS Cost Estimate is included as Appendix D.

## **4.L - Geotechnical Analysis**

**Preliminary Engineering Report** 

### **4.L – Geotechnical Analysis**

### 4.L.1 - EXISTING CONDITIONS

Available documents, the USGS Quadrangle Map, the NRCS Orange County Soil Survey and current plans were reviewed. The full evaluation can be found in the **Existing Conditions Technical Memorandum**, under separate cover.

- Ground surface topography varies from + 115 to +70 feet NGVD in the project area
- The south portion of the project previously contained citrus groves.
- Citrus groves are currently present southwest of SR 429.
- Near surface soils range from well drained Type A sand soils (soil types 4, 5, 6 and 47) to poorly drained Type D muck soils (soil types 25 and 42).
- The muck soils were likely removed for the SR 429 construction and were present from approximately Stations 575 to 585 along SR 429.
- Groundwater depth varies considerably from about + 70 to + 105 feet NGVD.
- Plastic clay layers are present underneath the sands and groundwater generally is perched on top of the relatively impervious clay soils.
- Project location is in a Karst or sinkhole prone environment.
- Geotechnical considerations include exploration for highly compressible organic muck soils, evaluation of variable groundwater conditions and deep Standard Penetration Test (SPT) borings for bridge foundation design.
- Bridges should be supported on a deep driven pile substructure due to Karst environment and likely high Factored Loads required.
- Dry stormwater ponds may be feasible depending on pond location, the presence of the clay confining layer and groundwater levels.
- Plastic and muck subsoil removal may be required depending on final roadway grades.

### 4.L.2 – GEOTECHNICAL ANALYSIS

A Contamination Screening Evaluation Technical Memorandum is provided in the Environmental Assessment Technical Memorandum, under separate cover.

# **Appendix A – Cost Estimate – Alternative** 1 – **Signalized Intersection**

#### ENGINEER'S ESTIMATE CFX Project No. 429-309 SR 429 / BINION ROAD INTERCHANGE

ITEM	DESCRIPTION	UNIT	QTY	U	NIT COST	Total	NOTES:
0101-001-00	MOBILIZATION	LS	1		10%	\$ 2,571,186.26	
0102-001-00	MAINTENANCE OF TRAFFIC	LS	1		10%	\$ 2,337,442.05	
0110-001-001	CLEARING & GRUBBING	LS	1		-	\$ 700,000.00	
0120-001-000	REGULAR EXCAVATION	CY	5,741	\$	25.00	\$ 143,537.00	
0120-006-000	EMBANKMENT	CY	53,942	\$	35.00	\$ 1,887,970.00	
0104-020-000	EROSION CONTROL	LS	1		-	\$ 100,000.00	
0160-004-000	TYPE B STABILIZATION	SY	34,326.5	\$	7.00	\$ 240,285.82	
0285-007-009	OPTIONAL BASE GROUP 09 (TYPE B-12.5)	SY	34,326.5	\$	45.00	\$ 1,544,694.57	
0334-001-054	SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC D, PG76 22	ΤN	6,607.9	\$	150.00	\$ 991,179.02	Assume 3.5" thick Type SP layer for entire project
0337-007-080	ASPHALT CONCRETE FC ,TRAFFIC B, FC-12.5, PG76 22	ΤN	2,831.9	\$	250.00	\$ 707,985.01	Assume 1.5" thick layer for entire project
0400-004-011	CONC CALSSS IV, RETAINING WALLS	CY	879	\$	1,500.00	\$ 1,319,050.00	Retaining wall for ponds; assume 10" thic CIP wall similar to CFX 429-153
0440-001-050	UNDERDRAIN, TYPE V	LF	920.0	\$	90.00	\$ 82,800.00	It is assumed that 1/2 of the Pond 201A underdrain pipes will need to be replaced
0520-072-101	SOUND/NOISE BARRIER-INC FOUNDATION, PERM	LF	2,527	\$	40.00	\$ 101,088.69	
0521-072-040	SHLD CONC BARRIER, 38" OR 44" HT	LF	7922	\$	300.00	\$ 2,376,600.00	
0530-074-000	BEDDING STONE	ΤN	50	\$	200.00	\$ 10,000.00	Bedding stone for underdrain replacement
0548-012-000	RETAINING WALL SYSTEM, PERMANENT, EXCLUDING BARRIER	SF	103,755	\$	45.00	\$ 4,668,975.00	
0570-001-002	PERFORMANCE TURF, SOD	SY	62,766	\$	6.00	\$ 376,595.91	
	DRAINAGE	LS	1		-	\$ 500,000.00	Assumed cost per CFX 528-160 sum of drainge pay item totals
	SIGNING AND PAVEMENT MARKING	LS	1		-	\$ 1,000,000.00	
	ITS	LS	1		-	\$ 850,000.00	
	LIGHTING	LS	1		-	\$ 950,000.00	
	SIGNALIZATION	LS	1		-	\$ 450,000.00	
	AET TOLLING POINT	EA	2	\$	680,000.00	\$ 1,360,000.00	Per CFX 429-316A + %20 for inflation
	STRUCTURES	LS	1		-	\$ 2,513,659.51	
	UTILITY RELOCATION	LS	1		-	\$ 500,000.00	Conservative cost estimate, includes mast arm/strain pole relocations
0999-001-000	ALLOWANCE FOR DISPUTE REVIEW BOARD	LS	1	\$	50,000.00	\$ 50,000.00	
0999-002-000	WORK ORDER ALLOWANCE	LS	1	\$	500,000.00	\$ 500,000.00	

ROADWAY SUBTOTAL = \$ 28,833,048.85

SUBTOTAL \$ 28,833,048.8

# **Appendix B – Cost Estimate – Alternative 2 – Roundabout Intersection**

#### ENGINEER'S ESTIMATE CFX Project No. 429-309 SR 429 / BINION ROAD INTERCHANGE

ITEM	DESCRIPTION	UNIT	QTY	UNIT CO	OST	Total	NOTES:
0101-001-00	MOBILIZATION	LS	1	10%		\$ 2,501,037.62	
0102-001-00	MAINTENANCE OF TRAFFIC	LS	1	10%	, )	\$ 2,273,670.56	
0110-001-001	CLEARING & GRUBBING	LS	1	-		\$ 700,000.00	
0120-001-000	REGULAR EXCAVATION	CY	5,741	\$	25.00	\$ 143,537.00	
0120-006-000	EMBANKMENT	CY	53,942	\$	35.00	\$ 1,887,970.00	
0104-020-000	EROSION CONTROL	LS	1	-		\$ 100,000.00	
0160-004-000	TYPE B STABILIZATION	SY	31,052.8	\$	7.00	\$ 217,369.62	
0285-007-009	OPTIONAL BASE GROUP 09 (TYPE B-12.5)	SY	31,052.8	\$	45.00	\$ 1,397,376.14	
0334-001-054	SUPERPAVE ASPHALTIC CONCRETE, TRAFFIC D, PG76 22	ΤN	5,977.7	\$	150.00	\$ 896,649.69	Assume 3.5" thick Type SP layer for entire project
0337-007-080	ASPHALT CONCRETE FC ,TRAFFIC B, FC-12.5, PG76 22	ΤN	2,561.9	\$	250.00	\$ 640,464.06	Assume 1.5" thick layer for entire project
0400-004-011	CONC CALSSS IV, RETAINING WALLS	CY	879	\$1,	500.00	\$ 1,319,050.00	Retaining wall for ponds; assume 10" thic CIP wall similar to CFX 429-153
0440-001-050	UNDERDRAIN, TYPE V	LF	920.0	\$	90.00	\$ 82,800.00	It is assumed that 1/2 of the Pond 201A underdrain pipes will need to be replaced
0520-001-010	CONCRETE CURB & GUTTER, TYPE F	LF	6546	\$	45.00	\$ 294,570.00	
0520-072-101	SOUND/NOISE BARRIER-INC FOUNDATION, PERM	LF	2,527	\$	40.00	\$ 101,088.69	
0521-072-040	SHLD CONC BARRIER, 38" OR 44" HT	LF	7922	\$	300.00	\$ 2,376,600.00	
0530-074-000	BEDDING STONE	ΤN	50	\$	200.00	\$ 10,000.00	Bedding stone for underdrain replacement
0548-012-000	RETAINING WALL SYSTEM, PERMANENT, EXCLUDING BARRIER	SF	103,755	\$	45.00	\$ 4,668,975.00	
0570-001-002	PERFORMANCE TURF, SOD	SY	62,766	\$	6.00	\$ 376,595.91	
	DRAINAGE	LS	1	-		\$ 500,000.00	Assumed cost per CFX 528-160 sum of drainge pay item totals
	SIGNING AND PAVEMENT MARKING	LS	1	-		\$ 1,000,000.00	
	ITS	LS	1	-		\$ 850,000.00	
	LIGHTING	LS	1	-		\$ 950,000.00	
	AET TOLLING POINT	EA	2	\$ 680,	00.00	\$ 1,360,000.00	Per CFX 429-316A + %20 for inflation
	STRUCTURES	LS	1	-		\$ 2,513,659.51	
	UTILITY RELOCATION	LS	1	-		\$ 350,000.00	Conservative cost estimate
0999-001-000	ALLOWANCE FOR DISPUTE REVIEW BOARD	LS	1	\$ 50,	000.00	\$ 50,000.00	
0999-002-000	WORK ORDER ALLOWANCE	LS	1	\$ 500,	00.00	\$ 500,000.00	

ROADWAY SUBTOTAL = \$ 28,061,413.81

SUBTOTAL \$ 28,061,413.8

## **Appendix C – Traffic Analysis Memo**

**Preliminary Engineering Report** 



Subject:	Project Traffic Analysis Memorandum SR 429 and Binion Road Interchange PD&E Study (Project # 429-309)
Copies:	Dana Chester, PE, Director of Engineering (CFX) Glenn Pressimone, PE, Chief of Infrastructure (CFX) Jonathan Williamson, PE (Dewberry) / Carleen Flynn, AICP (CDM Smith)
From:	Jimmy Mulandi, PhD, PE, PMP; Cristina Torres Reyes, PE (CDM Smith)
То:	David Falk, PE, Engineering Project Manager (CFX)
Date:	January 17, 2023

### **1.0 Overview**

#### 1.1 Background

As part of the 2045 Central Florida Expressway Authority (CFX) Master Plan stakeholder outreach efforts, the City of Apopka asked CFX to consider a new interchange on SR 429 connecting to Binion Road. In early 2021, the City of Apopka reviewed a new 365-acre mixed-use development project called The Ridge at Lake Bronson, located between Ocoee Apopka Road and Binion Road near the system-to-system interchange of SR 429, SR 414, and SR 451. The City also has 29 other recently approved and planned developments within the vicinity of the SR 429 corridor. These developments will increase population, employment, and traffic in the area. A direct access to SR 429 is expected to reduce congestion on local roads and relief adjacent interchanges. **Figure 1.1** is a map of the proposed interchange location in the regional context. The proposed interchange is located less than a mile north of SR 414 in west Orange County. It will include ramps to and from the north of SR 429 only, that will terminate at the Binion Road and Boy Scout Road intersection.

In Summer 2022, CFX initiated a Project Development and Environment (PD&E) study for the proposed partial interchange. This Project Traffic Analysis Memorandum is prepared to support the PD&E study. It provides existing conditions data, future traffic forecasts, and operational analysis results for the 2022 existing, 2025 opening and 2045 design year conditions.

### **1.2** Analysis Area of Influence

The analysis Area of Influence (AOI) for the proposed interchange is depicted on **Figure 1.2**. It includes the following existing facilities:

- SR 429 mainline segments from south of Ocoee Apopka Road to north of US 441 and interchange ramps
- Binion Road and Boy Scout Road intersection

For Build conditions, the analysis also included the proposed partial interchange at SR 429 and Binion Road.



Figure 1.1 Project Location





Figure 1.2 Analysis Area of Influence





#### **1.3 Operational Analysis Methodology**

The analysis documented in this memorandum was conducted for the 2022 existing, 2025 opening and 2045 design years. A Volume to Capacity (V/C) analysis was conducted for the SR 429 mainline segments and ramp roadways. The Binion Road and Boy Scout Road intersection was evaluated based on Level of Service (LOS)/delay.

The freeway segments V/C analysis was based on the LOS D maximum service volumes published in the 2020 Florida Department of Transportation (FDOT) Quality and LOS Handbook. The analysis for ramp roadways was based on LOS E targets from the Highway Capacity Manual (HCM) 7th Edition. The FDOT and HCM targets were adjusted for local conditions such as speed, truck proportion and Peak Hour Factor (PHF). Intersections were evaluated using Synchro Version 11, based on the HCM 7th Edition LOS and the delay targets presented in **Tables 1.1** and **1.2**. Unlike the HCM, Synchro has additional procedures for estimating control delay, such as estimation of right turn on red and queue delay associated with starvation and spillback. Thus, Synchro is expected to yield more accurate results than HCM because of these additional refinements.

Control Delay	LOS by Volume-t	o-Capacity Ratio*
(s/veh)	≤1.0	>1.0
≤10	А	F
>10-20	В	F
>20-35	С	F
>35-55	D	F
>55-80	E	F
>80	F	F

Table 1.1
Signalized Intersection HCM 7th Edition Level of Service Criteria

\*For approach-based and intersection wide assessments, LOS is defined solely by control delay.

#### Table 1.2

#### Unsignalized Intersection HCM 7th Edition Level of Service Criteria

Control Delay	LOS by Volume-to-Capacity Ratio								
(s/veh)	≤1.0	>1.0							
0-10	А	F							
>10-15	В	F							
>15-25	С	F							
>25-35	D	F							
>35-50	E	F							
>50	F	F							

The LOS criteria apply to each lane on a given approach and to each approach on the minor street. LOS is not calculated for major-street approaches or for the intersection as a whole.



### **2.0 Existing Conditions**

### 2.1 Roadway Facilities

**SR 429** is a north-south, limited-access tolled facility that forms a portion of the belt route system around the Orlando metro area. This facility begins at I-4 to the south, close to Champions Gate, and ends at US 441 to the north in South Apopka. SR 429 is designated as Wekiva Parkway north of US 441. The final link in the Central Florida Beltway - the extension of the Wekiva Parkway - is being built in stages by CFX and FDOT. The Wekiva Parkway extension is scheduled to be completed in 2023. CFX owns and operates most of the existing SR 429 corridor, including the segment within the project location. FTE owns and operates the portion of SR 429 from I-4 to Seidel Road.

