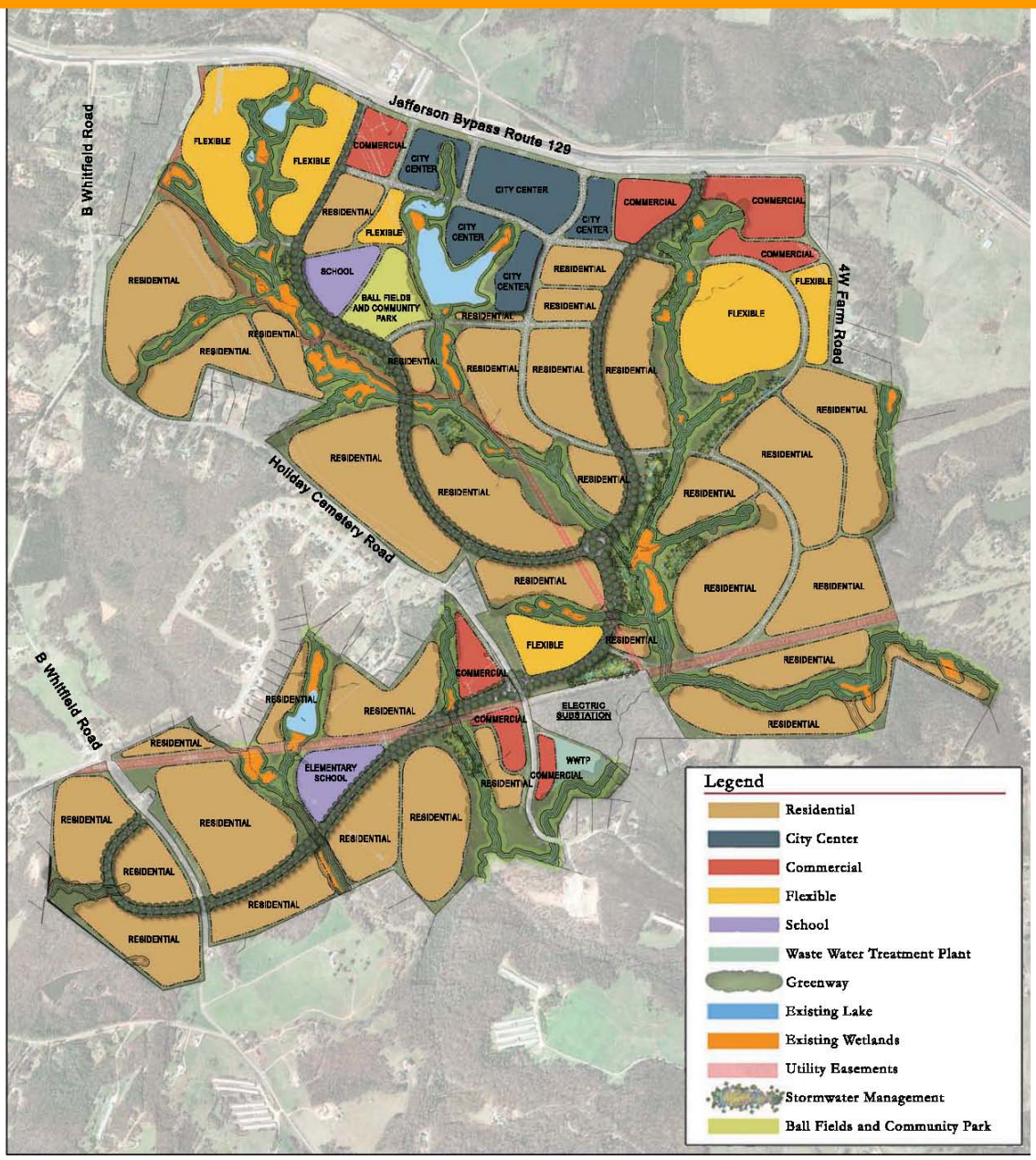
APPENDIX D

TRAFFIC IMPACT ANALYSIS

Traffic Impact Analysis
For
Arcade Master Plan
Arcade, Georgia
May 2011



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1.0 Introduction

1.1 Project Description

This Traffic Impact Analysis (TIA) evaluates the existing and future traffic operations for the proposed Arcade Master Plan development located in Arcade, Georgia. The proposed site is located along SR 15 ALT/US 129 between B Whitfield Road and New Kings Bridge Road as show in Figure 1.1. The proposed development totals approximately 1,604 acres and will consist of a mixture of land uses. These uses include approximately 3,999 residential units, 1,156,000 square feet of retail and service building space, and 2,604,000 square feet of office space. It is anticipated that the "Village Center" and other commercial within the residential area land uses will primarily consist of neighborhood driven services that will support the development. Other commercial land uses, primarily along SR 15 ALT/SR 15 ALT/US 129, would be expected to provide retail and office facilities. Other proposed land uses include two schools as well as an area designated for parks and recreational ball fields. The site plan shown in Figure 1.2 shows the proposed land uses and locations of access drives. Current plans call for the proposed development to have multiple access points along SR 15 ALT/US 129 as well as several entrances on Holiday Cemetery Road and B Whitfield Rd.

1.2 Study Objectives

The purpose of this study is to evaluate the impacts of the proposed development on the operation of the roadway network in the vicinity of the proposed site as well as the site entrances to the development. The principal objectives of this study include:

- Review the existing roadway network and weekday AM and PM peak hour traffic conditions in the study area
- Estimate the magnitude and characteristics of new traffic generated by the proposed development during the weekday AM and PM peak hours
- Assign the site generated traffic to the adjacent street system at existing and proposed access points
- Calculate the pre and post-development Levels of Service and turn lane storage requirements for all intersections and access points

- Identify any changes to existing or proposed access, intersection of roadway geometry and/or traffic control improvements required to properly accommodate pre and post-development traffic volumes and mitigate unacceptable impacts

