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Gulf Regional Planning Commission
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Re: Technical Memo for North Swan Road
Garver Project No. 20T18061

1.0 Introduction

North Swan Road provides a two-mile connection between US 49 and South Swan Road in central Harrison County. As residential neighborhoods have developed along the route over the last 20 years, traffic volumes have increased. Reports of speeding and increased congestion have led to safety and mobility concerns for the route. At the request of the Gulf Regional Planning Commission (GRPC), Garver performed a traffic study to evaluate existing and future traffic conditions along North Swan Road, and to recommend short and long-term mitigation measures to address the transportation problems in the study area.

2.0 Traffic Speeds

Several traffic speed studies were conducted between November 19, 2020, and March 4, 2021, with each study showing that motorists are travelling at excessive speeds along the route. A summary of the data collected in the first study (November 19, 2020) is provided in **Table 1**. The subsequent speed studies produced similar results. Over 95% of the vehicles are going over the posted speed limit of 30 mph, with most traveling at much higher speeds. Speeding is worst on the western end of the study area between Walter Smith Road and US 49, with the median speed being more than 50% above the posted speed limit.

Table 1: Traffic Speed Data

Location	85% Speed (mph)	95% Speed (mph)	Median Speed (mph)
North of South Swan Road	36.57	41.61	31.09
West of Swan Lake Blvd	41.85	48.88	33.78
West of Walter Smith Road	52.01	56.37	45.52

3.0 Existing Traffic Volumes

Turning movement counts at key intersections along North Swan Road were collected by GRPC in November and December 2020. The traffic counts were processed to determine the AM and PM peak hour volumes at the study intersections. Adjustment factors for the month and day of the week were applied to the raw data, and the adjusted volumes were balanced as necessary to develop 2020 Existing Volumes for the peak hours as shown in **Figure 1**.

4.0 Traffic Projections

To establish the future traffic conditions, an annual growth rate of 2% was utilized, and trip generation was performed for anticipated developments that are expected to impact the study area. Future traffic conditions were determined for the 2045 design year.

4.1 Trip Generation

Trips from the anticipated developments along North Swan Road were generated based on the *ITE Trip Generation Manual, 10th Edition*. Trip generation rates are expressed in vehicle trip ends per unit, with a unit being a characteristic of the type of facility such as number of dwelling units or square footage for a retail space. The ITE publication includes rates for AM Peak and PM Peak as well as directional distribution percentages. **Table 2** lists the future developments and results of the trip generation calculations. It should be noted that pass-by trips were taken into account for the retail-type developments such as shopping centers. The trips generated from the developments were distributed based on the existing traffic patterns along North Swan Road and added to 2045 background volumes. The resulting 2045 Post Development volumes are shown in **Figure 2**.