The SR 429 mainline south of Ocoee Apopka Road and north of US 441 has two 12-foot lanes and 10-foot inside and outside shoulders in each direction. The segment between Ocoee Apopka Road and SR 414 has two 12-foot lanes, one auxiliary lane, and 10-foot inside and outside shoulders in each direction. From SR 414 to US 441, the SR 429 mainline has three 12-foot lanes and 10-foot inside and outside shoulders in each direction. The posted speed limit within the study area is 70 mph. SR 429 forms a diamond interchange with Ocoee Apopka Road, a system-to system connection with SR 414 and a diamond interchange with US 441 via a connector road.

**Binion Road** is a two-lane, undivided rural collector which runs north-south. It serves mostly residential uses. It starts on the west side of Ocoee Apopka Road, runs north, and ends at the intersection with Pickford Circle/Lake View Drive. The posted speed limit within the study area is 40 mph.

**Boy Scout Road** is an east-west local road that terminates at Binion Road at a T-intersection. It is a two-lane road with a posted speed of 45 mph within the study area.

Existing conditions lane geometry at the Binion Road and Boy Scout Road intersection is depicted on **Figure 2.1**. Lane geometry information was obtained from high resolution aerial maps and field reviews.



2022 (Existing) Intersection Lane Geometry and Control **Binion Road Boy Scout Road** Movement

### Figure 2.1

### 2.2 Existing Traffic Data and Operations

Traffic volumes for SR 429 at Forest Lake mainline plaza and tolled ramps at Ocoee Apopka Road for 2022 were obtained from transaction data. Traffic data for non-tolled ramps were obtained from the 2021 CFX Traffic Data and Statistics Manual and the Florida Traffic Online web application. Traffic data for Binion Road was obtained from the Orange County Traffic Counts web application for 2021. To calculate the 2022 existing peak hour volumes, an analysis was conducted for the daily counts and the four highest consecutive 15-minute periods in the morning and evening. Seasonal and axle adjustment factors were applied to the data where necessary. Growth rates estimated from historical data were used where applicable. The data were then aggregated and balanced to ensure continuity of flow and consistency. A summary of the 2022 existing traffic and LOS D V/C ratios is presented in **Table 2.1**. The results show that the roadway segments and ramps within the AOI have a LOS D V/C ratio of 0.8 or less in year 2022, indicating that there are no capacity concerns in the area under existing conditions.

Figure 2.2 shows the final 2022 existing year peak hour volumes in the AM and PM conditions at the Binion Road and Boy Scout Road intersection. Typical peak hour traffic is low at the intersection.

The intersection LOS and delay was evaluated using the Synchro software, Version 11. Queue lengths were estimated using SimTraffic, the microsimulation companion of Synchro, to better account for vehicle interactions. The analysis results for the 2022 AM and PM peak hours are summarized in Table 2.2. Detailed Synchro/SimTraffic output reports are provided in Appendix A. The results show that all movements are currently operating at an acceptable LOS C or better in both the AM and PM peak hours.



				Lawaa	AADT				DM Dook Hour		LOS D Volume/Capacity (V/C)*						
Location		SR 429		Lanes Direction	AA		AIVI PE	ak Hour	PIVI Pe	ak Hour	AADT		AM Peak Hour		PM Peak Hour		
			Direction	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB		
Ponkan Mainline Plaza				2	11,820	11,160	755	484	797	958	0.3	0.3	0.2	0.1	0.2	0.2	
US 441				1	500	500	41	46	46	41	0.0	0.0	0.0	0.0	0.0	0.0	
				2	8,210	8,740	782	693	693	782	0.2	0.2	0.2	0.2	0.2	0.2	
				3	19,530	19,400	1,495	1,131	1,444	1,698	0.3	0.3	0.3	0.2	0.2	0.3	
SR 414	<u> </u>			2	6,200	6,100	643	526	526	643	0.2	0.2	0.2	0.1	0.1	0.2	
				2	16,720	16,650	1,744	1,427	1,427	1,744	0.4	0.4	0.5	0.4	0.4	0.5	
				2+1 Aux	30,050	29,950	2,596	2,031	2,345	2,799	0.6	0.6	0.5	0.4	0.5	0.6	
			Ι.														
Ocoee Apopka Road	<u> </u>		X	1	1,250	1,300	95	111	108	96	0.1	0.1	0.1	0.1	0.1	0.1	
				1	2,750	2,750	237	203	207	233	0.1	0.1	0.1	0.1	0.1	0.1	
Forest Lake Mainline Plaza				2	31,550	31,400	2,738	2,124	2,444	2,937	0.8	0.8	0.7	0.5	0.6	0.8	
	Bir	nion Ro	bad		SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	
North of Boy Scout Road				1	3,500	3,600	378	302	311	368	0.4	0.4	0.4	0.3	0.4	0.4	
South of Boy Scout Road				1	2,600	2,600	284	227	226	302	0.3	0.3	0.3	0.3	0.3	0.3	
	Воу	Scout	Road		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	
East of Binion Road				1	2,400	2,300	255	236	245	226	0.3	0.3	0.3	0.3	0.3	0.3	

Table 2.12022 Traffic and Volume to Capacity Ratios

AADT and peak hour volumes based on days of the week and peak periods with the highest demand.

Values in purple indicate peak hour directional volumes

\*LOS D V/C for freeway mainline and arterials. LOS E (capacity) V/C for ramps.



Figure 2.2 2022 (Existing) AM and PM Peak Hour Intersection Volumes



 Table 2.2

 2022 Existing AM and PM Peak Hour Intersection LOS/Delay (sec)

Intersection	Approach	Movement	LOS	Delay (Seconds)	Maximum Queue Length (Feet)*
			AM (PM)	AM (PM)	AM (PM)
		Left	-	-	-
	Eastbound	Through	-	-	-
		Right	-	-	-
		Left	C (C)	21.5 (18.3)	141 (160)
Binion Road	Westbound	Through	-	-	-
		Right	C (C)	21.5 (18.3)	141 (160)
Road		Left	-	-	-
(Unsignalized)	Northbound	Through	A (A)	0.0 (0.0)	41 (22)
		Right	A (A)	0.0 (0.0)	41 (22)
		Left	A (A)	1.5 (1.3)	95 (72)
	Southbound	Through	A (A)	4.9 (4.8)	95 (72)
		Right	-	-	-
	Overall Int	ersection	C (C)	21.5 (18.3)	-

\*SimTraffic maximum queue length



### **3.0 Future Conditions**

### 3.1 Travel Demand Model

The CFX travel demand model selected for this analysis was based on the Central Florida Regional Planning Model (CFRPM) version 6.1, covering ten counties. Using the regional model for the SR 414 Expressway Extension PD&E study as a starting point, updates and refinements with special emphasis on the I-4 corridor and SR 429 were made for better base year validation of year 2017. This model was designated CFX Model 414 Traffic and Revenue (T&R) and used for the SR 429 and Binion Road interchange PD&E study. Documentation for the base-year and future-year travel demand models can be found in the *Planning Level Traffic and Revenue Estimates for SR 429 and Binion Road Interchange* letter report Travel Demand Modeling Section provided in **Appendix B**.

### **3.2 Traffic Factors**

The future traffic factors for this study are presented in **Table 3.1**. The Design Hour Factor (K) is the proportion of the AADT that occurs during the design hour. The Directional Distribution Factor (D) is the proportion of traffic traveling in the peak direction during the design hour. The K and D factors represent the traffic demand a roadway is typically designed to accommodate.

Comment	Traffic Factors							
Segment	к	D	<b>T</b> 24	DHT				
Freeway Mainline								
SR 429	9.5%	55.0%	3.6%	2.0%				
SR 429 Ramps								
US 441								
Southbound Off-ramp and Northbound On-ramp	8.7%	52.8%	3.6%	2.0%				
Southbound On-ramp and Northbound Off-ramp	8.7%	52.8%	3.6%	2.0%				
Binion Road								
Southbound Off-ramp and Northbound On-ramp	9.5%	53.0%	3.6%	2.0%				
SR 414								
Southbound Off-ramp and Northbound On-ramp	9.5%	55.0%	3.6%	2.0%				
Southbound On-ramp and Northbound Off-ramp	9.5%	55.0%	3.6%	2.0%				
Arterials								
Binion Road	9.0%	55.5%	6.2%	4.0%				
Boy Scout Road	9.0%	52.2%	6.2%	4.0%				

Table 3.1 Future Traffic Factors

For future conditions analysis, this study used the standard K factor for the SR 429 and arterials. Consistent with FDOT, CFX has developed standard K factors for use in planning and design applications. The D factors were originally calculated using count data and adjusted where



applicable based on future projections to account for anticipated changes in land use and traffic patterns. The daily truck ( $T_{24}$ ) factors were obtained from the Florida Traffic Online web application for Portable Traffic Monitoring Site (PTMS) 75-0665, located on the SR 429 mainline, north of Ocoee Apopka Road and PTMS 75-8335, located on Binion Road, south of Lake View Drive. The Design Hour Truck (DHT) factor is the proportion of trucks within the peak hour and is assumed to be half of the  $T_{24}$  proportion rounded up to the nearest whole number for this study. A PHF of 0.95 was assumed for future conditions.

### **3.3 Traffic Forecasts**

Traffic projections were developed using the updated CFX Model 414 T&R for years 2025 and 2045, corresponding to the opening and design analysis years for the PD&E study, respectively. The ongoing widening of the SR 429 mainline to three lanes and Part Time Shoulder Use (PTSU) per direction from West Road to SR 414 (429-153) was considered in the analysis, and other planned and programmed improvements within the study area. The Peak Season Weekday Average Daily Traffic (PSWADT) from the model was converted to AADT by applying a Model Output Calibration Factor (MOCF) of 0.98. The future No Build AADT were compared against the year 2017 validated model to establish linear model growth rates. Using historical growth rates and model growth rates, the 2025 and 2045 No Build AADT were generated based on the final 2022 existing conditions profile. The Build AADT were refined by comparing against the No Build estimates. Directional Design Hour Volumes (DDHV) for the No Build and Build alternatives were generated by applying the project K and D traffic factors. Finally, adjustments were made to balance volumes to ensure continuity of flow and for reasonableness where applicable.

The final mainline and ramps AADT and the corresponding DDHV for years 2025 and 2045 are provided in **Tables 3.2** and **3.3** for the No Build and Build conditions, respectively. The bold values represent the mainline volumes, and the non-bold values represent ramp volumes. The data shows that traffic will primarily be diverted from the Ocoee Apopka Road and US 441 ramps to/from the north of SR 429 to the proposed Binion Road ramps. A small diversion is expected from the SR 414 ramps to/from north and there will be a small amount of induced trips due to the proposed ramps.

Future year turn movement volumes for the Binion Road and Boy Scout Road/SR 429 Ramps terminal intersection were developed using the projected ramp DDHV. Turn proportions were estimated using peak period data from the model and adjusted based on anticipated changes in land use and traffic patterns where applicable. The projected 2025 and 2045 design hour volumes are presented in **Figures 3.1** through **3.4** for the No Build and Build conditions. Generally, the 2045 DDHV at the Binion Road and Boy Scout Road intersection are expected to be low in the future during typical peak hours, even with the new SR 429 ramps to and from the north.



				2025							2045			
Location	SR 429			AADT	AM -	AM - DDHV		PM - DDHV			AM -	DDHV	PM - DDHV	
					SB	NB	SB	SB NB		AADT	SB	NB	SB	NB
Ponkan Mainline Plaza				32,200	1,850	1,530	1,530	1,850		82,200	4,300	3,640	3,640	4,300
US 441	$\leftarrow$		$\rightarrow$	3,500 20,200	150 970	170 860	170 860	150 970		10,200 30,700	420 1,420	470 1,260	470 1,260	<b>420</b> 1,420
				48,900	2,670	2,220	2,220	2,670		102,700	5,300	4,430	4,430	5,300
SR 414	Ę		$\rightarrow$	18,800 37,100	1,030 2,040	850 1,670	850 1,670	1,030 2,040		34,200 47,200	1,790 2,470	1,460 2,020	1,460 2,020	1,790 2,470
				67,200	3,680	3,040	3,040	3,680		115,700	5,980	4,990	4,990	5,980
Ocoee Apopka Road	$\prec$		<b>&gt;</b>	4,100 7,800	190 410	210 360	210 360	190 410		10,900 13,900	490 710	550 630	550 630	490 710
Forest Lake Mainline Plaza				70,900	3,900	3,190	3,190	3,900		118,700	6,200	5,070	5,070	6,200

## Table 3.2No Build Traffic Forecasts

Values in purple indicate peak hour directional volumes


						2025					2045		
Location		SR 429	1	AADT	AM -	DDHV	PM -	DDHV		AM -	DDHV	PM -	DDHV
				AADI	SB	NB	SB	NB	AADT	SB	NB	SB	NB
Ponkan Mainline Plaza				32,300	1,850	1,540	1,540	1,850	82,500	4,330	3,680	3,680	4,330
110 444				2,000	100	1.10	140	100	0.200	240	200	200	240
US 441			$\rightarrow$	2,800	120	140	140	120	8,200	340	380	380	340
				20,300	980	870	870	980	30,800	1,420	1,260	1,260	1,420
				49,800	2,710	2,270	2,270	2,710	105,100	5,410	4,560	4,560	5,410
Binion Road				1,800	80	90	90	80	4,600	210	230	230	210
				48,000	2,630	2,180	2,180	2,630	100,500	5,200	4,330	4,330	5,200
CD 414		4		10,000	1 020	840	040	1 0 2 0	22.000	1 770	1 450	1 450	1 770
SK 414	$\leftarrow$		$\rightarrow$	18,600	1,020	840	840	1,020	33,900	1,770	1,450	1,450	1,770
				37,100	2,040	1,670	1,670	2,040	47,200	2,470	2,020	2,020	2,470
				66,500	3,650	3,010	3,010	3,650	113,800	5,900	4,900	4,900	5,900
Ocoee Apopka Road	×	1 1	$\mathbf{X}$	3,400	160	180	180	160	9,000	410	460	460	410
			/	7,800	410	360	360	410	13,900	710	630	630	710
Forest Lake Mainline Plaza	-			70,900	3,900	3,190	3,190	3,900	118,700	6,200	5,070	5,070	6,200

#### Table 3.3 Build Traffic Forecasts

Values in purple indicate peak hour directional volumes



Binion Road Å 400 (330) 320 (390) 200 (160) — 200 (170) \_ 150 (170) Ł 100 (70) 250 (240) Boy Scout Road ♦ -270 (260) 70 (100) 170 (220) 300 (240) 240 (320)

Figure 3.1 2025 AM (PM) No Build DDHV

Figure 3.2 2045 AM (PM) No Build DDHV





Figure 3.3 2025 AM (PM) Build DDHV



Figure 3.4 2045 AM (PM) Build DDHV





#### 3.4 Capacity Analysis for Freeway Mainline and Ramps

Future lane requirements were evaluated to provide an estimated timeline for the onset of capacity deficiencies along the SR 429 mainline and ramp roadways for the No Build and Build alternatives. Freeway mainline LOS targets were based on the FDOT's Quality and LOS Handbook. Capacity analysis for ramp roadways was based on HCM targets. The FDOT and HCM targets were adjusted for local conditions such as speed, truck proportion and PHF.