Figure 1.1 Project Location Map

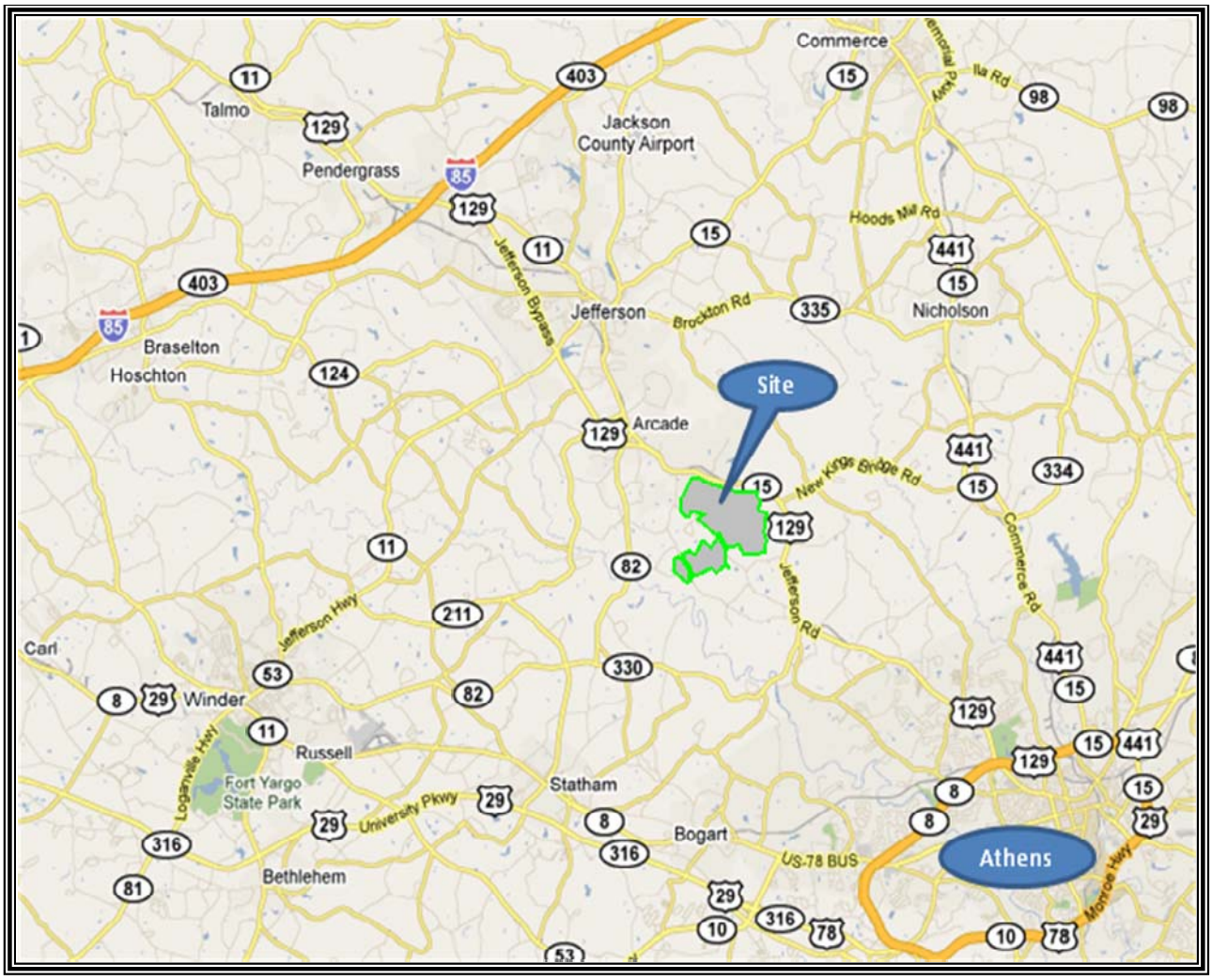
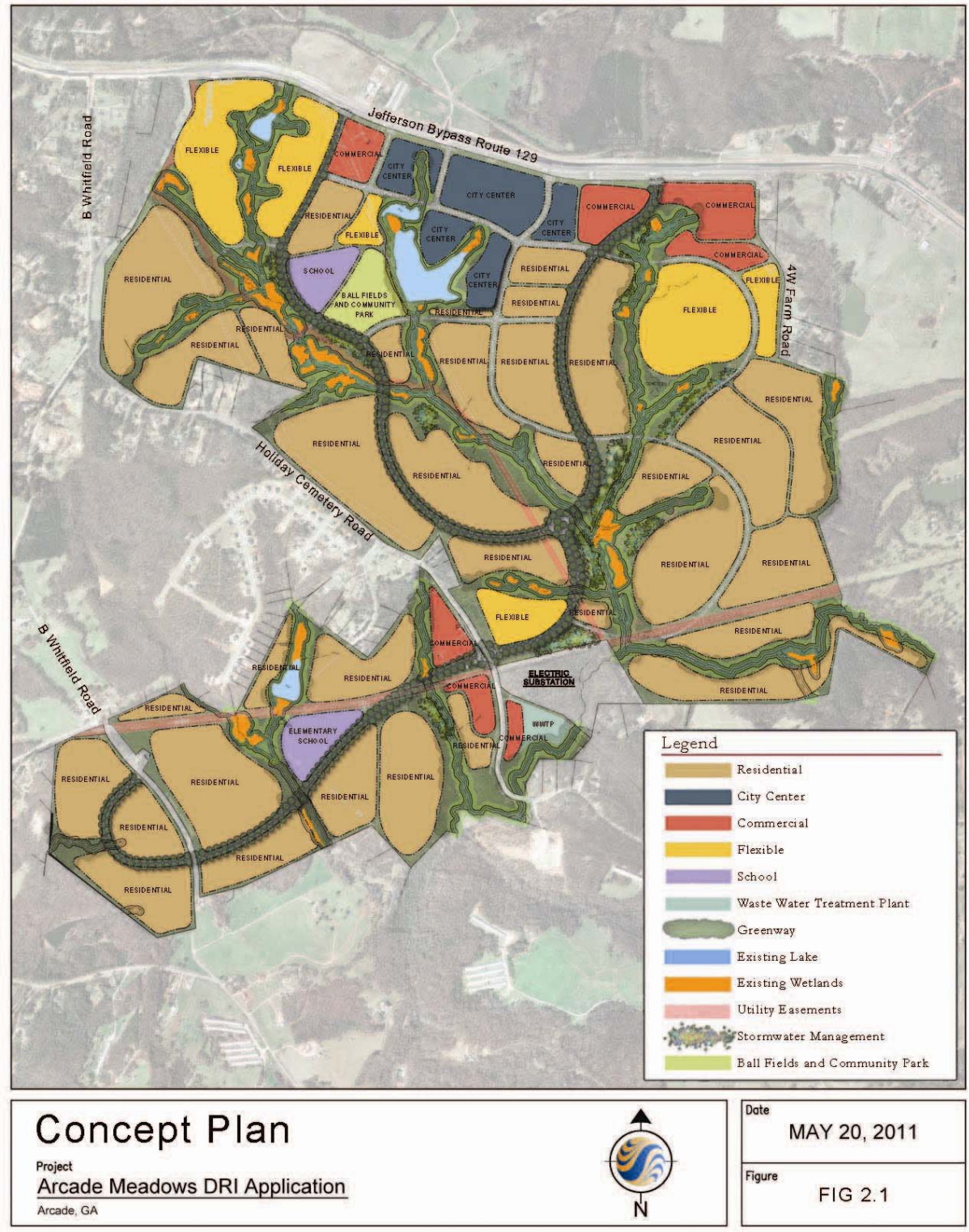


Figure 1.2 Site Plan



This study evaluates the level-of-service (LOS) and delays for the following scenarios:

- Base Year 2010: **Existing** Conditions — existing traffic
- Design Year 2025: **No Build** Traffic Conditions — existing traffic + background growth
- Design Year 2025: **Build** Traffic Conditions (with No Improvements) — existing traffic + background growth + site traffic of the proposed development
- Design Year 2025: **Build** Traffic Conditions (with Improvements) — existing traffic + background growth + site traffic of the proposed development

This study is based on the study team's understanding of the anticipated land uses shown in Figure 1.2 dated May 20, 2011 and subsequent more detailed land use information.

1.3 Study Assumptions

1. *Trip Generation*: The traffic generated by the proposed development was calculated using the methodology prescribed in the **ITE Trip Generation Manual, 8th Edition**. Table 1.1 summarizes the results.

Table 1.1 Trip Generation Summary

Trip Generation Summary	AM Peak Trips			PM Peak Trips		
	Enter	Exit	Total	Enter	Exit	Total
Total New Trips	3,725	2,703	6,428	4,153	5,564	9,717
Total Internal Trip Reduction	-1,659	-1,564	-3,223	-2,648	-2,706	-5,354
Total New Driveway Trips	2,066	1,139	3,205	1,505	2,858	4,363
Total Retail Pass-by Trip Reduction	N/A	N/A	N/A	-170	-170	-340
Total New External Trips	2,066	1,139	3,205	1,335	2,688	4,023

Many of the non-residential site trips generated by the commercial and "Village Center" land uses will be internal to the site, therefore the total number of site trips generated was reduced in order to accurately estimate how many trips would actually enter and exit the site. This study

estimates 55 percent of the non-residential trips will come from off-site; therefore the total number of non-residential trips was reduced by 45 percent and the residential trips were reduced to match the expected number of non-residential trips remaining within the site.