Figure 1

North Swan Road - 2020 Existing Volumes

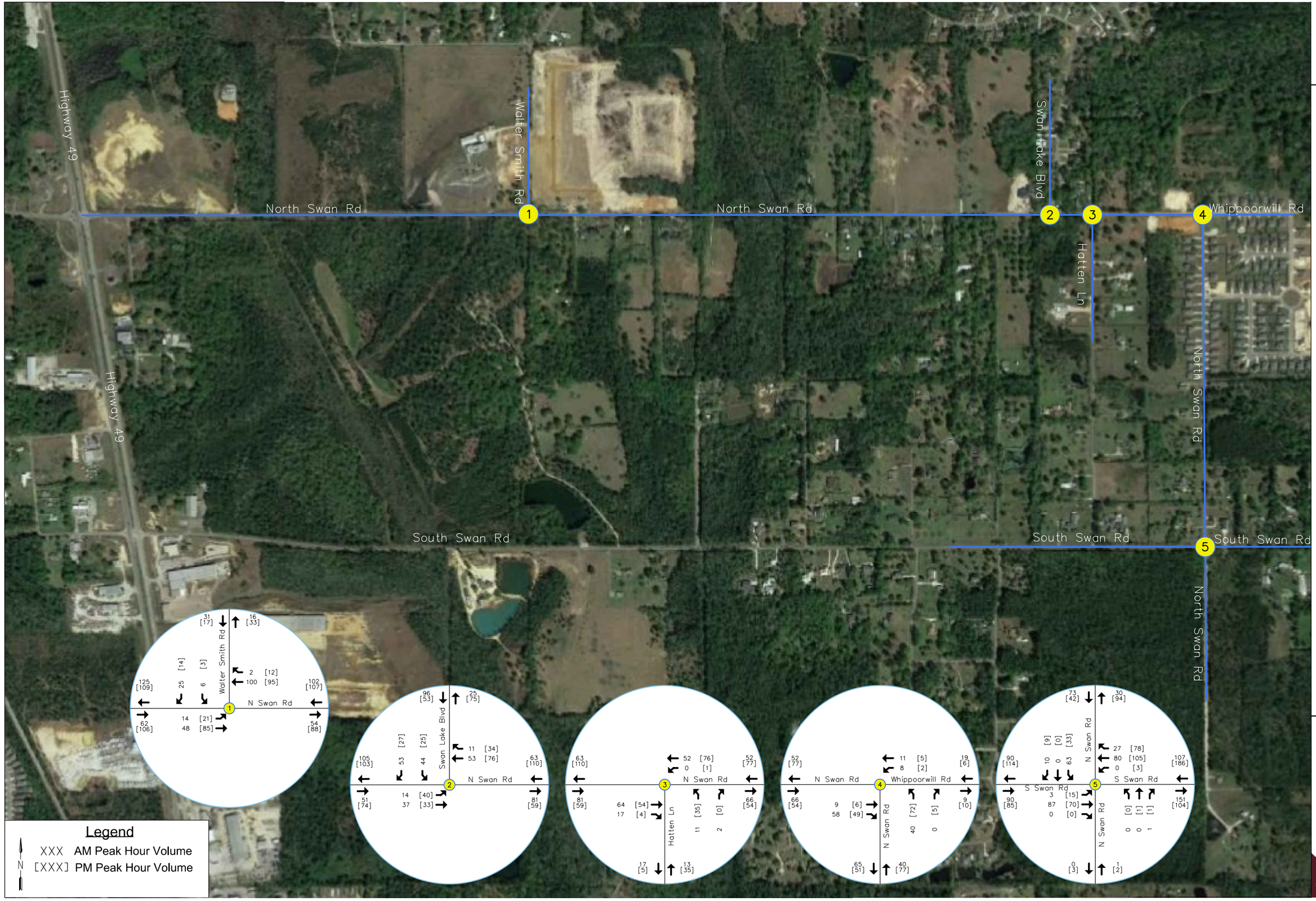

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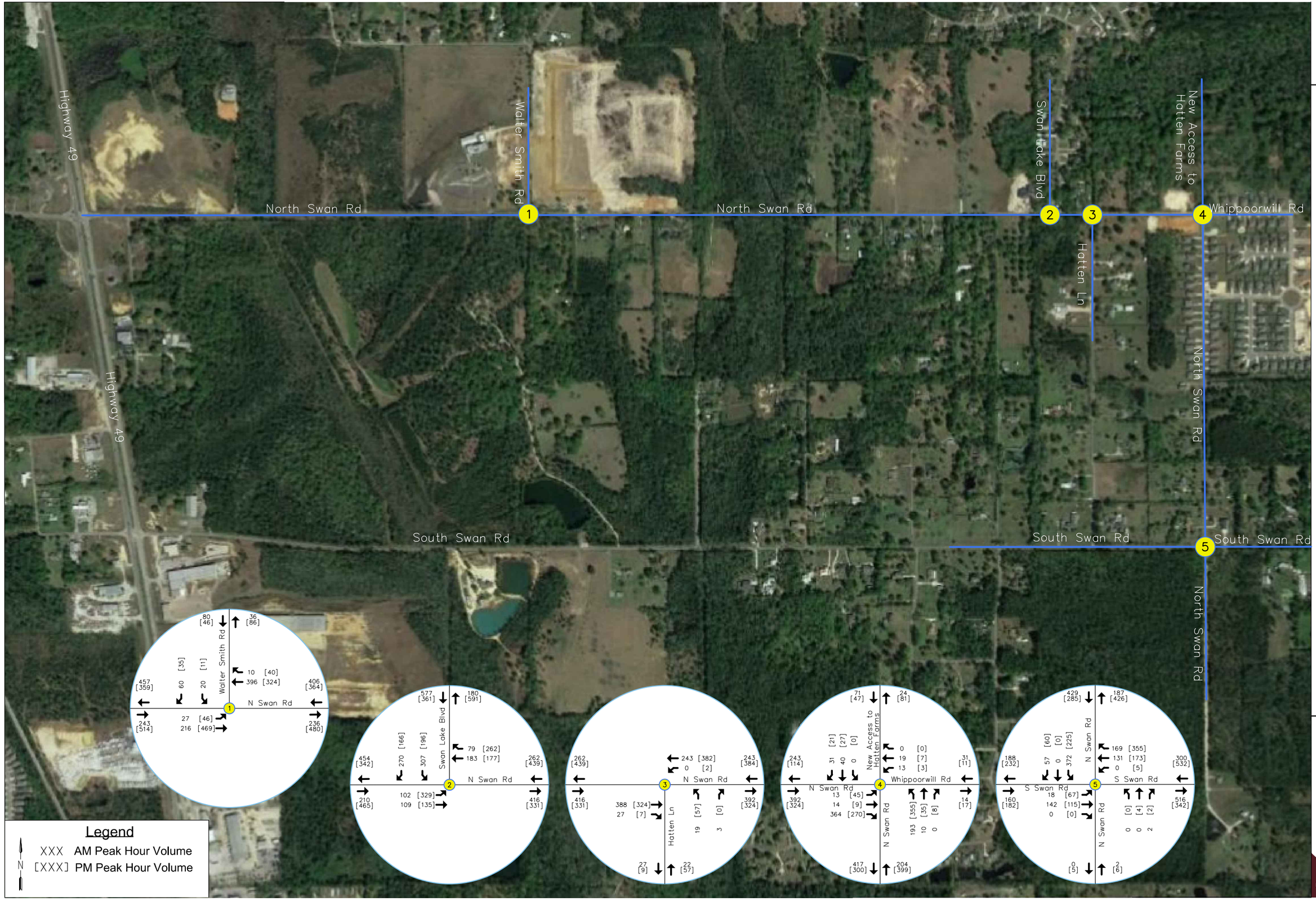
Table 2: Projected Traffic Generation