The lane requirements analysis per direction for the SR 429 mainline and ramps is summarized in **Table 3.4**. The analysis for the mainline segments was based on both LOS D and E (capacity) constraints. The analysis for ramp roadways was based on LOS E (capacity) target only. The future No Build and Build analysis considered the ongoing widening of the SR 429 mainline to three lanes and PTSU per direction from West Road to SR 414 (429-153).

The analysis showed that the programmed and proposed future number of lanes for the No Build and Build conditions are expected to accommodate projected demand through the 2045 design year, except for the SR 429 mainline segment north of US 441. This segment will require an additional third lane per direction in year 2042 and 2045 based on LOS D and E constraints, respectively, for both No Build and Build conditions. Detailed color-coded lane requirements analysis is presented in **Tables 3.5** through **3.8**.



				2022 5 1414		Future No Build	•		Future Build	
Location	:	SR 429	9	2022 Existing	Number of Issue	Lanes Needed (Year)	Lanes Needed (Year)	Number of Longs	Lanes Needed (Year)	Lanes Needed (Year)
				Number of Lanes	Number of Lanes	<sup>1</sup> LOS D/E	<sup>2</sup> LOS E/E	Number of Lanes	<sup>1</sup> LOS D/E	<sup>2</sup> LOS E/E
Ponkan Mainline Plaza				2	2	3 (2042)	3 (2045)	2	3 (2042)	3 (2045)
						,	,		,	,
US 441			$\rightarrow$	1	1	n/a	n/a	1	n/a	n/a
				2	2	n/a	n/a	2	n/a	n/a
				3	3	n/a	n/a	3	n/a	n/a
Binion Road	4			n/a	n/a	n/a	n/a	1	n/a	n/a
				3	3	n/a	n/a	3	n/a	n/a
SR 414			$\mathbf{N}$	2	2	n/a	n/a	2	n/a	n/a
			/	2	2	n/a	n/a	2	n/a	n/a
				2+1 Aux	5 (4 + 1 PTSU) + 1 Aux SB	n/a	n/a	5 (4 + 1 PTSU) + 1 Aux SB	n/a	n/a
					4 (3 + 1 PTSU) + 1 Aux NB	n/a	n/a	4 (3 + 1 PTSU) + 1 Aux NB	n/a	n/a
Ocoee Apopka Road			<u>×</u>	1	1	n/a	n/a	1	n/a	n/a
			r I	1	1	n/a	n/a	1	n/a	n/a
Forest Lake Mainline Plaza				2	4 (3 + 1 PTSU)	n/a	n/a	4 (3 + 1 PTSU)	n/a	n/a

Table 3.4 Lanes Requirements Summary – Number of Lanes per Direction

<sup>1</sup>Mainline Maximum Service Volume (LOS D)/Ramp Capacity (LOS E)

 $^2\mbox{Mainline}$  Maximum Service Volume (LOS E)/Ramp Capacity (LOS E)

n/a - not applicable or no additional lane needs



Table 3.5 No Build Mainline (LOS D) and Ramp Capacity (LOS E) Lane Requirements

								DDHV	' - Worst	Case Al	M or PM	Design	Hour											
Location	SR 4	429		Opening									I	nterpolate	d									Design
				2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Ponkan Mainline Plaza				1,850	1,970	2,090	2,220	2,340	2,460	2,580	2,700	2,830	2,950	3,070	3,190	3,320	3,440	3,560	3,690	3,810	3,930	4,050	4,180	4,300
US 441				170	190	200	220	230	250	260	280	290	310	320	340	350	370	380	400	410	430	440	460	470
I [		$\overline{}$		970	990	1,020	1,040	1,060	1,090	1,110	1,130	1,150	1,180	1,200	1,220	1,240	1,270	1,290	1,310	1,330	1,350	1,380	1,400	1,420
		ſ																						
				2,670	2,800	2,930	3,060	3,190	3,330	3,460	3,590	3,720	3,850	3,980	4,110	4,240	4,380	4,510	4,640	4,770	4,900	5,040	5,170	5,300
	4	$\rightarrow$		1,030	1,070	1,110	1,140	1,180	1,220	1,260	1,300	1,330	1,370	1,410	1,450	1,490	1,520	1,560	1,600	1,640	1,680	1,710	1,750	1,790
SR 414				2,040	2,060	2,080	2,110	2,130	2,150	2,170	2,190	2,220	2,240	2,260	2,280	2,300	2,320	2,340	2,370	2,390	2,410	2,430	2,450	2,470
			+1 Aux	3,680	3,800	3,910	4,030	4,140	4,260	4,370	4,490	4,600	4,720	4,830	4,950	5,060	5,180	5,290	5,410	5,520	5,640	5,750	5,870	5,980
Osean Amerika Deed				24.0	220	240	200	200	200	210	220	250	260	200	100	110	420	450	470	400	500	520	520	550
Осоее Арорка Коай		$\rightarrow$		210	230	240	260	280	300	310	330	350	360	380	400	410	430	450	470	480	500	520	530	550 710
	Y	r		410	430	440	400	470	490	500	520	530	550	500	580	590	010	620	640	050	670	080	700	/10
Forest Lake Mainline Plaza				3,900	4,020	4,130	4,250	4,360	4,480	4,590	4,710	4,820	4,940	5,050	5,170	5,280	5,400	5,510	5,630	5,740	5,860	5,970	6,090	6,200
			1										1		•									
Freeway Ing	outs					Freeway L	OS Targets						Ramp C	Capacity										
Truck % (t <sub>f</sub> )		2.0%			Lanes	LOS D	Lanes*	LOS D					Lanes	LOS E										
Free Flow Speed (mph)		75			2	3,900	2+1	4,900					1	1,850										
Peak Hour Factor (PHF)		0.95			3	5,850	3+1	6,850					2	3,700										
			-		4	7,800	4+1	8,800					3	5,550										
					5	9,750	5+1	10,750					Speed - 40	to 50 MPH	_									
					6	11,700	6+1	12,700																
							*Plus Aux	iliary Lane																



Table 3.6 Build Mainline (LOS D) and Ramp Capacity (LOS E) Lane Requirements

							DDH\	/ - Worst	Case Al	M or PM	Design	Hour											
Location	SR	429	Opening									I	nterpolate	d									Design
			2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Ponkan Mainline Plaza	-		1,850	1,980	2,100	2,230	2,350	2,480	2,600	2,730	2,850	2,980	3,100	3,220	3,350	3,470	3,590	3,720	3,840	3,960	4,080	4,210	4,330
US 441			140	150	160	180	190	200	210	220	240	250	260	270	280	300	310	320	330	340	360	370	380
			980	1,000	1,020	1,050	1,070	1,090	1,110	1,130	1,160	1,180	1,200	1,220	1,240	1,270	1,290	1,310	1,330	1,350	1,380	1,400	1,420
			2,710	2,850	2,980	3,120	3,250	3,390	3,530	3,660	3,800	3,930	4,070	4,200	4,340	4,470	4,610	4,740	4,870	5,010	5,140	5,280	5,410
Binion Road			90	100	100	110	120	130	130	140	150	150	160	170	170	180	190	200	200	210	220	220	230
			2,630	2,760	2,890	3,020	3,150	3,280	3,400	3,530	3,660	3,790	3,920	4,050	4,180	4,300	4,430	4,560	4,690	4,820	4,940	5,070	5,200
			1,020	1,060	1,100	1,130	1,170	1,210	1,250	1,290	1,320	1,360	1,400	1,440	1,470	1,510	1,550	1,590	1,620	1,660	1,700	1,730	1,770
SR 414			2,040	2,060	2,080	2,110	2,130	2,150	2,170	2,190	2,220	2,240	2,260	2,280	2,300	2,320	2,340	2,370	2,390	2,410	2,430	2,450	2,470
		+1 Au	x 3,650	3,760	3,880	3,990	4,100	4,220	4,330	4,440	4,550	4,670	4,780	4,890	5,000	5,120	5,230	5,340	5,450	5,560	5,680	5,790	5,900
Ocoee Apopka Road			180	190	210	220	240	250	260	280	290	310	320	330	350	360	380	390	400	420	430	450	460
			410	430	440	460	470	490	500	520	530	550	560	580	590	610	620	640	650	670	680	700	710
Forest Lake Mainline Plaza		╺┥	3,900	4,020	4,130	4,250	4,360	4,480	4,590	4,710	4,820	4,940	5,050	5,170	5,280	5,400	5,510	5,630	5,740	5,860	5,970	6,090	6,200
								_						_									
Freeway Ir	nputs	-			Freeway l	OS Targets	5					Ramp C	apacity										
Truck % (t <sub>f</sub> )		2.0%		Lanes	LOS D	Lanes*	LOS D					Lanes	LOS E										
Free Flow Speed (mph)		75		2	3,900	2+1	4,900					1	1,850										
Peak Hour Factor (PHF)		0.95		3	5,850	3+1	6,850					2	3,700										
				4	7,800	4+1	8,800					3	5,550	J									
				5	9,750	5+1	10,750					Speed - 40	to 50 MPH										
				6	11,700	6+1	12,700	J															
						*Plus Aux	iliary Lane																



Table 3.7 No Build Mainline (LOS E) and Ramp Capacity (LOS E) Lane Requirements

								DDHV	- Worst	Case Al	M or PM	Design	Hour											
Location	SR 4	429		Opening									I	nterpolate	ed									Design
				2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Ponkan Mainline Plaza				1,850	1,970	2,090	2,220	2,340	2,460	2,580	2,700	2,830	2,950	3,070	3,190	3,320	3,440	3,560	3,690	3,810	3,930	4,050	4,180	4,300
US 441				170	190	200	220	230	250	260	280	290	310	320	340	350	370	380	400	410	430	440	460	470
				970	990	1,020	1,040	1,060	1,090	1,110	1,130	1,150	1,180	1,200	1,220	1,240	1,270	1,290	1,310	1,330	1,350	1,380	1,400	1,420
				2,670	2,800	2,930	3,060	3,190	3,330	3,460	3,590	3,720	3,850	3,980	4,110	4,240	4,380	4,510	4,640	4,770	4,900	5,040	5,170	5,300
	4		<b>``</b>	1,030	1,070	1,110	1,140	1,180	1,220	1,260	1,300	1,330	1,370	1,410	1,450	1,490	1,520	1,560	1,600	1,640	1,680	1,710	1,750	1,790
SR 414				2,040	2,060	2,080	2,110	2,130	2,150	2,170	2,190	2,220	2,240	2,260	2,280	2,300	2,320	2,340	2,370	2,390	2,410	2,430	2,450	2,470
																	- 400							
			+1 Aux	3,680	3,800	3,910	4,030	4,140	4,260	4,370	4,490	4,600	4,720	4,830	4,950	5,060	5,180	5,290	5,410	5,520	5,640	5,750	5,870	5,980
Ocoee Apopka Road				210	230	240	260	280	300	310	330	350	360	380	400	410	430	450	470	480	500	520	530	550
			<b>`</b>	410	430	440	460	470	490	500	520	530	550	560	580	590	610	620	640	650	670	680	700	710
	1	ſ																						
Forest Lake Mainline Plaza	-			3,900	4,020	4,130	4,250	4,360	4,480	4,590	4,710	4,820	4,940	5,050	5,170	5,280	5,400	5,510	5,630	5,740	5,860	5,970	6,090	6,200
			-												-									
Freeway In	puts					Freeway L	OS Targets						Ramp C	Capacity										
Truck % (t <sub>f</sub> )		2.0%			Lanes	LOS E	Lanes*	LOS E					Lanes	LOS E										
Free Flow Speed (mph)		75			2	4,240	2+1	5,240					1	1,850										
Peak Hour Factor (PHF)		0.95			3	6,360	3+1	7,360					2	3,700										
					4	8,480	4+1	9,480					3	5,550										
					5	10,600	5+1	11,600					Speed - 40	to 50 MPH										
					6	12,720	6+1	13,720																
							*Plus Aux	iliary Lane																