2. Future Growth: A background growth rate of 1 percent per annum was used for the study area. The growth rate was determined based on historical population growth, projected population growth, and historical traffic counts from GDOT count stations. The population growth was obtained from the *2010 Georgia County Guide (www.georgiastats.uga.edu)* which projects the Jackson County population to increase by 3.3 percent from 2010 to 2015. Historical population growth has been approximately 3 percent. Historical GDOT traffic count stations in the study area show an average annual growth rate of 0.4 percent. These growth rates show that the population in Jackson County has been growing at a faster rate than traffic volumes. Based on this finding, the study team chose to use an annual growth rate lower than the population growth rate, but higher than the historical traffic growth rate.

3. Approved Developments and Road Improvement Plans: Based on conversations with officials at Jackson County Planning and GDOT, there are no other approved developments or road improvement plans in the study area at this time.

4. Access: The site currently has ten (10) driveways on SR 15 ALT/US 129 that were constructed recently when the roadway was widened and the median installed. Five (5) of these access points include a median crossover and channelized right-turn lanes. The development will be accessed by these access points along SR 15 ALT/US 129 as well as several entrances on Holiday Cemetery Road and B Whitfield Road where they pass through the site. The internal roadway network is proposed to connect all of the land uses within the site via multiple paths, with the possible exception of the northeastern portion that may be accessible to the remainder of the site via B Whitfield Road without requiring travel on SR 15 ALT/US 129.

2.0 Site Context

2.1 Project Study Area

The site access points, as well as nearby intersections on US 129 adjacent to the site were studied. In addition the nearest signalized intersections on US 129 (Bypass) at SR 15 ALT/US 129 BUS and at SR 11 to the northwest were also studied. The distance to the nearest signalized intersection to the southeast is approximately eight (8) miles at Whitehead Road near Athens. Figure 2.1 shows a map of the intersections and roadways included in this study.

2.2 Study Area Roadways and Intersections

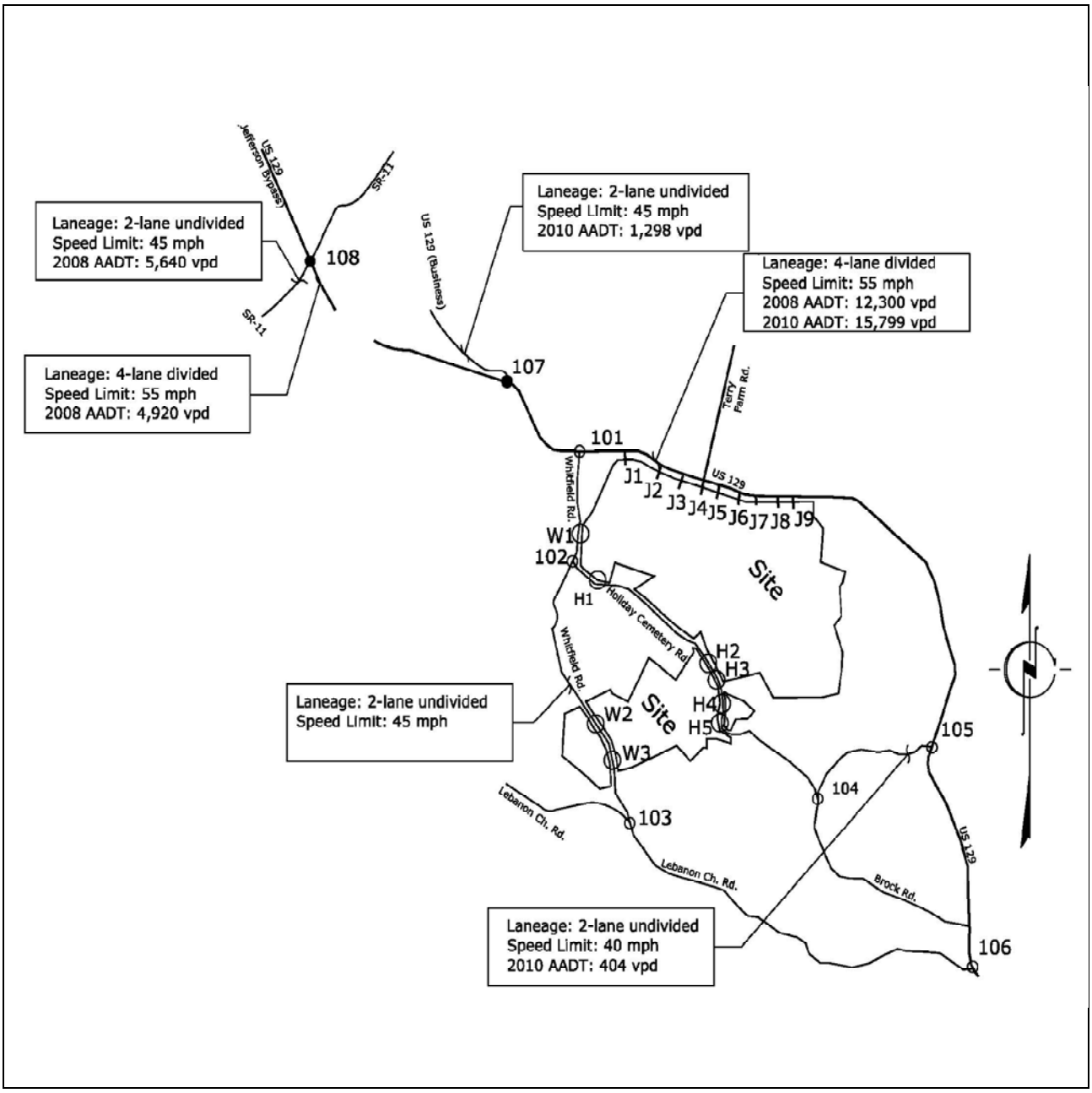
Regional access to the area is provided by SR 15 ALT/SR 11/US 129 to I-85, nine (9) miles to the northwest, and southwest approximately ten (10) miles to Athens, Georgia. Existing roadway characteristics such as laneage, speed limits, and historic Annual Average Daily Traffic (AADT) were obtained and are illustrated in Figure 2.1. The AADT's of these roadways were obtained from the Georgia Department of Transportation. Existing intersection geometry and traffic control was also obtained and is shown in Figure 2.2. The following existing intersections were studied:

- SR 11 at SR 11 CON/US 129 (Bypass) and SR 11 BUS
- SR 15 ALT/US 129 Business at SR 15 ALT/US 129 (Bypass)
- B Whitfield Road at SR 15 ALT/US 129
- Brock Road (north intersection) at SR 15 ALT/US 129
- Lebanon Church Road at SR 15 ALT/US 129
- B Whitfield Road at Holiday Cemetery Road
- B Whitfield Road at Lebanon Church Road
- Brock Road at Holiday Cemetery Road

The following site driveways were analyzed under the design year (2025) conditions:

- J1, the Northwestern Site Driveway on SR 15 ALT/US 129, east of B Whitfield Road (full access)
- J2, the Western Access Road on SR 15 ALT/US 129 (full access), aligned with a private driveway
- J3, the Western Village Driveway on SR 15 ALT/US 129 (right in/out only)
- J4, the Main Village Access Road on SR 15 ALT/US 129 (full access), aligned with Terry Farm Rd
- J5, the Civic Access Driveway on SR 15 ALT/US 129 (right in/out only)
- J6, the Central Village Access Road on SR 15 ALT/US 129 (full access)
- J7, the Eastern Village Driveway on SR 15 ALT/US 129 (right in/out only)
- J8, the Eastern Access Road on SR 15 ALT/US 129 (full access)
- J9, the Eastern Site Driveway on SR 15 ALT/US 129 (right in/out only)
- H1, on Holiday Cemetery Road, east of B Whitfield Road
- H2/6, on Holiday Cemetery Road, northwest of the Eastern Access Road
- H3/7, Holiday Cemetery Road at the Eastern Access Road
- H4/8, on Holiday Cemetery Road, southeast of the Eastern Access Road
- H5, on Holiday Cemetery Road, southeast of the Eastern Access Road
- W1, on B Whitfield Road north of Holiday Cemetery Road
- W2, on B Whitfield Road at the terminus of the Eastern Access Road
- W3/4, B Whitfield Road at the Eastern Access Road