Development	Development Type	Size	Unit	ITE Land Use Code	Daily			AM			PM		
					Total	Entering	Exiting	Total	Entering	Exiting	Total	Entering	Exiting
North Swan Estates	Single-Family Residential	47	Dwelling Units	210 - Single-Family Detached Housing	519	260	260	38	10	29	49	31	18
Swan Lake Estates	Single-Family Residential	274	Dwelling Units	210 - Single-Family Detached Housing	2,628	1,314	1,314	199	50	150	267	168	99
		500	Dwelling Units	210 - Single-Family Detached Housing	4,571	2,285	2,285	360	90	270	476	300	176
Hatten Farms	Single-Family Residential	127	Dwelling Units	210 - Single-Family Detached Housing	1,296	648	648	95	24	71	128	81	47
Subdivision A	Single-Family Residential	76	Dwelling Units	210 - Single-Family Detached Housing	808	404	404	59	15	44	78	49	29
Assisted Living Center	Assisted Living	70	Employees	254 - Assisted Living	297	148	148	116	90	25	57	17	40
Commercial A	General Commercial	9,000	Square Feet	815 - Free-Standing Discount Store	478	239	239	11	7	3	36	18	18
Gross Trip Generation Totals					**10,596**	**5,298**	**5,298**	**877**	**285**	**592**	**1,092**	**664**	**427**

Figure 2

North Swan Road - 2045 Post Development Volumes



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5.0 Operational Analysis

The study area was evaluated under 2020 Existing and 2045 No Build conditions. Level of Service (LOS) was the key measure of effectiveness (MOE) used for the analysis and was determined at key intersections within the study area. LOS is a concept defined by the *Highway Capacity Manual (HCM)* to qualitatively describe operating conditions within a traffic stream. LOS is typically stratified into six categories (A through F). These range from LOS A indicating free-flow, low density, or nearly negligible delay conditions to LOS F where demand exceeds capacity and large queues are experienced. For unsignalized intersections, the *HCM* uses control delay for the basis of determining LOS. **Table 3** shows the Levels of Service as stated in the *HCM*.

Table 3: LOS Thresholds for Intersections

Level of Service	Description	Stop Controlled Intersection
		Control Delay (sec/veh)
A	Most vehicles do not stop	0 to 10
B	Some vehicles stop	> 10 to 15
C	Significant number of stops	> 15 to 25
D	Many stop, individual cycle failure	> 25 to 35
E	Frequent individual cycle failure, at capacity	> 35 to 50
F	Arrival rate exceeds capacity	> 50 or v/c >1

Synchro 10 software was used to determine the expected delays and LOS at the study intersections based on *HCM* methodology. The analysis results for the study intersections are summarized in **Tables 4 and 5** for 2020 Existing and 2045 No Build conditions, respectively. It should be noted that for the 2045 No Build conditions, a new access road to Hatten Farms Subdivision was assumed to be constructed at the intersection of North Swan Road and Whippoorwill Road, modifying the existing three-legged intersection into a four-legged intersection with stop-control.

For the 2020 Existing conditions, LOS B or better was shown for all movements at all study intersections for both peak periods. For the 2045 No Build conditions, the majority of movements were LOS C or better. Failing LOS E/F was shown for the southbound approaches at the North Swan Road/Swan Lake Boulevard intersection and at the North Swan Road/South Swan Road intersection.