 Table 3.8

 Build Mainline (LOS E) and Ramp Capacity (LOS E) Lane Requirements

							DDH\	/ - Worst	t Case Al	M or PM	Design	Hour											
Location	SR 4	129	Opening									I	nterpolate	d									Design
			2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Ponkan Mainline Plaza			1,850	1,980	2,100	2,230	2,350	2,480	2,600	2,730	2,850	2,980	3,100	3,220	3,350	3,470	3,590	3,720	3,840	3,960	4,080	4,210	4,330
US 441			140	150	160	180	190	200	210	220	240	250	260	270	280	300	310	320	330	340	360	370	380
			980	1,000	1,020	1,050	1,070	1,090	1,110	1,130	1,160	1,180	1,200	1,220	1,240	1,270	1,290	1,310	1,330	1,350	1,380	1,400	1,420
			2,710	2,850	2,980	3,120	3,250	3,390	3,530	3,660	3,800	3,930	4,070	4,200	4,340	4,470	4,610	4,740	4,870	5,010	5,140	5,280	5,410
Dinion Dood			00	100	100	110	120	120	120	140	150	150	100	170	170	100	100	200	200	210	220	220	220
			90	100	100	110	120	130	130	140	150	150	100	170	1/0	180	190	200	200	210	220	220	230
			2,630	2,760	2,890	3,020	3,150	3,280	3,400	3,530	3,660	3,790	3,920	4,050	4,180	4,300	4,430	4,560	4,690	4,820	4,940	5,070	5,200
			1,020	1,060	1,100	1,130	1,170	1,210	1,250	1,290	1,320	1,360	1,400	1,440	1,470	1,510	1,550	1,590	1,620	1,660	1,700	1,730	1,770
SR 414			2,040	2,060	2,080	2,110	2,130	2,150	2,170	2,190	2,220	2,240	2,260	2,280	2,300	2,320	2,340	2,370	2,390	2,410	2,430	2,450	2,470
		+1 Au	ix <b>3,650</b>	3,760	3,880	3,990	4,100	4,220	4,330	4,440	4,550	4,670	4,780	4,890	5,000	5,120	5,230	5,340	5,450	5,560	5,680	5,790	5,900
Ocoee Apopka Road	×		180	190	210	220	240	250	260	280	290	310	320	330	350	360	380	390	400	420	430	450	460
			410	430	440	460	470	490	500	520	530	550	560	580	590	610	620	640	650	670	680	700	710
		ſ																					
Forest Lake Mainline Plaza			3,900	4,020	4,130	4,250	4,360	4,480	4,590	4,710	4,820	4,940	5,050	5,170	5,280	5,400	5,510	5,630	5,740	5,860	5,970	6,090	6,200
								_						-									
Freeway Ir	nputs				Freeway I	OS Targets	5					Ramp C	Capacity										
Truck % (t <sub>f</sub> )		2.0%		Lanes	LOS E	Lanes*	LOS E					Lanes	LOS E										
Free Flow Speed (mph)		75		2	4,240	2+1	5,240					1	1,850										
Peak Hour Factor (PHF)		0.95		3	6,360	3+1	7,360					2	3,700										
				4	8,480	4+1	9,480					3	5,550										
				5	10,600	5+1	11,600	l				Speed - 40	to 50 MPH										
				6	12,720	6+1	13,720	J															
						*Plus Aux	iliary Lane																



#### **3.5 Ramp Terminal Intersection Analysis Alternatives**

The proposed SR 429 and Binion Road interchange will form a partial interchange on SR 429, providing access to/from the north only. The ramps will be tolled and will terminate at the Binion Road and Boy Scout Road intersection. Due to right-of-way constraints on SR 429, a concept was developed in which the southbound ramp flies over the SR 429 mainline. To accommodate the geometrics for the flyover ramp, Boy Scout Road will need to be realigned to the south as it intersects with Binion Road. Two configurations were developed for the ramp terminal intersection at Binion Road: a signalized and a roundabout intersection.

The proposed concepts are depicted on **Figures 3.5** and **3.6** for the signalized and roundabout intersections, respectively. The proposed configuration for the roundabout includes a right-turn bypass lane for the SR 429 off-ramp and a wide circulatory lane and apron to properly accommodate trucks.



Figure 3.5 Conceptual Layout of Proposed Interchange Configuration (Signal Alternative)



Figure 3.6 Conceptual Layout of Proposed Interchange Configuration (Roundabout Alternative)



#### **3.6 Future Intersection Operations Analysis**

Future operations analysis was conducted for the proposed Binion Road and Boy Scout Road/SR 429 Ramps intersection alternatives using the 2025 and 2045 design hour volumes on **Figures 3.3** and **3.4**, to verify operations in the opening and design years. The signalized intersection alternative was evaluated using the Synchro software, Version 11, whereas, the roundabout alternative was evaluated using the SIDRA software, Version 9. The analysis results for the 2025 and 2045 AM (PM) peak hour conditions are presented in **Tables 3.9** through **3.12**. The proposed storage lengths for the turn bays based on 2045 peak hour maximum queues are also provided in the tables and graphically depicted on **Figures 3.7** and **3.8**. For the signalized intersection, queue lengths were estimated using SimTraffic, the microsimulation companion of Synchro, to better account for vehicle interactions. Detailed Synchro/SimTraffic and SIDRA reports are provided in **Appendices C** and **D**, respectively.



Interception	Annach	Mayoment	LOS	Delay (Seconds)	Maximum Queue Length (Feet)*
Intersection	Approach	wovement	AM (PM)	AM (PM)	AM (PM)
		Left	B (B)	15.9 (16.6)	31 (50)
	Eastbound	Through	C (C)	27.6 (26.7)	98 (72)
		Right	A (A)	0.3 (0.7)	52 (74)
		Left	B (B)	18.7 (18.4)	134 (90)
	Westbound	Through	C (C)	20.9 (21.3)	63 (70)
Binion Road and		Right	A (A)	1.1 (4.6)	68 (65)
Boy Scout Road/		Left	B (A)	11.1 (9.8)	70 (49)
SK 429 Kamps	Northbound	Through	C (C)	25.3 (21.5)	89 (136)
		Right	A (A)	0.5 (0.4)	66 (45)
		Left	B (A)	11.4 (9.9)	110 (87)
	Southbound	Through	B (B)	18.3 (14.3)	126 (112)
		Right	B (B)	18.3 (14.3)	126 (112)
	Overall In	tersection	B (B)	13.9 (12.4)	-

Table 3.9 2025 AM (PM) Design Hour Signalized Intersection LOS/Delay (sec)

\*SimTraffic maximum queue length



		17 D CO.B.1 110 U	neanaa		
Intersection	Approach	Movement	LOS	Delay (Seconds)	Maximum Queue Length (Feet)
Intersection	Арргоасп	wovement	AM (PM)	AM (PM)	AM (PM)
		Left	A (A)	5.6 (5.1)	11 (11)
	Eastbound	Through	A (A)	5.6 (5.1)	11 (11)
		Right	A (A)	5.6 (5.1)	11 (11)
		Left	A (A)	6.0 (6.2)	34 (34)
	Westbound	Through	A (A)	6.0 (6.2)	34 (34)
Binion Road and		Right	A (A)	6.0 (6.2)	34 (34)
Boy Scout Road/		Left	A (A)	6.1 (6.6)	33 (44)
SR 429 Ramps	Northbound	Through	A (A)	6.1 (6.6)	33 (44)
		Right	A (A)	6.1 (6.6)	33 (44)
		Left	A (A)	7.0 (5.8)	51 (37)
	Southbound	Through	A (A)	7.0 (5.8)	51 (37)
		Right	A (A)	7.0 (5.8)	51 (37)
	Overall Int	ersection	A (A)	6.3 (6.1)	-

Table 3.10 2025 AM (PM) Design Hour Roundabout Intersection LOS/Delay (sec)



Intersection	Annroach	Movement	LOS	Delay (Seconds)	Maximum Queue Length (Feet)*	Proposed # of Turn Lanes/
Intersection	Арргоасп	wovement	AM (PM)	AM (PM)	AM (PM)	Storage Length (Feet)
		Left	C (C)	21.4 (22.5)	116 (94)	1/200'
	Eastbound	Through	C (C)	34.8 (34.4)	137 (126)	-
		Right	A (A)	0.9 (2.4)	90 (96)	1/200'
		Left	C (C)	33.6 (29.0)	193 (165)	1/275'
	Westbound	Through	C (C)	32.5 (31.7)	95 (114)	-
Binion Road and		Right	A (A)	4.9 (9.7)	113 (220)	1/275'
Boy Scout Road/		Left	B (B)	13.8 (10.8)	176 (108)	1/275'
SR 429 Ramps	Northbound	Through	C (C)	34.5 (30.4)	235 (240)	-
		Right	A (A)	1.0 (4.1)	92 (141)	1/275'
		Left	B (B)	16.0 (14.7)	263 (194)	1/350'
	Southbound	Through	С (В)	24.0 (18.7)	332 (219)	-
		Right	С (В)	24.0 (18.7)	332 (219)	-
	Overall In	tersection	С (В)	20.4 (18.4)	-	-

 Table 3.11

 2045 AM (PM) Design Hour Signalized Intersection LOS/Delay (sec)

\*SimTraffic maximum queue length



Intercection	Approach	Movement	LOS	Delay (Seconds)	Maximum Queue Length (Feet)	Proposed # of Turn Lanes/
intersection	Арргоаст	wovement	AM (PM)	AM (PM)	AM (PM)	Storage Length (Feet)
		Left	В (В)	13.4 (10.3)	52 (45)	-
	Eastbound	Through	В (В)	13.4 (10.3)	52 (45)	-
		Right	В (В)	13.4 (10.3)	52 (45)	1/200'
		Left	B (C)	13.4 (15.0)	136 (144)	-
	Westbound	Through	B (C)	13.4 (15.0)	136 (144)	-
Binion Road and		Right	В (С)	13.4 (15.0)	136 (144)	-
Boy Scout Road/		Left	C (C)	15.1 (18.1)	170 (286)	-
SR 429 Ramps	Northbound	Through	C (C)	15.1 (18.1)	170 (286)	-
		Right	C (C)	15.1 (18.1)	170 (286)	-
		Left	С (В)	22.6 (12.0)	402 (154)	-
	Southbound	Through	С (В)	22.6 (12.0)	402 (154)	-
		Right	С (В)	22.6 (12.0)	402 (154)	-
	Overall Int	tersection	С (В)	17.2 (14.6)	-	-

Table 3.12 2045 AM (PM) Design Hour Roundabout Intersection LOS/Delay (sec)

A 200' storage is proposed for the eastbound right turn by-pass to ensure the turn lane is not blocked by through movement queue.



Figure 3.7 Proposed Lane Geometry and Storage Lengths for Signalized Intersection







Figure 3.8 Proposed Lane Geometry and Storage Lengths for Roundabout Intersection



The results in Tables 3.9 and 3.10 show that all movements are expected to operate at an acceptable LOS C or better in 2025 for the signalized intersection alternative and LOS A for the roundabout alternative. The overall LOS is B for the signalized intersection and A for the roundabout intersection. In the 2045 design year (Tables 3.11 and 3.12), all movements are expected to operate at an acceptable LOS C or better for both the signalized and roundabout intersection alternatives. The overall LOS for the intersection is also C or better. Although traffic operations are similar for both alternatives, delays are lower for the roundabout when compared to the signal. The roundabout alternative also has fewer conflict points and is deemed safer than the signalized alternative.

# 4.0 Conclusion

The proposed SR 429 and Binion Road partial interchange is being considered to provide new access by adding ramps to and from the north. The Binion Road interchange will provide additional local access between SR 414 and US 441 and allow trips that need to navigate the local street system to access SR 429 to points north including US 441, SR 46, and the Wekiva Parkway. The analysis showed that traffic will primarily be diverted from the Ocoee Apopka Road and US 441 ramps to/from the north of SR 429 to the proposed Binion Road ramps. A small diversion is expected from the SR 414 ramps to/from north and there will be a small amount of induced trips due to the proposed ramps.

Two intersection configurations were developed for the ramp terminal: a signalized and a roundabout intersection. Both intersection alternatives are expected to operate at an acceptable LOS C or better in the 2045 design year. However, the roundabout alternative has fewer conflict points and is deemed safer than the signalized alternative. Both intersection configurations were presented to the City of Apopka's Transportation Planning Department for feedback on a preferred alternative. The City selected the signalized intersection alternative.



Appendices



Appendix A

2022 AM and PM Peak Hour Synchro/SimTraffic Reports

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		4Î			<u>स</u>
Traffic Volume (vph)	95	141	161	66	189	189
Future Volume (vph)	95	141	161	66	189	189
Satd. Flow (prot)	1645	0	1756	0	0	1783
Flt Permitted	0.980					0.976
Satd. Flow (perm)	1645	0	1756	0	0	1783
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	256	0	247	0	0	410
Sign Control	Stop		Free			Free
Intersection Summarv						

Control Type: Unsignalized Intersection Capacity Utilization 56.8%

ICU Level of Service B

Analysis Period (min) 15

# Intersection: 4: Binion Road & Boy Scout Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	141	41	95
Average Queue (ft)	61	1	32
95th Queue (ft)	103	11	71
Link Distance (ft)	972	966	978
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			
Queuing Penalty (veh)			

# Network Summary

Network wide Queuing Penalty: 0

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Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	¥		el el			<del>ب</del> ا
Traffic Volume (vph)	66	160	208	94	151	160
Future Volume (vph)	66	160	208	94	151	160
Satd. Flow (prot)	1628	0	1750	0	0	1783
Flt Permitted	0.986					0.976
Satd. Flow (perm)	1628	0	1750	0	0	1783
Confl. Peds. (#/hr)						
Confl. Bikes (#/hr)						
Peak Hour Factor	0.89	0.89	0.89	0.89	0.89	0.89
Growth Factor	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0
Parking (#/hr)						
Mid-Block Traffic (%)	0%		0%			0%
Shared Lane Traffic (%)						
Lane Group Flow (vph)	254	0	340	0	0	350
Sign Control	Stop		Free			Free
Intersection Summary						

# Intersection Summary

Control Type: Unsignalized Intersection Capacity Utilization 57.0%

ICU Level of Service B

Analysis Period (min) 15

# Intersection: 4: Binion Road & Boy Scout Road

Movement	WB	NB	SB
Directions Served	LR	TR	LT
Maximum Queue (ft)	160	22	72
Average Queue (ft)	61	1	30
95th Queue (ft)	106	7	63
Link Distance (ft)	972	966	978
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

# Network Summary

Network wide Queuing Penalty: 0



Appendix **B** 

Planning Level T&R Estimates for SR 429 and Binion Road Interchange Letter Report Travel Demand Modeling Section

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# Planning Level T&R Estimates for SR 429 and Binion Road Interchange

# 1. Travel Demand Modeling

This section contains brief descriptions of the base-year and future-year travel demand models, including an account of model validation and the assumptions used to produce traffic forecasts (socio-economic data forecasts, network improvements and toll rates).

# 1.1. Base-Year Model

CDM Smith used the latest version of the CFX travel demand model with validation year of 2017 and forecast years of 2025 and 2045, updated for application to the T&R study. CDM Smith started with the regional model used to predict the traffic and revenue growth for the S.R. 414 Expressway Extension PD&E study, referred to as *CFX Model 414 T&R*. This model was created with updates/revisions to the models from previous studies and originally based on the *Central Florida Regional Planning Model (CFRPM) v6.1,* produced by the Florida Department of Transportation (FDOT), District 5. Like its predecessor, the *CFX Model 414 T&R*, is a project-specific model of peak-season, average weekday traffic, with a disaggregated zone structure and supporting transportation network in the study area. The base year model was reviewed for use in this study. No additional validation can be found in *the Preliminary Level Traffic and Revenue Estimates for S.R. 414 Expressway Extension* letter report. For this study a closer evaluation of the area around the proposed interchange was considered, and the project-specific model area is shown in **Figure 1-1**. The purple outlined areas represent the traffic analysis zones (TAZs) that contain the socioeconomic data within the modeling structure for the study area.