Figure 2.1 Study Area Roadways and Intersections



3.0 Traffic Volumes

3.1 Existing Peak Hour Traffic Volumes

AM and PM peak hour turning movement counts (TMC) were obtained in April and May 2010 for the study intersections. All data was collected while area schools were open. TMC data was collected to properly analyze existing traffic conditions and accurately estimate future traffic volumes. The counts were collected in 15-minute intervals from 7:00 AM – 9:00 AM and 3:00 – 6:00 PM to ensure peak hour traffic data was recorded. Bi-directional 48-hour vehicular counts were also obtained at the following locations:

- SR 15 ALT/US 129 Business – south of SR-82
- SR 15 ALT/US 129 (Bypass) – south of SR-82
- Lavender Road – east of SR-82
- Brock Road – south of Holiday Cemetery Road
- New Kings Bridge Road – east of SR 15 ALT/US 129
- SR 15 ALT/US 129 – south of Brock Road (north)
- Brock Road – east of Holiday Cemetery Road

AM and PM peak hours were determined to be 7:00 – 8:00 AM and 4:00 – 5:00 PM. Existing (2010) peak hour traffic volumes are shown in Figure 3.1.

3.2 Future Growth and Approved Developments

A background growth rate of 1% per annum was used for the study area. The growth rate was determined based on both projected population growth and historical traffic counts from GDOT count stations. The population growth was obtained from the 2010 Georgia County Guide (www.georgiastats.uga.edu) which projects the Jackson County population to increase by 3.3 percent from 2010 to 2015. Historical GDOT traffic count stations in the study area show an average annual growth rate of 0.4 percent. These growth rates show that the population in Jackson County is expected to grow at faster rate than the traffic within the study area has

historically grown. Based on this finding, the study team chose to use an annual growth rate lower than the population growth rate, but higher than the historical traffic growth rate.

Based on conversations with officials at Jackson County Planning and GDOT, there are no other approved developments or road improvement plans in the study area at this time.

3.3 2025 Design Year Traffic Volumes: No Build

Based on the 1% growth rate and the design year (2025), base year (2010) traffic volumes were projected to the year 2025 in order to obtain No Build traffic conditions. No Build (2025) traffic volumes are contained in Figure 3.2.

Figure 3.1 Existing 2010 Traffic Volumes

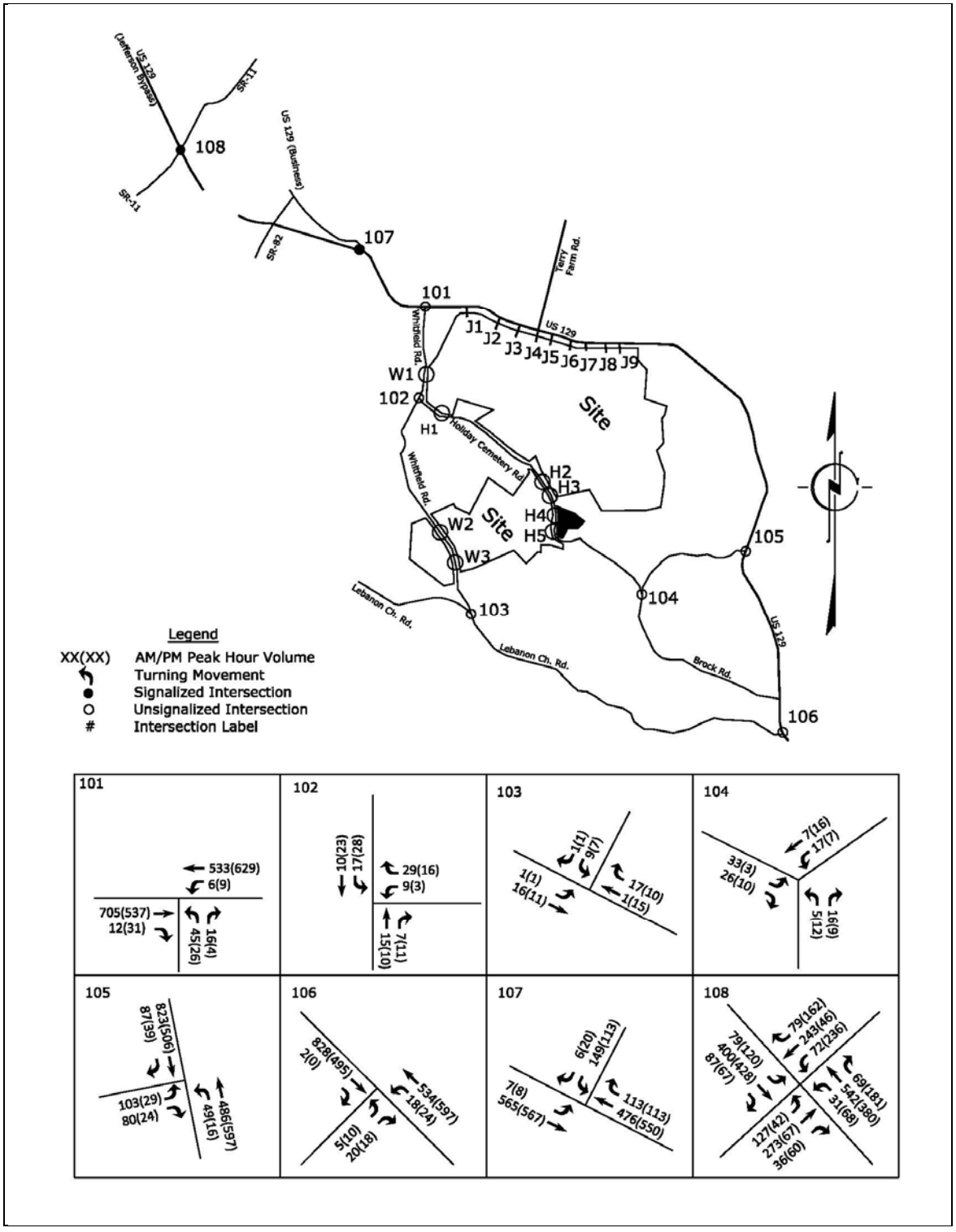
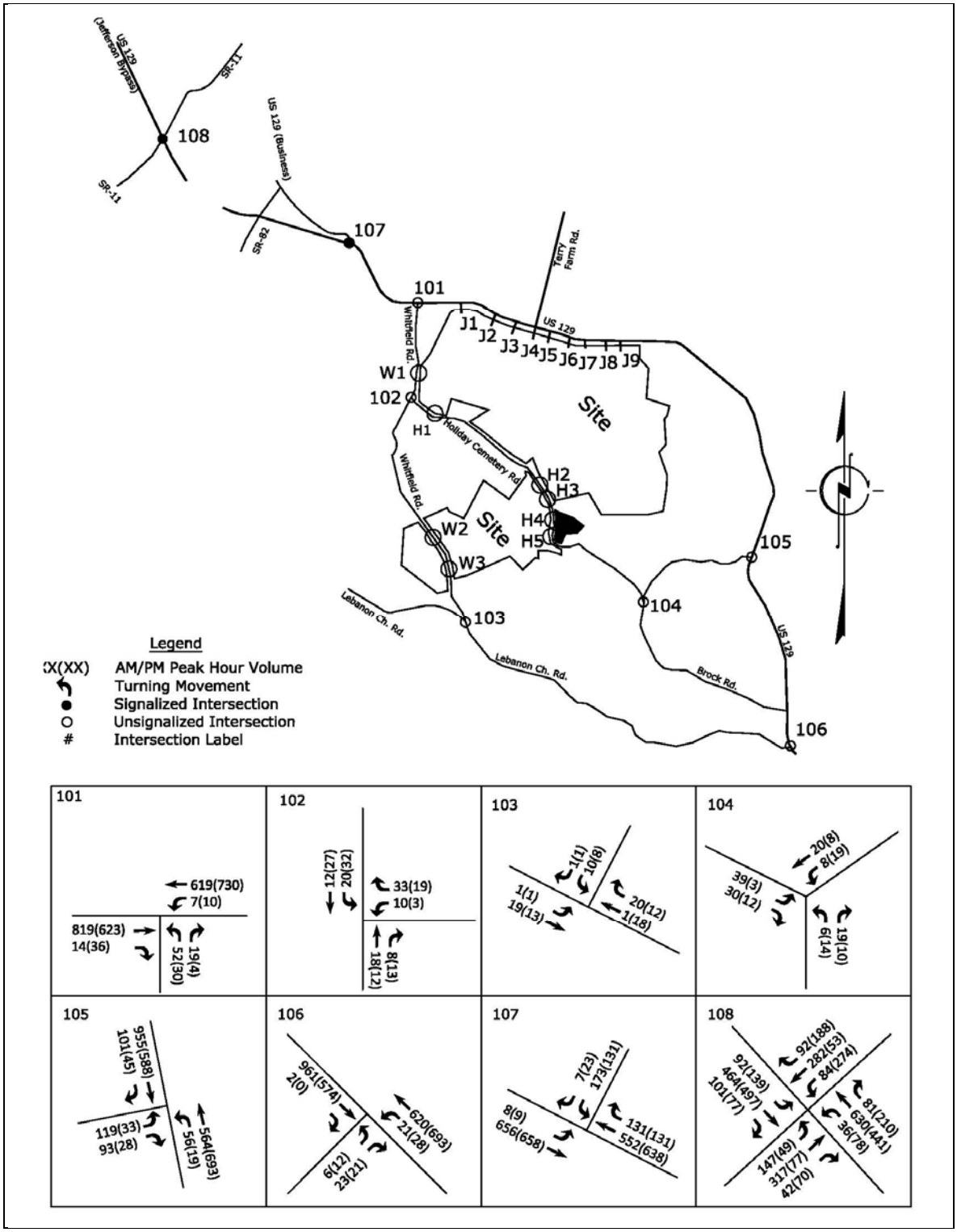