Table 4: 2020 Existing Conditions

Intersection	Control	Time Period	MOE	EB Movement			WB Movement			NB Movement			SB Movement			Overall
				Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
N Swan Rd @ Walter Smith Rd	One-Way Stop	AM	LOS	A				n/a[1]					A		A	A
			Delay	7.5									9.1		9.1	2.0
		PM	LOS	A				n/a[1]					A		A	A
			Delay	7.5									9.1		9.1	1.4
N Swan Rd @ Swan Lake Blvd	One-Way Stop	AM	LOS	A				n/a[1]					A		A	A
			Delay	7.4									9.4		9.4	4.8
		PM	LOS	A				n/a[1]					A		A	A
			Delay	7.5									9.6		9.6	3.4
N Swan Rd @ Hatten Ln	One-Way Stop	AM	LOS		n/a[1]		A			A		A				A
			Delay				0			9.2		9.2				0.8
		PM	LOS		n/a[1]		A			A		A				A
			Delay				7.3			9.5		9.5				2.0
N Swan Rd @ Whippoorwill Rd	All-Way Stop	AM	LOS	A			A			A						A
			Delay	6.8			7.3			7.6						7.1
		PM	LOS	A			A			A						A
			Delay	6.8			7.3			7.7						7.3
N Swan Rd @ S Swan Rd	One-Way Stop	AM	LOS	A			A			A			B			A
			Delay	7.4			0			8.7			10.2			2.8
		PM	LOS	A			A			A			B			A
			Delay	7.7			7.4			9.9			10.4			1.9

Table 5: 2045 No Build Conditions

Intersection	Control	Time Period	MOE	EB Movement			WB Movement			NB Movement			SB Movement			Overall
				Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
N Swan Rd @ Walter Smith Rd	One-Way Stop	AM	LOS	A				n/a[1]					B		B	A
			Delay	8.3									13		13	1.7
		PM	LOS	A				n/a[1]					B		B	A
			Delay	8.2									13.3		13.3	1.1
N Swan Rd @ Swan Lake Blvd	One-Way Stop	AM	LOS	A				n/a[1]					F		F	F
			Delay	8.1									109.9		109.9	61.2
		PM	LOS	A				n/a[1]					F		F	F
			Delay	9.9									453.3		453.3	132.3
N Swan Rd @ Hatten Ln	One-Way Stop	AM	LOS		n/a[1]		A			B		B				A
			Delay				0			14		14				0.5
		PM	LOS		n/a[1]		A			C		C				A
			Delay				8			16.9		16.9				1.2
N Swan Rd @ Whippoorwill Rd	All-Way Stop	AM	LOS	B			A			B			A			B
			Delay	11.4			8.7			10.8			8.7			10.8
		PM	LOS	B			A			C			A			B
			Delay	11.8			8.9			15.6			8.7			13.5
N Swan Rd @ S Swan Rd	One-Way Stop	AM	LOS	A			A			A			E			C
			Delay	8			0			9			37.4			18.2
		PM	LOS	A			A			C			E			B
			Delay	8.9			7.5			15.3			43.7			13.1

6.0 Proposed Improvements

Traffic analyses revealed that North Swan Road currently experiences safety issues with motorists traveling at excessive speeds. The expected increase in traffic volumes in the future will result in the North Swan Road/Swan Lake Boulevard and the North Swan Road/South Swan Road intersections

experiencing unacceptable levels of service. Recommended improvements to mitigate these issues are grouped into Short-Term and Long-Term Improvements.

6.1 Short-Term Improvements

The Short-Term improvements are aimed at the immediate need, which is reducing vehicle speeds along the route. Traffic calming measures such as **Lateral Shifts, Chicanes, Speed Tables and Median Islands** may be implemented to force drivers to travel at lower speeds in order to maneuver safely through the area.

Lateral Shift

Speed Table

Chicane

Median Island

Any of these measures could be implemented west of Walter Smith Road to change the character of the roadway and to alert drivers that they are entering an area where reduced speeds are necessary.

Flashing Radar Speed Limit Signs have also proven very effective in reducing speeds. With 95% of travelers exceeding the 30 MPH speed limit, these signs could be placed at strategic locations along the route to immediately reduce speeds at a relatively low cost.