Figure 1-1. Binion Road Study Area in CFX Model 414 T&R

# 1.2. Future-Year Models

The future-year models start from the base-year *CFX Model 414 T&R* and retain all the updates and enhancements created for previous models as well as the model improvements identified in the study area. There are two future year models, one for opening year of 2025 and the second for the horizon year of 2045. Additionally, for each model year, there are three scenario models: No Build, Build No-Toll and Build Toll models. The results for 2035 are interpolated, assuming a proportion of the difference between 2025 and 2045.

#### **1.2.1.** Socioeconomic Data Forecasts

Independent socioeconomic forecasts of population, employment and school enrollment were developed by Fishkind and Associates (FKA) for the entirety of Orange and Lake Counties for the Lake Orange County Connector (S.R. 516) project which were also incorporated into this project model. These forecasts are documented under separate cover, *Lake Orange Connector, Lake and Orange Counties Analysis, 2017 Base Year Analysis and Socioeconomic Data Forecast Analysis (2025, 2035 and 2045)*, January 31, 2019.





The SE data forecasts for the Binion Road interchange analysis were modified to incorporate the 30 planned and approved developments provided by the City of Apopka, in addition to the SE data set adjustments from the S.R. 414 Expressway Extension T&R study. In the model, the ZDATA1 file contains the housing and population data and the ZDATA2 file contains the employment and school enrollment data. For the ZDATA1 file, each of the housing developments were located by TAZ and dwelling units were added by category, i.e., single-family or multi-family, and population was calculated using the average person/household in a comparable TAZ. These changes are summarized in the SE data forecasts for Orange County for Year 2025 data set and are contained in **Table 1-1**. The data in the 2045 data set was reviewed for consistency and negative growth but ultimately not updated for this analysis.

ZDATA1	Single Family Dwelling Unit	Single Family Population	Multi-Family Dwelling Unit	Multi-Family Population
S.R. 414 SE	354,949	902,730	249,926	478,613
Data Set				
Binion Road	357,062	912,840	253,380	487,781
SE Data Set				
Net Increase	2,113	10,110	3,454	9,168
Percent	0.60%	1.12%	1.38%	1.92%
Change				

	Table 1-1.	Comparison	of SE	Data	Sets
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As the largest development planned in the City of Apopka, and the one with the greatest impact on this interchange, The Ridge at Lake Bronson development plan employment was estimated based on land use from the Planned Development Master Plan, dated April 26, 2021, and shown in **Table 1-2**. The employment was calculated using national standards for employment per square foot of 1 employee/ 1,500 sq. ft. of Industrial uses, 1 employee/500 sq. ft. for Commercial uses, 1 employee/300 sq. ft. for Office uses, and 0.15 employees/acre for Civic uses. Employment data is found in the ZDATA2 file of the model, and this was checked against the employment estimates for The Ridge at Lake Bronson development as well as the other developments provided by the City of Apopka. No adjustments were made to the ZDATA2 files for 2025 or 2045 as the employment in these zones were already sufficient to meet employment thresholds from these developments.

Table 1-2. Employment Estimates for The Ridge at Lake Bronson Development

The Ridge	he Ridge INDUSTRIAL		COMM	ERCIAL	SER	VICE	SERV	SERVICE		
at Lake Bronson Land Uses	Industrial (SF)	IND Jobs	Retail (SF)	COM Jobs	Office (SF)	SER Jobs	Civic (acre)	SER Jobs	Total Employment	
Commercial	-	-	300,000	600	-	-	-	-	600	
Office	-	-	-	-	75 <i>,</i> 000	250	-	-	250	
Industrial	1,500,000	1,000	-	-	-	-	-	-	1,000	
Recreation	-	-	-	-	-	-	57	9	9	
	1,500,000	1,000	125,000	250	75,000	250	57	9	1,859	

Source: Square feet from The Ridge PD, Planned Development Master Plan, April 2021.





#### 1.2.2. Roadway Improvements

The future year networks from the *CFX Model S.R. 414 T&R* were taken directly from the model for use in this study. The future year networks were updated to include the new interchange and connection to Boy Scout Road. These networks already included the transportation improvements identified in the CFX, FDOT and county work programs, as well as the improvements included in the cost feasible plan from Metroplan Orlando's Long-Range Transportation Plan (LRTP) for year 2040. Some 2045 regional network improvements to note include:

- Widening of S.R. 429 (6 lanes) from Seidel Road to S.R. 414
- Completion of I-4 Ultimate Improvement (10 lanes) from S.R. 408 to S.R. 434
- Completion of Wekiva Parkway (4 lanes) from Mt. Plymouth Road to I-4
- Construction of the S.R. 414 Expressway Extension from US 441 to S.R. 434

#### 1.2.3. Tolls

The future-year models contain updated toll amounts at CFX toll locations, based on the following procedures. Like the base-year model, the future-year models use the average toll amounts that reflect the combination of vehicle class and payment method. Based on traffic count data, CDM Smith has determined that 6% of the traffic stream will be trucks of all sizes and used the toll amounts from 4-Axle vehicles to represent the truck toll. The payment method splits used in this analysis were established using the share of revenue by payment method from FY 2021 CFX toll operations data, as shown in **Table 1-3**.

Average	Rev Split
Paid In-Lane	81.1%
PBP	18.9%
Total	100.0%

Table 1-3. FY 2021 Share by Payment Method

The S.R. 429/Wekiva Parkway, including the Ponkan Mainline, Mt. Plymouth Mainline and Coronado Mainline Plazas, was created with all electronic tolling (AET), i.e., without cash toll collection. **Table 1-4** contains a summary of the FY 2021 2-Axle and 4-Axle toll amounts by payment method and the derived average toll amounts. With the Binion Road interchange being in the Forest Lake Plaza group, the rate per mile for this segment of S.R. 429 is \$0.128 per mile for 2-axle ETC customers. The Binion Road interchange is approximately 2.3 miles from the zero-point location at US 441, and at \$0.128 per mile equates to a \$0.30 ETC toll for 2-axle vehicles. This is consistent with the S.R. 438/Plant St. interchange at the south end of this plaza group.





Toll Location	Diaza Group	E	ГС	Ca	ish	Рау Ву	Average	
TOILLOCATION	Plaza Group	2 Axles	4 Axles	2 Axles	4 Axles	2 Axles	4 Axles	toll
S.R. 438		\$0.30	\$0.30	\$0.50	\$0.50	\$0.60	\$0.60	\$0.36
West Road		\$0.87	\$0.87	\$1.00	\$1.00	\$1.74	\$1.74	\$1.04
Forest Lake Main	Forest Lake	\$1.45	\$2.61	\$1.75	\$3.00	\$2.90	\$5.22	\$1.82
C.R. 437A		\$0.58	\$0.58	\$0.75	\$0.75	\$1.16	\$1.16	\$0.70
Binion Road		\$0.30	\$0.30	n/a	n/a	\$0.60	\$0.60	\$0.36
Ponkan Main	Ponkan	\$0.83	\$1.66	n/a	n/a	\$1.66	\$3.32	\$1.05
Mt. Plymouth Main	Mt. Plymouth	\$0.78	\$1.55	n/a	n/a	\$1.56	\$3.10	\$0.99
Coronado Main	Coronado	\$0.67	\$1.35	n/a	n/a	\$1.34	\$2.70	\$0.85

Table 1-4. FY 2021 Toll Amounts by Class and Payment Method

The final step in determining toll amount for the travel demand model was to escalate the present toll amounts at the CFX floor index rate of 1.5% per year, per the Customer First Toll Policy. **Table 1-5** contains the future average toll rates used in the travel demand model and in the revenue calculations. The shares of traffic by vehicle class and payment type were assumed to be an average of the shares. Finally, the toll amounts were escalated at 1.5% per year according to CFX policy.

	Average Toll Rate							
Location	2025	2035	2045					
Forest Lake Main	\$1.930	\$2.240	\$2.600					
Binion Road Ramps	\$0.380	\$0.440	\$0.510					
Ponkan Main	\$1.118	\$1.297	\$1.505					
Mount Plymouth Main	\$1.049	\$1.217	\$1.412					
Coronado Main	\$0.903	\$1.048	\$1.217					

#### Table 1-5. Average Toll Rates

#### 1.2.4. Other Parameters

CDM Smith has assumed an annual inflation rate of 2.5%. The value of time (VOT) from model validation was established to be \$16.67 per hour in the validation year. This is consistent with prior models. The models use a parameter known as the Coefficient of Toll (CTOLL) which is the inverse of the value of time. The product of CTOLL and the toll amount is the time penalty from the tolls. **Table 1-6** contains the values of VOT and CTOLL used in the base-year and future-year models.

#### Table 1-6. VOT and CTOLL

	2017	2025	2045		
VOT	\$16.67	\$20.31	\$33.27		
CTOLL	0.060	0.049	0.030		

Other model parameters include the following:

- Vehicle operating cost (VOC) = \$0.03 per mile in base year
- For interpolation to 2035 between 2025 and 2045 = 45% of difference occurs in 2035





Appendix C

2025 AM and PM Peak Hour Synchro/SimTraffic Reports 2045 AM and PM Peak Hour Synchro/SimTraffic Reports

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# SR 429 & Binion Road Interchange 4: Binion Road & SR 429 Ramps/Boy Scout Road

2025 AM Build

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	۲.	•	1	5	•	1	5	•	1	ሻ	f,	
Traffic Volume (vph)	10	40	30	100	30	140	50	140	70	180	180	10
Future Volume (vph)	10	40	30	100	30	140	50	140	70	180	180	10
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1827	1553	1736	1812	0
Flt Permitted	0.736			0.431			0.632			0.475		
Satd. Flow (perm)	1345	1827	1553	787	1827	1553	1155	1827	1553	868	1812	0
Satd. Flow (RTOR)			279			279			284		4	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	42	32	105	32	147	53	147	74	189	200	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	15.0	24.0	24.0	14.0	23.0	23.0	13.0	28.0	28.0	24.0	39.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.4	6.4	6.4	6.4	6.4	
Act Effct Green (s)	10.3	7.3	7.3	13.8	12.5	12.5	18.9	12.2	12.2	28.0	24.8	
Actuated g/C Ratio	0.19	0.14	0.14	0.26	0.23	0.23	0.35	0.23	0.23	0.52	0.46	
v/c Ratio	0.04	0.17	0.07	0.31	0.07	0.26	0.11	0.36	0.13	0.31	0.24	
Control Delay	15.9	27.6	0.3	18.7	20.9	1.1	11.1	25.3	0.5	11.4	18.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	15.9	27.6	0.3	18.7	20.9	1.1	11.1	25.3	0.5	11.4	18.3	
LOS	В	С	A	В	С	A	В	С	A	В	В	
Approach Delay		15.8			9.8			15.9			14.9	
Approach LOS		В			А			В			В	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 53.6	6											
Control Type: Actuated-Unc	coordinated											
Maximum v/c Ratio: 0.36												
Intersection Signal Delay: 1	3.9			Ir	tersection	n LOS: B						
Intersection Capacity Utiliza	tion 46.8%			IC	CU Level	of Service	eΑ					
Analysis Period (min) 15												

4: Binion Road & SR 429 Ramps/Boy Scout Road Splits and Phases:



# Intersection: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	
Directions Served	L	Т	R	L	Т	R	L	Т	R	L	TR	
Maximum Queue (ft)	31	98	52	134	63	68	70	89	66	110	126	
Average Queue (ft)	8	28	17	45	16	24	23	39	21	48	45	
95th Queue (ft)	28	65	41	82	42	44	51	76	51	90	92	
Link Distance (ft)		966			954			954			953	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200		200	275		275	275		275	350		
Storage Blk Time (%)												
Queuing Penalty (veh)												

# Network Summary

Network wide Queuing Penalty: 0

# SR 429 & Binion Road Interchange 4: Binion Road & SR 429 Ramps/Boy Scout Road

2025 PM Build

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	5	•	1	5	•	1	5	•	1	ሻ	f,	
Traffic Volume (vph)	10	30	50	70	40	150	30	200	100	150	140	10
Future Volume (vph)	10	30	50	70	40	150	30	200	100	150	140	10
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1827	1553	1736	1809	0
Flt Permitted	0.730			0.592			0.657			0.506		
Satd. Flow (perm)	1334	1827	1553	1082	1827	1553	1200	1827	1553	924	1809	0
Satd. Flow (RTOR)			201			201			206		5	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	32	53	74	42	158	32	211	105	158	158	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	12.0	21.0	21.0	12.0	21.0	21.0	12.0	40.0	40.0	17.0	45.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.4	6.4	6.4	6.4	6.4	
Act Effct Green (s)	9.7	7.2	7.2	12.0	11.3	11.3	21.7	20.0	20.0	28.3	27.5	
Actuated g/C Ratio	0.19	0.14	0.14	0.23	0.22	0.22	0.42	0.38	0.38	0.54	0.53	
v/c Ratio	0.04	0.13	0.14	0.23	0.11	0.32	0.06	0.30	0.15	0.25	0.17	
Control Delay	16.6	26.7	0.7	18.4	21.3	4.6	9.8	21.5	0.4	9.9	14.3	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	16.6	26.7	0.7	18.4	21.3	4.6	9.8	21.5	0.4	9.9	14.3	
LOS	В	C	A	В	C	A	A	C	A	A	В	
Approach Delay		11.2			10.9			14.1			12.1	
Approach LOS		В			В			В			В	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 52.	1											
Control Type: Actuated-Unc	coordinated											
Maximum v/c Ratio: 0.32	<b>.</b> .											
Intersection Signal Delay: 1	2.4			In	tersection	n LOS: B						
Intersection Capacity Utiliza	ation 45.7%				CU Level	of Service	e A					
Analysis Period (min) 15												

Splits and Phases: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Ø1	₩ø2	<b>√</b> Ø3	<b>₩</b> Ø4
17 s	40 s	12 s	21 s
▼ ø5	Ø6	▶ 07	<b>4</b> Ø8
12 s	45 s	12 s	21 s