Figure 3.2 No Build (2025) Traffic Volumes



3.3 Site Traffic

Trip Generation: The traffic generated by the proposed Arcade Master Plan was calculated using rates from **ITE Trip Generation, 8th Edition**. Since there are currently no committed retail, services, or office users for the site, the total building square footages for these uses for the entire site were grouped together as either shopping center (Land Use Code 820) or general office building (Land Use Code 710) to calculate the total new trip generation for the uses on the site. The proposed square footage of the buildings in each planning area on the site as a ratio of the total square footage of each land use was calculated and used to distribute the trips to each planning area and each phase of development. The residential trips were calculated and distributed similarly based on the number of dwelling units proposed for each planning area and each phase of development. While this procedure may not yield the most precise number of trips for each internal planning area or driveway, the overall number of new trips expected to be generated by the land uses and intensities proposed for the site should be fairly accurate.

It was assumed that many of the non-residential site trips generated by the commercial and "Village Center" land uses would be internal to the site. Since this study's focus was on the site access driveways as well as the adjacent street network, the total number of site trips generated by non-residential land uses was reduced in order to estimate the number of trips that actually enter and exit the site. It was assumed that 45 percent of the non-residential trips would come from on-site; therefore the total number of non-residential trips was reduced by 45 percent and the residential trips were reduced accordingly. Although this reduction is in excess of the **ITE Trip Generation Handbook, 2nd Edition,** methodology calculations, subsequent published documentation of the underestimation by approximately two-thirds of actual internal trip reduction rates at large mixed-use developments research (NCHRP 8-51) in the **ITE Journal** in August 2010 and January 2011, as well as nationally broadcast webinars by the researchers and authors, supports at least this amount of trip reduction. The trip generation results for the residential land uses are presented in Table 3.1. Non-residential trips are shown in Table 3.2.

Pass-by Reductions: Reductions due to pass-by and diverted trips of vehicles already on SR 15 ALT/US 129 to retail and service land uses within the site were taken intersections on US 129 beyond the site access points based on the **ITE Trip Generation Handbook, 2nd Edition,** methodology and data for a shopping center (Land Use Code 820), although individual

retail and service uses (drugstore, restaurants, banks, gasoline stations, convenience stores) on the site are expected to generate additional pass-by trip reductions, at rates approximately two-three times higher than the shopping center use of this size generates**.** The conservative pass-by trip reduction used for this analyses to estimate the number of new vehicular trips at intersections external to the site is also recognizes considerable pass-by trip reductions from trips originating and terminating within the site that are accounted for in the internal trip reduction calculations. The trip generation summary is shown in Table 3.3.

Trip Distribution and Assignment: The directional distribution percentages and assignment of traffic to and from the site were estimated based on three factors:

- Existing peak hour traffic patterns
- Anticipated travel patterns provided by the developer
- Anticipated employment locations

Based on this information, 54% of the new vehicular trips are assumed to originate and terminate to the northwest of the site and 46% of the new vehicular trips will originate and terminate to the southeast of the site. Additionally, although some of the new trips to and from the site will use other local roadways, to provide a conservative analysis all of the new external trips were assigned to SR 15 ALT/US 129 intersections.

Table 3.1 Trip Generation – Residential Land Uses

Land Use	ITE Code	Unit of Measure	Number of Units	New Daily External Trips	AM Peak Hr External Trips		PM Peak Hr External Trips	
					IN	OUT	IN	OUT
Apartments	220	Dwelling Units	240	860	29	48	16	27
Single Family	210	Dwelling Units	198	710	24	40	13	22
Single Family	210	Dwelling Units	100	359	12	20	6	11
Townhomes	230	Dwelling Units	132	473	16	27	9	15
Townhomes	230	Dwelling Units	72	258	9	14	5	8
Townhomes	230	Dwelling Units	18	65	2	4	1	2
Single Family	210	Dwelling Units	120	430	14	24	8	14
Apartments	220	Dwelling Units	240	860	29	48	16	27
Single Family	210	Dwelling Units	40	143	5	8	3	5
Single Family	210	Dwelling Units	142	509	17	29	9	16
Single Family	210	Dwelling Units	161	577	19	32	10	18
Single Family	210	Dwelling Units	111	398	13	22	7	12
Single Family	210	Dwelling Units	156	559	19	31	10	18
Single Family	210	Dwelling Units	33	118	4	7	2	4
Single Family	210	Dwelling Units	160	574	19	32	10	18
Single Family	210	Dwelling Units	216	774	26	43	14	24
Single Family	210	Dwelling Units	78	280	9	16	5	9
Single Family	210	Dwelling Units	63	226	8	13	4	7
Single Family	210	Dwelling Units	189	678	23	38	12	21
Single Family	210	Dwelling Units	96	344	12	19	6	11
Single Family	210	Dwelling Units	63	226	8	13	4	7
Single Family	210	Dwelling Units	30	108	4	6	2	3
Single Family	210	Dwelling Units	9	32	1	2	1	1
Apartments	220	Dwelling Units	102	366	12	21	7	11
Single Family	210	Dwelling Units	130	466	16	26	8	15
Single Family	210	Dwelling Units	85	305	10	17	6	10
Single Family	210	Dwelling Units	97	348	12	20	6	11
Single Family	210	Dwelling Units	67	240	8	13	4	8
Single Family	210	Dwelling Units	245	878	30	49	16	28
Single Family	210	Dwelling Units	14	50	2	3	1	2
Single Family	210	Dwelling Units	67	240	8	13	4	8
Single Family	210	Dwelling Units	78	280	9	16	5	9
Single Family	210	Dwelling Units	85	305	10	17	6	10
Single Family	210	Dwelling Units	12	43	1	2	1	1
Total Residential			**3,999**	**14,337**	**483**	**804**	**259**	**450**