Flashing Radar Speed Limit Sign

6.2 Long-Term Improvements

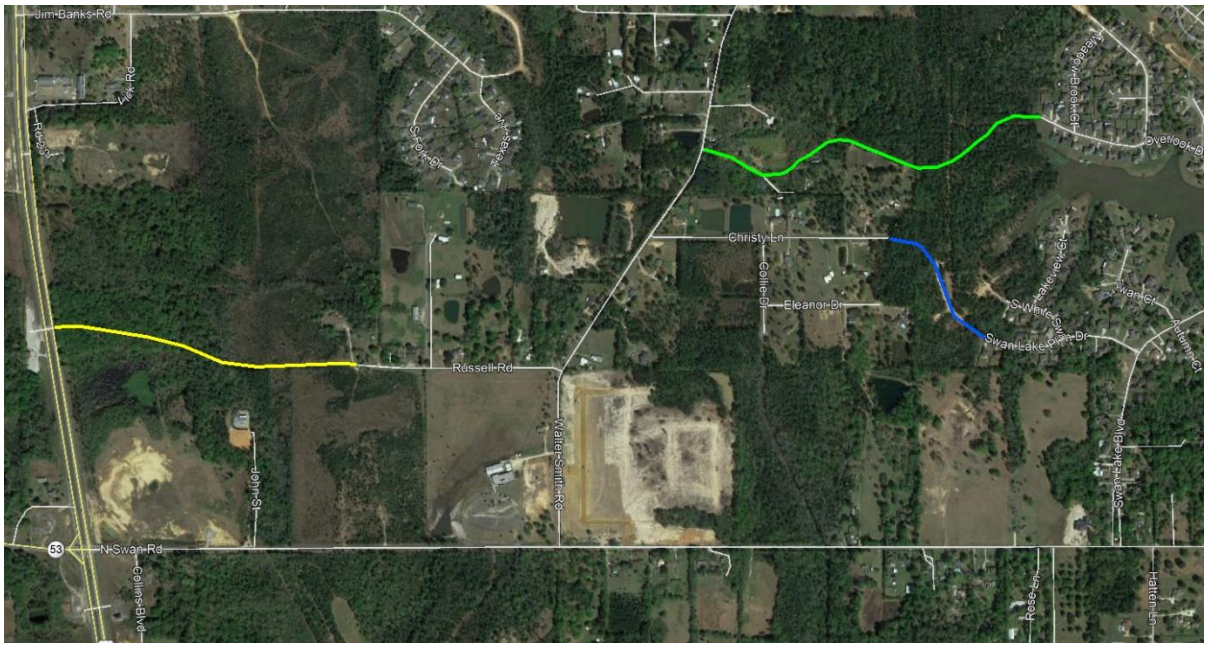
Congestion will become more of an issue as traffic volumes continue to grow. The Long-Term improvements are aimed at managing or redirecting traffic flow to allow congested intersections to operate at acceptable levels.

Signalization

The heavy volumes generated by Swan Lake Boulevard may eventually result in the need for signalization as the Swan Lake Estates neighborhood continues to build out. Signalization may also be required at the North Swan Road/South Swan Road intersection if traffic volumes continue to increase as predicted in Section 5.

New Outlet for Swan Lake Estates

As Swan Lake Estates continues to expand, a new outlet may be required to reduce traffic at the North Swan Road/Swan Lake Boulevard intersection. A new connection from Swan Lake Place to Christy Lane (Blue in the graphic below) or from Overlook Drive to Walter Smith Road (Green) are possible connection options. If either of the connections to Walter Smith Road are implemented, the Walter Smith Road/N. Swan Road intersection may become congested. If so, a signal may be required at the North Swan Road/Walter Smith Road intersection. Another solution may be to extend Russell Road to Highway 49 (Yellow) to redirect traffic away from said intersection.



Roundabout at Hatten Farms

The Hatten Farms development on the eastern end of the study area is expected to expand to the north, with access to be provided by converting the existing three-way intersection at North Swan Lake Road and Whippoorwill Road to a four-way intersection. A roundabout, which studies have shown to be safer than stop-controlled intersections, could be a good fit for this location.

Widen Hatten Lane

Traffic along the north-south section of North Swan Road may reach volumes that will prevent residents with direct access driveways from entering the roadway. A possible solution would be to redirect traffic to a widened Hatten Lane where right of way limits could be expanded with much less impact to existing homes than the impact of widening North Swan Road. This solution would require significant public and stakeholder input to understand the impacts to existing Hatten Lane residents.

Hatten Lane

7.0 Summary

North Swan Road is currently experiencing issues with vehicle speeds, and expected traffic growth will lead to unacceptable levels of service at key intersections in the future. Speeds could be reduced by implementing the traffic-calming measures shown in the Short-Term Improvements section. The Long-Term Improvements, including widening, signalization and improved connectivity, could alleviate the expected congestion in the future.

Jeffrey A. Pierce, PE