# Intersection: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	
Directions Served	L	Т	R	L	Т	R	L	Т	R	L	TR	
Maximum Queue (ft)	50	72	74	90	70	65	49	136	45	87	112	
Average Queue (ft)	8	23	26	37	18	27	10	48	21	40	32	
95th Queue (ft)	29	51	51	71	42	50	33	95	36	72	77	
Link Distance (ft)		966			954			954			953	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200		200	275		275	275		275	350		
Storage Blk Time (%)												
Queuing Penalty (veh)												

# Network Summary

Network wide Queuing Penalty: 0

# SR 429 & Binion Road Interchange 4: Binion Road & SR 429 Ramps/Boy Scout Road

2045 AM Build

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Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	ሻ	•	1	5	•	1	ሻ	•	1	5	4Î	
Traffic Volume (vph)	60	70	80	180	70	210	110	260	130	300	330	50
Future Volume (vph)	60	70	80	180	70	210	110	260	130	300	330	50
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1827	1553	1736	1790	0
Flt Permitted	0.709			0.508			0.526			0.349		
Satd. Flow (perm)	1295	1827	1553	928	1827	1553	961	1827	1553	638	1790	0
Satd. Flow (RTOR)			279			279			284		10	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	63	74	84	189	74	221	116	274	137	316	400	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Total Split (s)	15.0	24.0	24.0	14.0	23.0	23.0	13.0	28.0	28.0	24.0	39.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.4	6.4	6.4	6.4	6.4	
Act Effct Green (s)	14.5	8.9	8.9	15.9	12.0	12.0	22.7	16.0	16.0	35.5	26.2	
Actuated g/C Ratio	0.21	0.13	0.13	0.23	0.17	0.17	0.33	0.23	0.23	0.51	0.38	
v/c Ratio	0.20	0.32	0.19	0.63	0.23	0.44	0.30	0.65	0.24	0.59	0.59	
Control Delay	21.4	34.8	0.9	33.6	32.5	4.9	13.8	34.5	1.0	16.0	24.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	21.4	34.8	0.9	33.6	32.5	4.9	13.8	34.5	1.0	16.0	24.0	
LOS	С	С	A	С	С	A	В	С	А	В	С	
Approach Delay		18.1			20.3			21.2			20.5	
Approach LOS		В			С			С			С	
Intersection Summary												
Cycle Length: 90												
Actuated Cycle Length: 69.6												
Control Type: Actuated-Uncoordinated												
Maximum v/c Ratio: 0.65												
Intersection Signal Delay: 2			Ir	tersection	n LOS: C							
Intersection Capacity Utiliza	ation 63.3%			IC	CU Level	of Service	e B					
Analysis Period (min) 15												

4: Binion Road & SR 429 Ramps/Boy Scout Road Splits and Phases:


#### Intersection: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	
Directions Served	L	Т	R	L	Т	R	L	Т	R	L	TR	
Maximum Queue (ft)	116	137	90	193	95	113	176	235	92	263	332	
Average Queue (ft)	39	48	35	83	37	48	47	104	32	100	113	
95th Queue (ft)	80	92	63	145	74	88	93	178	60	170	199	
Link Distance (ft)		966			954			954			953	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200		200	275		275	275		275	350		
Storage Blk Time (%)											0	
Queuing Penalty (veh)											0	

#### Network Summary

Network wide Queuing Penalty: 0

# SR 429 & Binion Road Interchange 4: Binion Road & SR 429 Ramps/Boy Scout Road

2045 PM Build

	≯	→	$\rightarrow$	-	+	•	1	1	1	1	ŧ	-
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	۲.	•	1	5	•	1	ሻ	•	1	5	4Î	
Traffic Volume (vph)	50	70	110	130	70	250	80	360	180	240	250	60
Future Volume (vph)	50	70	110	130	70	250	80	360	180	240	250	60
Satd. Flow (prot)	1736	1827	1553	1736	1827	1553	1736	1827	1553	1736	1774	0
Flt Permitted	0.709			0.640			0.563			0.288		
Satd. Flow (perm)	1295	1827	1553	1169	1827	1553	1029	1827	1553	526	1774	0
Satd. Flow (RTOR)			201			263			206		17	
Confl. Peds. (#/hr)												
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	53	74	116	137	74	263	84	379	189	253	326	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	7	4		3	8	•	5	2	•	1	6	
Permitted Phases	4	04.0	4	8	04.0	8	2	40.0	2	6	45.0	
Total Split (s)	12.0	21.0	21.0	12.0	21.0	21.0	12.0	40.0	40.0	17.0	45.0	
Total Lost Time (s)	6.8	6.8	6.8	6.8	6.8	6.8	6.4	6.4	6.4	6.4	6.4	
Act Effet Green (s)	12.6	8.7	8.7	14.0	11.3	11.3	26.0	20.2	20.2	35.7	28.0	
Actuated g/C Ratio	0.18	0.13	0.13	0.20	0.16	0.16	0.38	0.29	0.29	0.52	0.41	
V/C Ratio	0.19	0.32	0.31	0.48	0.25	0.55	0.19	0.71	0.31	0.50	0.44	
Control Delay	22.5	34.4	2.4	29.0	31.7	9.7	10.8	30.4	4.1	14.7	18.7	
Queue Delay	0.0	0.0	0.0	20.0	0.0	0.0	10.0	0.0	0.0	14.7	10.0	
	22.5	34.4 C	Z.4	29.0	31.7	9.7	10.0 D	30.4	4.1	14.7 D	10./ D	
LUS Approach Dolou	U	16.5	A	U	10 7	A	D	20.2	A	D	D 17.0	
Approach LOS		10.5 R			10.7 R			20.3			17.0 R	
		D			D			U			D	
Intersection Summary												
Cycle Length: 90	-											
Actuated Cycle Length: 68.5	) A a ralimata d											
Movimum v/o Potio: 0.71	cordinated											
Interception Signal Delay: 1	0 /			In	torootio							
Intersection Capacity Litiliza	0.4 ition 62 1%					of Service	۵ R					
Analysis Period (min) 15	10011 02.4 %						<u>- D</u>					

Splits and Phases: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Ø1	Ø2	<b>√</b> Ø3	<b>₩</b> 04
17 s	40 s	12 s	21 s
▼ ø5	Ø6		<b>4</b> Ø8
12 s	45 s	12 s	21 s

#### Intersection: 4: Binion Road & SR 429 Ramps/Boy Scout Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	
Directions Served	L	Т	R	L	Т	R	L	Т	R	L	TR	
Maximum Queue (ft)	94	126	96	165	114	220	108	240	141	194	219	
Average Queue (ft)	30	45	40	69	36	64	35	125	32	80	85	
95th Queue (ft)	66	86	71	123	74	125	73	214	64	138	161	
Link Distance (ft)		966			954			954			953	
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	200		200	275		275	275		275	350		
Storage Blk Time (%)												
Queuing Penalty (veh)												

#### Network Summary

Network wide Queuing Penalty: 0



Appendix D

2025 AM and PM Peak Hour SIDRA Reports 2045 AM and PM Peak Hour SIDRA Reports

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### **MOVEMENT SUMMARY**

#### V Site: 1 [RA 1-lane (Site Folder: 2025 AM Build)]

SR 429/Binion Road Interchange 2025 AM Build Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfo	rmance										
Mov	Turn	INP	UT	DEM	AND	Deg.	Aver.	Level of	95% BA	ACK OF	Prop. E	ffective	Aver.	Aver.
ID		VOLU	IMES HV/1	FLO [ Total	ws uvi	Satn	Delay	Service	QUE [ \/eh	EUE Diet 1	Que	Stop	NO.	Speed
		veh/h	%	veh/h	%	v/c	sec		veh	ft		nate	Cycles	mph
Sout	h: Binio	on Road												
3	L2	50	4.0	53	4.0	0.267	6.1	LOS A	1.3	33.3	0.45	0.33	0.45	28.8
8	T1	140	4.0	147	4.0	0.267	6.1	LOS A	1.3	33.3	0.45	0.33	0.45	28.7
18	R2	70	4.0	74	4.0	0.267	6.1	LOS A	1.3	33.3	0.45	0.33	0.45	27.7
Appr	oach	260	4.0	274	4.0	0.267	6.1	LOS A	1.3	33.3	0.45	0.33	0.45	28.5
East	Boy S	cout Roa	d											
1	L2	100	4.0	105	4.0	0.268	6.0	LOS A	1.3	34.0	0.42	0.30	0.42	28.4
6	T1	30	4.0	32	4.0	0.268	6.0	LOS A	1.3	34.0	0.42	0.30	0.42	28.3
16	R2	140	4.0	147	4.0	0.268	6.0	LOS A	1.3	34.0	0.42	0.30	0.42	27.3
Appr	oach	270	4.0	284	4.0	0.268	6.0	LOS A	1.3	34.0	0.42	0.30	0.42	27.8
North	n: Binic	on Road												
7	L2	180	4.0	189	4.0	0.359	7.0	LOS A	2.0	50.5	0.44	0.31	0.44	27.6
4	T1	180	4.0	189	4.0	0.359	7.0	LOS A	2.0	50.5	0.44	0.31	0.44	27.6
14	R2	10	4.0	11	4.0	0.359	7.0	LOS A	2.0	50.5	0.44	0.31	0.44	26.6
Appr	oach	370	4.0	389	4.0	0.359	7.0	LOS A	2.0	50.5	0.44	0.31	0.44	27.6
West	: Ram	os												
5	L2	10	4.0	11	4.0	0.106	5.6	LOS A	0.4	10.9	0.53	0.46	0.53	29.3
2	T1	40	4.0	42	4.0	0.106	5.6	LOS A	0.4	10.9	0.53	0.46	0.53	29.2
12	R2	30	4.0	32	4.0	0.106	5.6	LOS A	0.4	10.9	0.53	0.46	0.53	28.2
Appr	oach	80	4.0	84	4.0	0.106	5.6	LOS A	0.4	10.9	0.53	0.46	0.53	28.8
All Vehio	cles	980	4.0	1032	4.0	0.359	6.3	LOS A	2.0	50.5	0.45	0.32	0.45	28.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6). Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## **QUEUE ANALYSIS**

#### V Site: 1 [RA 1-lane (Site Folder: 2025 AM Build)]

SR 429/Binion Road Interchange 2025 AM Build Site Category: (None) Roundabout

Lane Que	ues (Di	stance	)												
Lane	Contin.	Deg.	Prog.	Overflow	Back	of Queue	Que	ue at	Cycle A	verage	Qu	eue	Prob.	Prob.	Ov.
Number	Lane	Satn	Factor	Queue		(ft)	Start o	f Green	Qu	eue	Storag	e Ratio	Block. S	SL Ov. I	_ane
		v/c	(Queue)	(11)	Av.	95%	Av.	95%	Av.	95%	Av.	95%	%	%	INU.
South: Bini	on Road														
Lane 1		0.267	1.000	0.0	13.4	33.3	NA	NA	12.0	21.7	0.01	0.03	0.0	NA	NA
Approach		0.267			13.4	33.3	NA	NA	12.0	21.7	0.01	0.03			
East: Boy S	Scout Roa	ad													
Lane 1		0.268	1.000	0.0	13.7	34.0	NA	NA	12.2	22.0	0.01	0.03	0.0	NA	NA
Approach		0.268			13.7	34.0	NA	NA	12.2	22.0	0.01	0.03			
North: Binie	on Road														
Lane 1		0.359	1.000	0.0	20.3	50.5	NA	NA	19.4	35.2	0.02	0.05	0.0	NA	NA
Approach		0.359			20.3	50.5	NA	NA	19.4	35.2	0.02	0.05			
West: Ram	ps														
Lane 1		0.106	1.000	0.0	4.4	10.9	NA	NA	3.4	6.1	0.00	0.01	0.0	NA	NA
Approach		0.106			4.4	10.9	NA	NA	3.4	6.1	0.00	0.01			
Intersection	ı	0.359			20.3	50.5	NA	NA	19.4	35.2	0.02	0.05			

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

Lane Queue	es (Vel	hicles)													
Lane C Number L	Contin. Lane	Deg. Satn ( <sup>1</sup>	Prog. Factor Queue)	Overflow Queue (veh)	Back (\ (\	of Queue /eh) 95%	Que Start o (ve	ue at f Green eh) 95%	Cycle A Que (ve	verage eue eh) م5%	Qu Storag	eue e Ratio 95%	Prob. Block. S %	Prob. L Ov. I %	Ov. ₋ane No.
South: Binion	Road	V/C	_	_	<i>/</i> \v.	5570	Γ.ν.	0070	/ \v.	0070	/	0070	70	70	_
Lane 1		0.267	1.000	0.0	0.5	1.3	NA	NA	0.5	0.8	0.01	0.03	0.0	NA	NA
Approach		0.267			0.5	1.3	NA	NA	0.5	0.8	0.01	0.03			
East: Boy Sco	out Roa	ad													
Lane 1		0.268	1.000	0.0	0.5	1.3	NA	NA	0.5	0.9	0.01	0.03	0.0	NA	NA
Approach		0.268			0.5	1.3	NA	NA	0.5	0.9	0.01	0.03			
North: Binion	Road														
Lane 1		0.359	1.000	0.0	0.8	2.0	NA	NA	0.8	1.4	0.02	0.05	0.0	NA	NA
Approach		0.359			0.8	2.0	NA	NA	0.8	1.4	0.02	0.05			
West: Ramps	;														
Lane 1		0.106	1.000	0.0	0.2	0.4	NA	NA	0.1	0.2	0.00	0.01	0.0	NA	NA
Approach		0.106			0.2	0.4	NA	NA	0.1	0.2	0.00	0.01			
Intersection		0.359			0.8	2.0	NA	NA	0.8	1.4	0.02	0.05			

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

Continuous La	ne Per	forman	се												
Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy Spaci sec	ing ft	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Den veh/mi	pc/mi	LOS (Density Method)		
South: Binion Roa	ad														
This approach do	es not	have any	continuo	us lanes											
East: Boy Scout F	ast: Boy Scout Road														
This approach do	ast: Boy Scout Road his approach does not have any continuous lanes														
North: Binion Roa	ad														
This approach do	es not	have any	continuo	us lanes											
West: Ramps															
This approach do	es not	have any	continuo	us lanes											