Table 3.2 Trip Generation – Non-Residential Land Uses

Land Use	ITE LUC	Unit of Measure	Number of Units	New Daily External Trips	AM Peak Hr External Trips		PM Peak Hr External Trips	
					IN	OUT	IN	OUT
General Office Building	710	GFA (sf)	350,000	1210	165	22	37	181
General Office Building	710	GFA (sf)	210,000	726	99	13	22	109
General Office Building	710	GFA (sf)	60,000	207	28	4	6	31
Restaurant	932	GFA (sf)	10,000	159	2	1	8	8
Shopping Center	820	GFA (sf)	231,000	3664	16	1	157	164
Restaurant	932	GFA (sf)	10,000	159	2	1	8	8
General Office Building	710	GFA (sf)	112,000	387	53	7	12	58
Shopping Center (incl Grocery)	820	GFA (sf)	239,983	3803	17	1	163	171
Restaurant	932	GFA (sf)	10,000	159	2	1	8	8
General Office Building	710	GFA (sf)	41,350	143	19	3	4	21
Civic	733	GFA (sf)	144,000	2171	153	19	69	153
Shopping Center	820	GFA (sf)	75,000	1190	14	9	57	60
General Office Building	710	GFA (sf)	30,000	104	14	2	3	16
Apts (Flats over Retail)	220	Units	100	359	12	20	6	11
Daycare	565	GFA (sf)	10,000	436	40	35	36	41
Religious	560	GFA (sf)	12,000	60	3	2	2	2
Shopping Center	820	GFA (sf)	104,350	1655	20	13	80	83
General Office Building	710	GFA (sf)	17,650	61	8	1	2	9
Apts (Flats over Retail)	220	Units	50	179	6	10	3	6
Senior Adult Housing Attached	252	Units	200	717	25	41	13	20
Shopping Center	820	GFA (sf)	155,000	2459	29	19	119	123
Hotel	312	Rooms	98	272	13	9	17	15
Shopping Center	820	GFA (sf)	140,000	2221	27	17	107	111
Medical Office Building	720	GFA (sf)	29,000	524	29	8	14	37
General Office Building	710	GFA (sf)	985,000	3408	408	8	55	466
General Office Building	710	GFA (sf)	85,000	294	40	5	9	44
Elem. School	520	Student	450	320	47	39	28	33
County Park	411	Acres	17	15	0	0	0	0
General Office Building	710	GFA (sf)	410,000	1418	193	26	43	212
General Office Building	710	GFA (sf)	130,000	450	61	8	14	67
Shopping Center	820	GFA (sf)	30,000	476	6	4	23	24
Shopping Center	820	GFA (sf)	90,000	1428	17	11	69	72
Shopping Center	820	GFA (sf)	60,000	952	11	7	46	48
Elem. School	520	Student	450	320	47	39	28	33
Total Non-Residential Trips				**30,851**	**1,583**	**335**	**1,246**	**2,408**

Table 3.3 Trip Generation – Summary

Trip Generation Summary	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
		Enter	Exit	Total	Enter	Exit	Total
Total New Trips	85,645	3,725	2,703	6,428	4,153	5,564	9,717
Total Internal Trip Reduction	-40,457	-1,659	-1,564	-3,223	-2,648	-2,706	-5,354
Total New Driveway Trips	45,188	2,066	1,139	3,205	1,505	2,858	4,363
Retail Pass-by Trip Reduction	-3,518	N/A	N/A	N/A	-170	-170	-340
Total New External Trips	41,670	2,066	1,139	3,205	1,335	2,688	4,023

Site Driveway Trip Distribution and Assignment: There are multiple site access points on the roads surrounding the site. Estimates were made as to the site driveway trip distribution based on the land use, origin/destination within the site, the trip distribution factors mentioned above, whether full-movement with a median crossover or right in/out access currently exists, and the capacity at each intersection to accommodate left-turning into and out of the site. The new trips were initially distributed to the SR 15 ALT/US 129 access points as shown in Table 3.4, then adjusted, primarily by eliminating or decreasing the number of peak hour left turning vehicles out of the site at the full-movement intersections that were not expected to be signalized and increasing the left-turn volumes at J2 and J8 accordingly.

Table 3.4 Initial Site Driveway Trip Distribution

Access to SR 15 ALT/US 129	Distribution %
J1 (stop controlled w/ median break)	6%
J2 (median break/proposed to be signalized)	5%
J3 (stop controlled w/ median break)	6%
J4 (stop controlled w/ median break)	25%
J5 (right-in/right-out only)	3%
J6 (stop controlled w/ median break)	3%
J7 (right-in/right-out only)	2%
J8 (median break/proposed to be signalized)	24%
J9 (right-in/right-out only)	6%
H1-8&W1-4 via B Whitfield, Brock, Lebanon Church Roads	20%

The driveway assignments were initially based on the locations of the median crossovers and the proximity to the various land uses within the site. Based on the site plan, J2, and J8 would be expected to service the highest numbers of site trips. The new trips at the study intersections are shown in Figures 3.3 and 3.4.

3.4 2025 Design Year Traffic Volumes: Build Condition

The total build traffic volumes for 2025 are presented in Figures 3.5 and 3.6.

3.5 Phased Development Traffic Volumes

The phased build-out of the development is expected to generate the daily and peak hour traffic volumes shown in Table 3.5. The total trips expected from each type of land use when the development is completely built-out was apportioned to each phase of development based on the intensity of use in the planning areas for that phase in relationship to the total build-out volumes and intensities of use. The internal capture was similarity estimated because the early phases are expected to include sufficient retail and office land uses to minimize some trips leaving the site. Development of significant residential use without sufficient off-setting commercial use to minimize the number of new external trips could result in less internally captured trips and more new trips on the external roadway network than anticipated.

Table 3.5 Trip Generation

Phased Trip Generation	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
		Enter	Exit	Total	Enter	Exit	Total
Phase 1-Mixed Use	7,350	168	206	375	271	320	589
Phase 2-Mixed Use	8,560	720	103	824	240	892	1,133
Phase 3-Mixed Use	10,091	376	169	544	384	588	973
Phase 4A-Mixed Use	4,704	132	147	279	194	225	418
Phase 4B- Residential	1,635	56	91	147	29	51	81
Phase 5-Residential	1,993	67	111	180	36	65	98
Phase 6- Residential	1,606	54	89	144	29	50	79
Phase 7-Mixed Use	7,313	229	188	416	263	377	640
Phase 8-Commercial	1,936	264	35	299	59	290	349