Midblock Effective Detection Zone Length = 7 ft

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### **MOVEMENT SUMMARY**

#### V Site: 1 [RA 1-lane (Site Folder: 2025 PM Build)]

SR 429/Binion Road Interchange 2025 PM Build Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfo	rmance										
Mov	Turn	INP	UT	DEM	AND	Deg.	Aver.	Level of	95% BA	ACK OF	Prop. E	ffective	Aver.	Aver.
U		VOLU		FLO [ Total	vvS н\/ 1	Sath	Delay	Service	QUE [ \/eh	EUE Dist 1	Que	Stop Rate	NO. Cycles	Speed
		veh/h	%	veh/h	%	v/c	sec		veh	ft		Trate	Cycles	mph
Sout	h: Binio	on Road												
3	L2	30	4.0	32	4.0	0.324	6.6	LOS A	1.7	43.6	0.44	0.31	0.44	28.8
8	T1	200	4.0	211	4.0	0.324	6.6	LOS A	1.7	43.6	0.44	0.31	0.44	28.7
18	R2	100	4.0	105	4.0	0.324	6.6	LOS A	1.7	43.6	0.44	0.31	0.44	27.7
Appr	oach	330	4.0	347	4.0	0.324	6.6	LOS A	1.7	43.6	0.44	0.31	0.44	28.4
East	Boy S	cout Roa	d											
1	L2	70	4.0	74	4.0	0.270	6.2	LOS A	1.3	33.7	0.46	0.35	0.46	28.5
6	T1	40	4.0	42	4.0	0.270	6.2	LOS A	1.3	33.7	0.46	0.35	0.46	28.4
16	R2	150	4.0	158	4.0	0.270	6.2	LOS A	1.3	33.7	0.46	0.35	0.46	27.4
Appr	oach	260	4.0	274	4.0	0.270	6.2	LOS A	1.3	33.7	0.46	0.35	0.46	27.9
North	n: Binic	n Road												
7	L2	150	4.0	158	4.0	0.278	5.8	LOS A	1.4	36.7	0.36	0.22	0.36	28.2
4	T1	140	4.0	147	4.0	0.278	5.8	LOS A	1.4	36.7	0.36	0.22	0.36	28.1
14	R2	10	4.0	11	4.0	0.278	5.8	LOS A	1.4	36.7	0.36	0.22	0.36	27.2
Appr	oach	300	4.0	316	4.0	0.278	5.8	LOS A	1.4	36.7	0.36	0.22	0.36	28.2
West	: Ram	os												
5	L2	10	4.0	11	4.0	0.107	5.1	LOS A	0.4	11.2	0.48	0.38	0.48	29.6
2	T1	30	4.0	32	4.0	0.107	5.1	LOS A	0.4	11.2	0.48	0.38	0.48	29.5
12	R2	50	4.0	53	4.0	0.107	5.1	LOS A	0.4	11.2	0.48	0.38	0.48	28.5
Appr	oach	90	4.0	95	4.0	0.107	5.1	LOS A	0.4	11.2	0.48	0.38	0.48	28.9
All Vehic	cles	980	4.0	1032	4.0	0.324	6.1	LOS A	1.7	43.6	0.42	0.30	0.42	28.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6). Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## **QUEUE ANALYSIS**

#### V Site: 1 [RA 1-lane (Site Folder: 2025 PM Build)]

SR 429/Binion Road Interchange 2025 PM Build Site Category: (None) Roundabout

Lane Que	ues (Di	stance	)												
Lane	Contin.	Deg.	Prog.	Overflow	Back of	of Queue	Que	ue at	Cycle A	verage	Qu	eue	Prob.	Prob.	Ov.
Number	Lane	Satn	Factor	Queue		(ft)	Start o	f Green	Qu /f	eue	Storag	e Ratio	Block. S	SL Ov. I	Lane
		v/c	Queue)	(11)	Av.	95%	Av.	95%	Av.	95%	Av.	95%	%	%	NU.
South: Bini	on Road														
Lane 1		0.324	1.000	0.0	17.6	43.6	NA	NA	16.4	29.7	0.02	0.04	0.0	NA	NA
Approach		0.324			17.6	43.6	NA	NA	16.4	29.7	0.02	0.04			
East: Boy S	Scout Ro	ad													
Lane 1		0.270	1.000	0.0	13.5	33.7	NA	NA	12.2	22.1	0.01	0.03	0.0	NA	NA
Approach		0.270			13.5	33.7	NA	NA	12.2	22.1	0.01	0.03			
North: Binio	on Road														
Lane 1		0.278	1.000	0.0	14.8	36.7	NA	NA	13.1	23.7	0.01	0.04	0.0	NA	NA
Approach		0.278			14.8	36.7	NA	NA	13.1	23.7	0.01	0.04			
West: Ram	ps														
Lane 1		0.107	1.000	0.0	4.5	11.2	NA	NA	3.4	6.2	0.00	0.01	0.0	NA	NA
Approach		0.107			4.5	11.2	NA	NA	3.4	6.2	0.00	0.01			
Intersection	ı	0.324			17.6	43.6	NA	NA	16.4	29.7	0.02	0.04			

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

Lane Queues (	Vehicles)	)												
Lane Conti Number Lane	n. Deg. e Satn	Prog. Factor (Queue)	Overflow Queue (veh)	Back (	of Queue veh)	Que Start o (ve	ue at f Green eh)	Cycle A Qu (ve	\verage eue eh)	Qu Storag	eue e Ratio	Prob. Block. S	Prob. L Ov. I	Ov. ₋ane No.
	v/c			Av.	95%	Av.	95%	Av.	95%	Av.	95%	%	%	
South: Binion Roa	ad													
Lane 1	0.324	1.000	0.0	0.7	1.7	NA	NA	0.6	1.1	0.02	0.04	0.0	NA	NA
Approach	0.324			0.7	1.7	NA	NA	0.6	1.1	0.02	0.04			
East: Boy Scout F	Road													
Lane 1	0.270	1.000	0.0	0.5	1.3	NA	NA	0.5	0.9	0.01	0.03	0.0	NA	NA
Approach	0.270			0.5	1.3	NA	NA	0.5	0.9	0.01	0.03			
North: Binion Roa	ıd													
Lane 1	0.278	1.000	0.0	0.6	1.4	NA	NA	0.5	0.9	0.01	0.04	0.0	NA	NA
Approach	0.278			0.6	1.4	NA	NA	0.5	0.9	0.01	0.04			
West: Ramps														
Lane 1	0.107	1.000	0.0	0.2	0.4	NA	NA	0.1	0.2	0.00	0.01	0.0	NA	NA
Approach	0.107			0.2	0.4	NA	NA	0.1	0.2	0.00	0.01			
Intersection	0.324			0.7	1.7	NA	NA	0.6	1.1	0.02	0.04			

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

Continuous La	ne Per	forman	се												
Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy Spaci sec	ing ft	Aver. Vehicle Length ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Den veh/mi	pc/mi	LOS (Density Method)		
South: Binion Roa	ad														
This approach do	es not	have any	continuo	us lanes											
East: Boy Scout F	ast: Boy Scout Road														
This approach do	ast: Boy Scout Road his approach does not have any continuous lanes														
North: Binion Roa	ad														
This approach do	es not	have any	continuo	us lanes											
West: Ramps															
This approach do	es not	have any	continuo	us lanes											

Midblock Effective Detection Zone Length = 7 ft

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### **MOVEMENT SUMMARY**

#### W Site: 1 [RA 1-lane (Site Folder: 2045 AM Build)]

SR 429/Binion Road Interchange 2045 AM Build Site Category: (None) Roundabout

Vehi	cle M	ovemen	t Perfo	rmance										
Mov	Turn	INP	UT	DEM	AND	Deg.	Aver.	Level of	95% BA		Prop. E	Iffective	Aver.	Aver.
U		VOLU		FLO [ Total	vvS н\/ 1	Sath	Delay	Service	QUI [\/eh	EUE Dist 1	Que	Stop Rate	NO. Cycles	Speed
		veh/h	%	veh/h	%	v/c	sec		veh	ft		naic	Cycles	mph
Sout	h: Binio	on Road												
3	L2	110	4.0	116	4.0	0.641	15.1	LOS C	6.6	170.3	0.79	1.03	1.34	24.4
8	T1	260	4.0	274	4.0	0.641	15.1	LOS C	6.6	170.3	0.79	1.03	1.34	24.3
18	R2	130	4.0	137	4.0	0.641	15.1	LOS C	6.6	170.3	0.79	1.03	1.34	23.6
Appr	oach	500	4.0	526	4.0	0.641	15.1	LOS C	6.6	170.3	0.79	1.03	1.34	24.1
East	Boy S	cout Roa	d											
1	L2	180	4.0	189	4.0	0.590	13.4	LOS B	5.3	136.2	0.75	0.93	1.18	24.7
6	T1	70	4.0	74	4.0	0.590	13.4	LOS B	5.3	136.2	0.75	0.93	1.18	24.6
16	R2	210	4.0	221	4.0	0.590	13.4	LOS B	5.3	136.2	0.75	0.93	1.18	23.9
Appr	oach	460	4.0	484	4.0	0.590	13.4	LOS B	5.3	136.2	0.75	0.93	1.18	24.3
North	n: Binic	on Road												
7	L2	300	4.0	316	4.0	0.806	22.6	LOS C	15.6	401.9	0.93	1.41	2.04	21.4
4	T1	330	4.0	347	4.0	0.806	22.6	LOS C	15.6	401.9	0.93	1.41	2.04	21.3
14	R2	50	4.0	53	4.0	0.806	22.6	LOS C	15.6	401.9	0.93	1.41	2.04	20.8
Appr	oach	680	4.0	716	4.0	0.806	22.6	LOS C	15.6	401.9	0.93	1.41	2.04	21.3
West	: Ram	ps												
5	L2	60	4.0	63	4.0	0.412	13.4	LOS B	2.0	52.1	0.74	0.83	0.99	25.0
2	T1	70	4.0	74	4.0	0.412	13.4	LOS B	2.0	52.1	0.74	0.83	0.99	24.9
12	R2	80	4.0	84	4.0	0.412	13.4	LOS B	2.0	52.1	0.74	0.83	0.99	24.1
Appr	oach	210	4.0	221	4.0	0.412	13.4	LOS B	2.0	52.1	0.74	0.83	0.99	24.6
All Vehic	cles	1850	4.0	1947	4.0	0.806	17.2	LOS C	15.6	401.9	0.83	1.12	1.52	23.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6). Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## **QUEUE ANALYSIS**

#### V Site: 1 [RA 1-lane (Site Folder: 2045 AM Build)]

SR 429/Binion Road Interchange 2045 AM Build Site Category: (None) Roundabout

Lane Queues (Distance)															
Lane	Contin.	Deg.	Prog.	Overflow	Back o	f Queue	Que	ue at	Cycle A	verage	Qu	eue	Prob.	Prob.	Ov.
Number	Lane	Satn	Factor	Queue	(	ft)	Start o	f Green	Qu	eue	Storag	e Ratio	Block. S	L Ov. I	Lane
		(	Queue)	(ft)	<b>A</b>	050/	(1	ft)	(1	t)	<b>A</b>	050/			No.
		V/C			AV.	95%	AV.	95%	AV.	95%	AV.	95%	%	%	
South: Bini	on Road														
Lane 1		0.641	1.000	21.6	68.5	170.3	NA	NA	56.9	103.2	0.07	0.17	0.0	NA	NA
Approach		0.641			68.5	170.3	NA	NA	56.9	103.2	0.07	0.17			
East: Boy S	Scout Roa	ad													
Lane 1		0.590	1.000	15.4	54.8	136.2	NA	NA	46.6	84.6	0.05	0.14	0.0	NA	NA
Approach		0.590			54.8	136.2	NA	NA	46.6	84.6	0.05	0.14			
North: Binio	on Road														
Lane 1		0.806	1.000	64.6	161.7	401.9	NA	NA	115.8	210.0	0.16	0.40	0.0	NA	NA
Approach		0.806			161.7	401.9	NA	NA	115.8	210.0	0.16	0.40			
West: Ram	ps														
Lane 1		0.412	1.000	3.9	21.0	52.1	NA	NA	21.2	38.4	0.02	0.05	0.0	NA	NA
Approach		0.412			21.0	52.1	NA	NA	21.2	38.4	0.02	0.05			
Intersection	۱	0.806			161.7	401.9	NA	NA	115.8	210.0	0.16	0.40			

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

Lane Queues (Vehicles)															
Lane Cor Number La	ntin. Ine	Deg. Satn	Prog. Factor Queue)	Overflow Queue (veh)	Back (	of Queue veh)	Que Start o (ve	ue at f Green eh)	Cycle A Que (ve	verage eue eh)	Que Storag	eue e Ratio	Prob. I Block. S	Prob. L Ov. I	Ov. ₋ane No.
South: Binion R	oad	v/C	_	_	Av.	90%	Av.	90%	Av.	9570	<i>P</i> \V.	9576	70	70	_
Lane 1	(	0.641	1.000	0.8	2.7	6.6	NA	NA	2.2	4.0	0.07	0.17	0.0	NA	NA
Approach	(	0.641			2.7	6.6	NA	NA	2.2	4.0	0.07	0.17			
East: Boy Scout	t Road	d													
Lane 1	(	0.590	1.000	0.6	2.1	5.3	NA	NA	1.8	3.3	0.05	0.14	0.0	NA	NA
Approach	(	0.590			2.1	5.3	NA	NA	1.8	3.3	0.05	0.14			
North: Binion Re	oad														
Lane 1	(	0.806	1.000	2.5	6.3	15.6	NA	NA	4.5	8.1	0.16	0.40	0.0	NA	NA
Approach	(	0.806			6.3	15.6	NA	NA	4.5	8.1	0.16	0.40			
West: Ramps															
Lane 1	(	0.412	1.000	0.2	0.8	2.0	NA	NA	0.8	1.5	0.02	0.05	0.0	NA	NA
Approach	(	0.412			0.8	2.0	NA	NA	0.8	1.5	0.02	0.05			
Intersection	(	0.806			6.3	15.6	NA	NA	4.5	8.1	0.16	0.40			

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

Continuous Lane Performance												
Lane Number	Deg. Satn v/c	Unint. Speed mph	Unint. Travel Delay sec	Hdwy Spacii	ng Aver. Vehicle Length ft ft	Occup. Time sec	Space Time sec	Space Occup. Ratio %	Time Occup. Ratio %	Dens veh/mi	sity pc/mi	LOS (Density Method)
South: Binion Roa	ad										pont	
This approach do	es not	have any	continuo	us lanes								
East: Boy Scout F	Road											
This approach do	es not	have any	continuo	us lanes								
North: Binion Roa	ıd											
This approach do	This approach does not have any continuous lanes											
West: Ramps												
This approach does not have any continuous lanes												

Midblock Effective Detection Zone Length = 7 ft

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### **MOVEMENT SUMMARY**

#### V Site: 1 [RA 1-lane (Site Folder: 2045 PM Build)]

SR 429/Binion Road Interchange 2045 PM Build Site Category: (None) Roundabout

Vehi	Vehicle Movement Performance   Mov Turn INPUT DEMAND Deg. Aver. Level of 95% BACK OF Prop. Effective Aver. Aver.													
Mov	Turn	INP	UT	DEM	AND	Deg.	Aver.	Level of	95% BA	ACK OF	Prop. E	ffective	Aver.	Aver.
		TotaL		FLO [ Total	WS HV 1	Sath	Delay	Service	QUE [ \/eh	EUE Dist 1	Que	Stop Rate	No. Cycles	Speed
		veh/h	%	veh/h	%	v/c	sec		veh	ft		nate	Cycles	mph
Sout	h: Binio	on Road												
3	L2	80	4.0	84	4.0	0.735	18.1	LOS C	11.1	285.8	0.85	1.18	1.64	23.4
8	T1	360	4.0	379	4.0	0.735	18.1	LOS C	11.1	285.8	0.85	1.18	1.64	23.3
18	R2	180	4.0	189	4.0	0.735	18.1	LOS C	11.1	285.8	0.85	1.18	1.64	22.6
Appr	oach	620	4.0	653	4.0	0.735	18.1	LOS C	11.1	285.8	0.85	1.18	1.64	23.1
East	Boy S	cout Roa	d											
1	L2	130	4.0	137	4.0	0.617	15.0	LOS C	5.6	144.2	0.78	1.00	1.32	24.2
6	T1	70	4.0	74	4.0	0.617	15.0	LOS C	5.6	144.2	0.78	1.00	1.32	24.1
16	R2	250	4.0	263	4.0	0.617	15.0	LOS C	5.6	144.2	0.78	1.00	1.32	23.4
Appr	oach	450	4.0	474	4.0	0.617	15.0	LOS C	5.6	144.2	0.78	1.00	1.32	23.8
North	n: Binic	n Road												
7	L2	240	4.0	253	4.0	0.596	12.0	LOS B	6.0	154.1	0.69	0.72	0.95	25.3
4	T1	250	4.0	263	4.0	0.596	12.0	LOS B	6.0	154.1	0.69	0.72	0.95	25.2
14	R2	60	4.0	63	4.0	0.596	12.0	LOS B	6.0	154.1	0.69	0.72	0.95	24.5
Appr	oach	550	4.0	579	4.0	0.596	12.0	LOS B	6.0	154.1	0.69	0.72	0.95	25.2
West	: Ram	os												
5	L2	50	4.0	53	4.0	0.365	10.3	LOS B	1.7	45.1	0.69	0.72	0.79	26.5
2	T1	70	4.0	74	4.0	0.365	10.3	LOS B	1.7	45.1	0.69	0.72	0.79	26.4
12	R2	110	4.0	116	4.0	0.365	10.3	LOS B	1.7	45.1	0.69	0.72	0.79	25.5
Appr	oach	230	4.0	242	4.0	0.365	10.3	LOS B	1.7	45.1	0.69	0.72	0.79	26.0
All Vehic	cles	1850	4.0	1947	4.0	0.735	14.6	LOS B	11.1	285.8	0.77	0.94	1.25	24.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab). Roundabout LOS Method: Same as Sign Control.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).

Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6). Roundabout Capacity Model: US HCM 6.

Delay Model: HCM Delay Formula (Geometric Delay is not included).

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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## **QUEUE ANALYSIS**

#### V Site: 1 [RA 1-lane (Site Folder: 2045 PM Build)]

SR 429/Binion Road Interchange 2045 PM Build Site Category: (None) Roundabout

Lane Que	ues (Di	stance	)												
Lane	Contin.	Deg.	Prog.	Overflow	Back o	f Queue	Que	ue at	Cycle A	Average	Qu	eue	Prob.	Prob.	Ov.
Number	Lane	Satn	Factor	Queue	(	ft)	Start of	f Green	Qu	eue	Storag	e Ratio	Block. S	SL Ov. I	Lane
		v/c	(Queue)	(11)	Av.	95%	Av.	95%	Av.	95%	Av.	95%	%	%	NO.
South: Bini	on Road														
Lane 1		0.735	1.000	41.0	115.0	285.8	NA	NA	84.6	153.5	0.11	0.29	0.0	NA	NA
Approach		0.735			115.0	285.8	NA	NA	84.6	153.5	0.11	0.29			
East: Boy S	Scout Roa	ad													
Lane 1		0.617	1.000	18.0	58.0	144.2	NA	NA	51.0	92.5	0.06	0.14	0.0	NA	NA
Approach		0.617			58.0	144.2	NA	NA	51.0	92.5	0.06	0.14			
North: Binio	on Road														
Lane 1		0.596	1.000	13.8	62.0	154.1	NA	NA	49.9	90.4	0.06	0.15	0.0	NA	NA
Approach		0.596			62.0	154.1	NA	NA	49.9	90.4	0.06	0.15			
West: Ram	ps														
Lane 1		0.365	1.000	1.7	18.2	45.1	NA	NA	17.9	32.5	0.02	0.05	0.0	NA	NA
Approach		0.365			18.2	45.1	NA	NA	17.9	32.5	0.02	0.05			
Intersection	ı	0.735			115.0	285.8	NA	NA	84.6	153.5	0.11	0.29			

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

Lane Queues (Vehicles)															
Lane ( Number	Contin. Lane	Deg. Satn (	Prog. Factor Queue)	Overflow Queue (veh)	Back (\ (\	of Queue /eh) 95%	Que Start of (ve	ue at f Green eh) 95%	Cycle A Que (Ve	verage eue h) 05%	Qu Storag	eue e Ratio 95%	Prob. I Block. S %	Prob. L Ov. I %	Ov. ₋ane No.
South: Binior	n Road	v/C	_	_	Λν.	3370	<i>r</i> .v.	3370	Λν.	3370	Λν.	3370	/0	70	_
Lane 1		0.735	1.000	1.6	4.5	11.1	NA	NA	3.3	5.9	0.11	0.29	0.0	NA	NA
Approach		0.735			4.5	11.1	NA	NA	3.3	5.9	0.11	0.29			
East: Boy Sc	cout Roa	ad													
Lane 1		0.617	1.000	0.7	2.2	5.6	NA	NA	2.0	3.6	0.06	0.14	0.0	NA	NA
Approach		0.617			2.2	5.6	NA	NA	2.0	3.6	0.06	0.14			
North: Binion	n Road														
Lane 1		0.596	1.000	0.5	2.4	6.0	NA	NA	1.9	3.5	0.06	0.15	0.0	NA	NA
Approach		0.596			2.4	6.0	NA	NA	1.9	3.5	0.06	0.15			
West: Ramps	s														
Lane 1		0.365	1.000	0.1	0.7	1.7	NA	NA	0.7	1.3	0.02	0.05	0.0	NA	NA
Approach		0.365			0.7	1.7	NA	NA	0.7	1.3	0.02	0.05			
Intersection		0.735			4.5	11.1	NA	NA	3.3	5.9	0.11	0.29			

Queue Model: HCM Queue Formula.

Gap-Acceptance Capacity: Traditional M1.

Continuous Lane Performance												
Lane Number	Deg. Satn v/c	Unint. Speed	Unint. Travel Delay sec	Hdwy Spaci	ng Ave Vehic Leng	er. Occup. le Time th ft sec	Space Time	Space Occup. Ratio %	Time Occup. Ratio %	Den veh/mi	sity pc/mi	LOS (Density Method)
South: Binion Roa	ad										penni	
This approach do	es not	have any	continuo	us lanes								
East: Boy Scout F	Road											
This approach do	es not	have any	continuo	us lanes								
North: Binion Roa	ad											
This approach do	es not	have any	continuo	us lanes								
West: Ramps												
This approach does not have any continuous lanes												

Midblock Effective Detection Zone Length = 7 ft

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## **Appendix D – ITS Cost Estimate**

	* ENGINEER'S ESTIMATE *											
	CFX PROJECT NO. 429-309; CONTRACT NO. 001844											
	ITEM NO. QUANTITY UNIT DESCRIPTION UNIT PRICE TOTAL											
ITEM NO.	QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL							
630-002-011	4,000.00	LF	CONDUIT, FURNISH & INSTALL, OPEN TRENCH	\$13.00	\$52,000.00							
630-002-012	1,000.00	LF	CONDUIT, FURNISH & INSTALL, DIRECTIONAL BORE	\$30.00	\$30,000.00							
630-002-014	100.00	LF	CONDUIT, FURNISH & INSTALL, ABOVEGROUND	\$35.14	\$3,514.00							
633-001-121	5,100.00	LF	FIBER OPTIC CABLE, F&I, UNDERGROUND, 2-12 FIBERS	\$3.75	\$19,125.00							
633-002-031	20.00	EA	FIBER OPTIC CONNECTION, INSTALL, SPLICE	\$56.00	\$1,120.00							
633-002-032	20.00	EA	FIBER OPTIC CONNECTION, INSTALL, TERMINATION	\$92.00	\$1,840.00							
633-003-012	4.00	EA	FIBER OPTIC CONNECTION HARDWARE, F&I, SPLICE TRAY	\$179.00	\$716.00							
33-003-013 48.00 EA FIBER OPTIC CONNECTION HARDWARE, F&I, PRETERMINATED CONNECTOR ASSEMBLY \$74.00 \$3,552.00												
633-003-016	33-003-016 4.00 EA FIBER OPTIC CONNECTION HARDWARE, F&I, PATCH PANEL- FIELD TERMINATED \$2,024.00 \$8,096.00											
633-003-017	33-003-017 4.00 EA FIBER OPTIC CONNECTION HARDWARE, F&I, CONNECTOR PANEL \$155.00 \$620.00											
633-008-001	333-008-001 140.00 LF MULTI-CONDUCTOR COMMUNICATION CABLE, FURNISH & INSTALL \$6.00 \$840.00											
635-002-011	10.00	EA	PULL & SPLICE BOX, F&I, 13" x 24" COVER SIZE	\$1,120.00	\$11,200.00							
635-002-012	15.00	EA	PULL & SPLICE BOX, F&I, 24" X 36" COVER SIZE	\$2,500.00	\$37,500.00							
639-002-001	5,057.00	LF	ELECTRICAL SERVICE WIRE, FURNISH & INSTALL	\$16.00	\$80,912.00							
639-003-011	2.00	EA	ELECTRICAL SERVICE DISCONNECT, F&I, POLE MOUNT	\$1,800.00	\$3,600.00							
639-006-001	4.00	EA	ELECTRICAL POWER SERVICE- TRANSFORMER FURNISH & INSTALL	\$3,000.00	\$12,000.00							
641-002-012	4.00	EA	PRESTRESSED CONCRETE POLE, F&I, TYPE P-II SERVICE POLE	\$2,178.00	\$8,712.00							
660-007-022	2.00	EA	VEHICLE DETECTION SYSTEM- WRONG WAY FOR EXIT RAMP, 3 OR MORE LANES, AC POWERED	\$80,000.00	\$160,000.00							
676-002-122	2.00	EA	ITS CABINET, FURNISH & INSTALL, POLE MOUNT WITH SUNSHIELD, 336S, 24" W X 46" H X 22" D	\$9,500.00	\$19,000.00							
684-001-001	6.00	EA	MANAGED FIELD ETHERNET SWITCH, FURNISH & INSTALL	\$5,000.00	\$30,000.00							
684-002-001	1.00	EA	DEVICE SERVER, FURNISH & INSTALL	\$1,660.00	\$1,660.00							
685-001-012	4.00	EA	UNINTERRUPTIBLE POWER SUPPLY, FURNISH AND INSTALL, ONLINE/DOUBLE CONVERSION	\$8,800.00	\$35,200.00							
685-002-001	4.00	EA	REMOTE POWER MANAGEMENT UNIT- RPMU, FURNISH AND INSTALL	\$18,202.00	\$72,808.00							
695-003-011	1.00	AS	TRAFFIC MONITORING SITE SPEED/CLASSIFICATION UNIT, FURNISH & INSTALL, VOLUME SPEED AND CLASSIFICATION	\$7,100.00	\$7,100.00							
700-001-011	4.00	AS	SINGLE POST SIGN, F&I GROUND MOUNT, UP TO 12 SF	\$500.00	\$2,000.00							
700-006-011	8.00	AS	HIGHLIGHTED SIGN, F&I GROUND MOUNT- AC POWERED, UP TO 12 SF	\$7,000.00	\$56,000.00							
700-013-012	6.00	EA	RETROREFLECTIVE SIGN STRIP- FURNISH AND INSTALL, 2'	\$108.00	\$648.00							
700-013-015	6.00	EA	RETROREFLECTIVE SIGN STRIP- FURNISH AND INSTALL, 5'	\$95.00	\$570.00							
	<u>.</u>	<u> </u>	Contingency (25%)		\$165,083.25							
	TOTAL COST \$825,416.25											

# **Appendix E – Typical Section Package**



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DATE	DESCRIPTION	DATE	DESCRIPTION	P.E. LICENSE NUMBER 70949	SR 429 IN AT RINI	N ROAD	CENTRAL	
				THE BALMORAL GROUP		<b>FLORIDA</b>		
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165 LINCOLN AVENUE

WINTER PARK, FL 32789

ROAD NO.

SR 429

PROJECT NO.

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# TYPICAL SECTIONS

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# **Appendix F – Conceptual Design Roadway Plans**



SR 429 INTERCHANGE WITH BINION ROAD (RE-ALIGNED BOY SCOUT ROAD SIGNAL ALT. 1)





SR 429 INTERCHANGE WITH BINION ROAD (RE-ALIGNED BOY SCOUT ROAD ROUNDABOUT ALT. 2)





	REVIS	SIONS		BYRON D SPRAGUE IR PE				
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