Figure 3.1 New Weekday Peak Hours External Trips

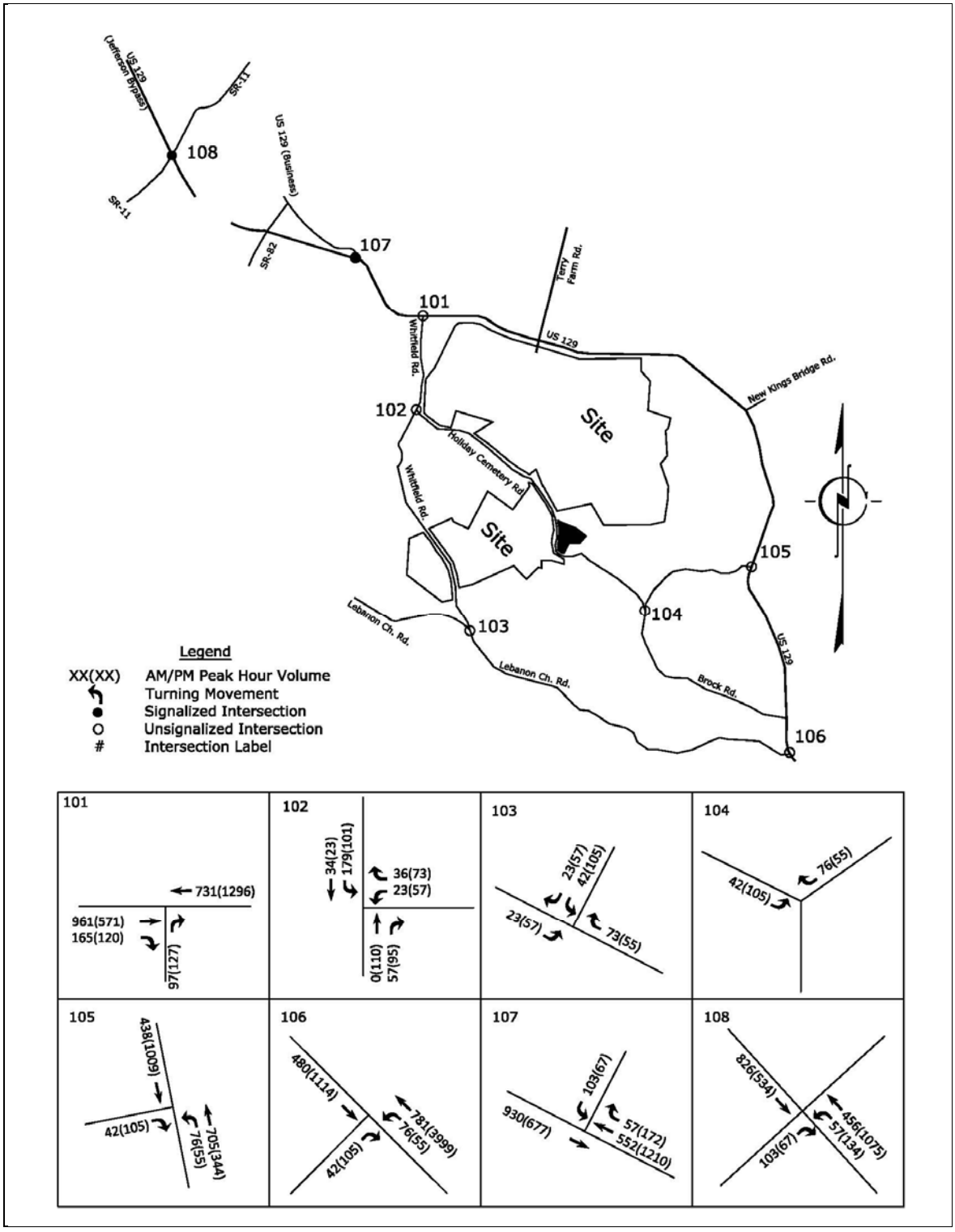


Figure 3.2 New Weekday Peak Hour Driveway Trips

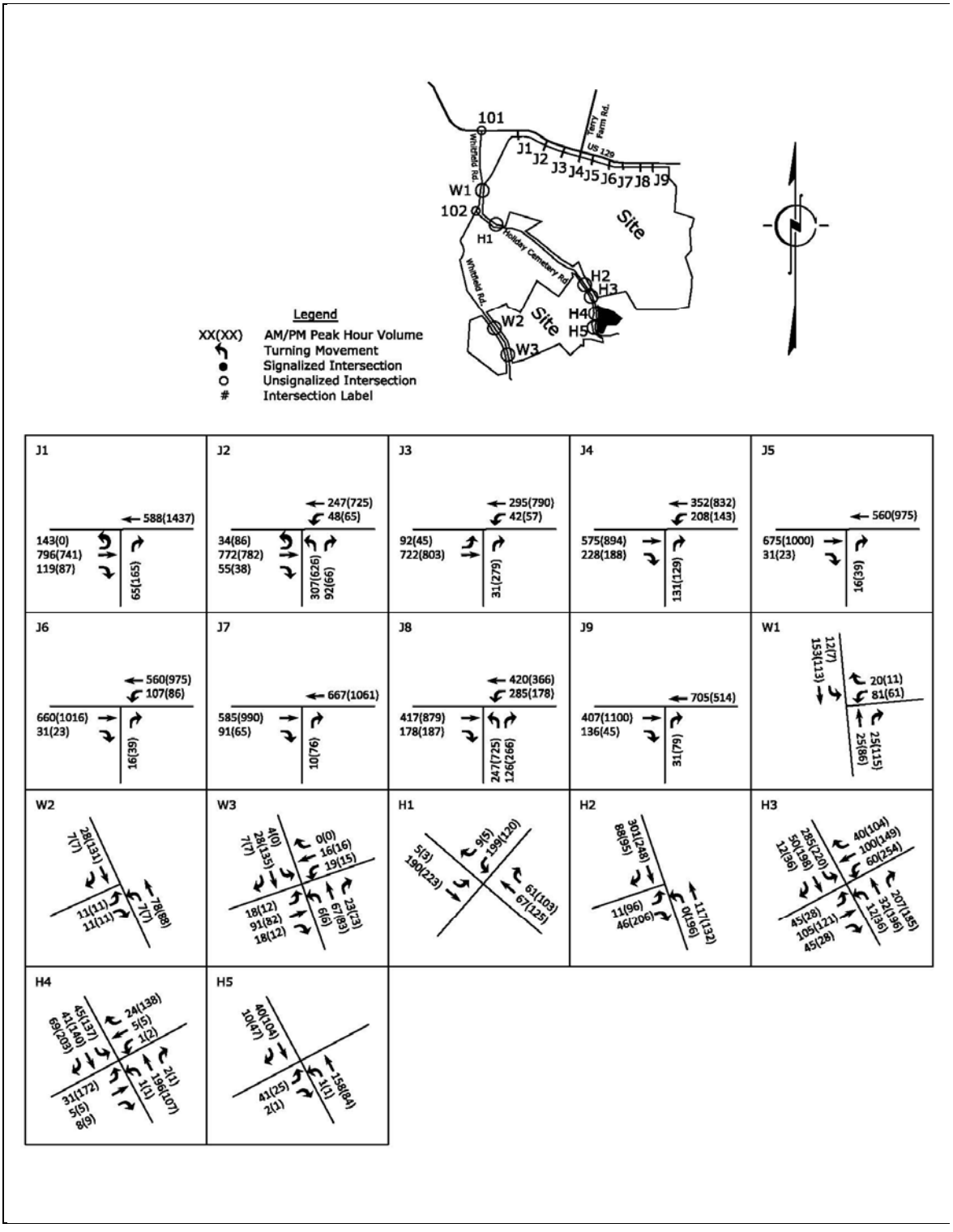


Figure 3.3 Build (2025) Peak Hours External Traffic Volumes

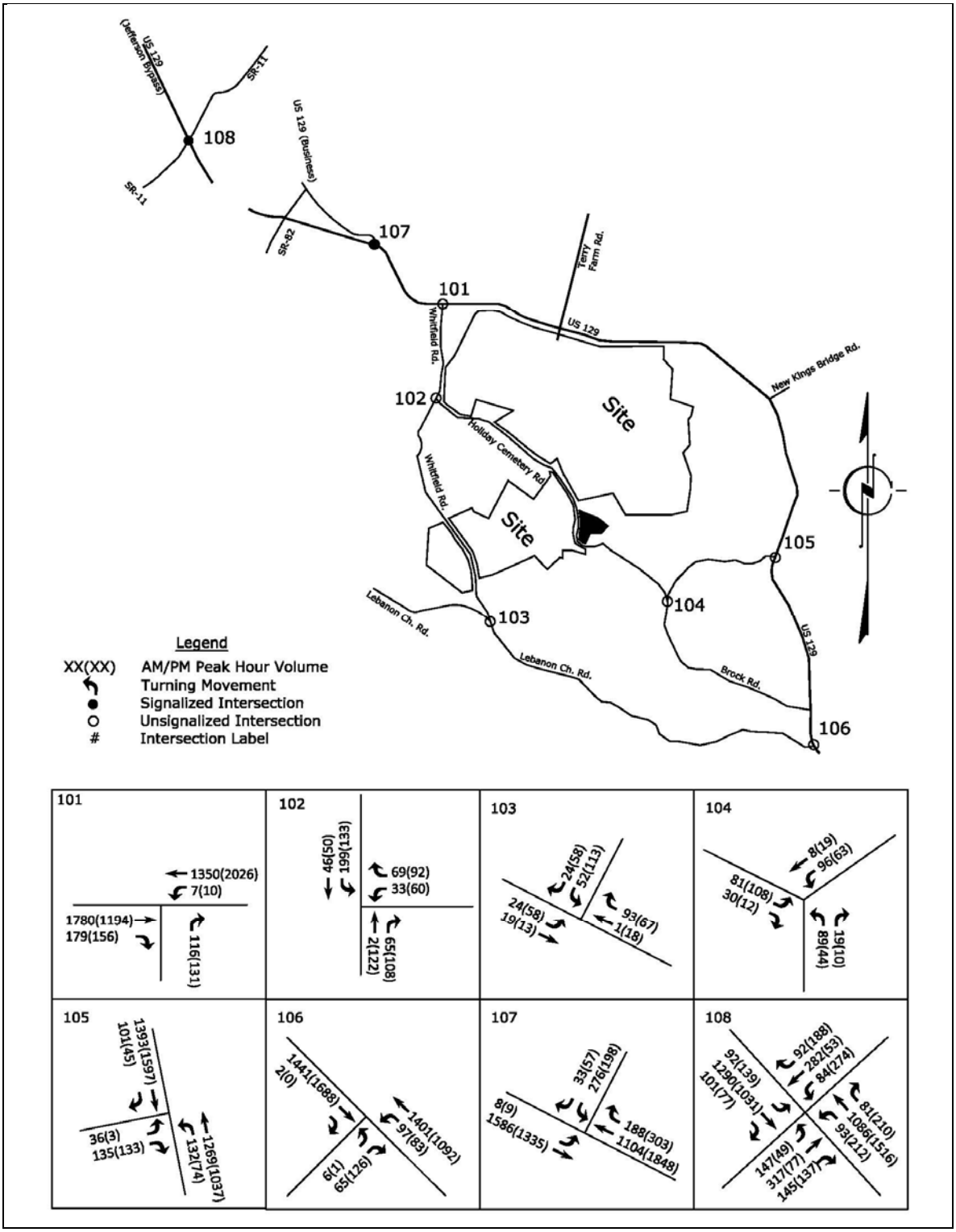
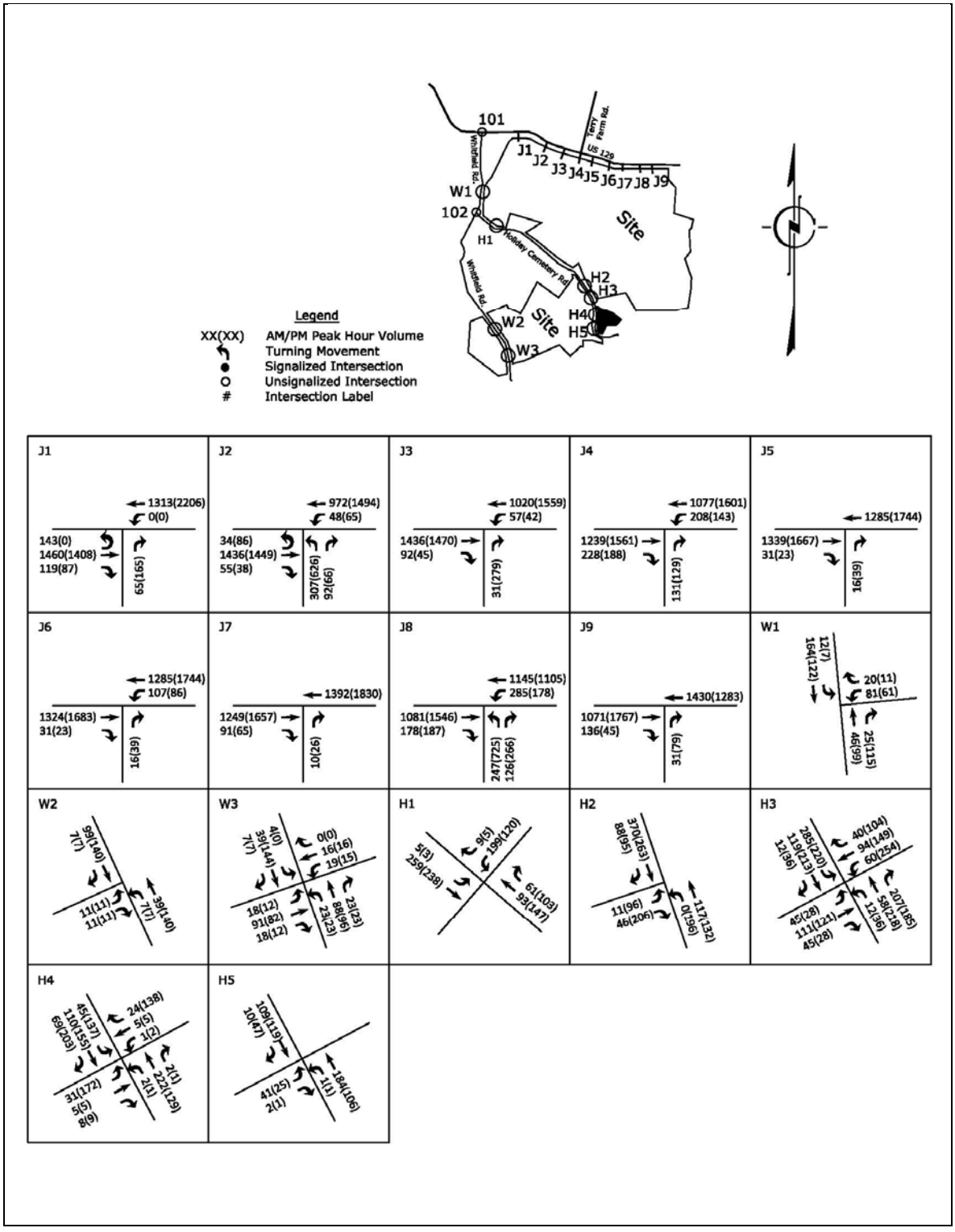


Figure 3.4 Build (2025) Peak Hours Driveway Traffic Volumes



4.0 Capacity Analysis

4.1 Analysis Background

This section describes the analysis of traffic operations on the roadway network, the impacts of the projected increases in traffic volumes, and appropriate mitigation and traffic control strategies.

4.2 Traffic Delay Indicators

Before summarizing future traffic conditions, an explanation of the traffic indicators used may be helpful. This study demonstrates traffic conditions using a type of roadway capacity and traffic signal timing software called Synchro. Synchro is based on the methodologies presented in the Highway Capacity Manual (HCM) which is widely held as the standard for evaluating roadway capacities.

This study uses two key indicators to demonstrate traffic conditions. The indicators, intersection delay and intersection Level of Service (LOS), are intersection specific. For signalized intersections and All Way Stop Sign Controlled (AWSC) intersections, the LOS is provided for each intersection as a whole. For stop controlled intersections, LOS is provided for each approach.

4.3 Capacity Analysis Overview

For this study, a capacity analysis was performed for the roadway network within the project study area. The Synchro© Version 7 software package was utilized to analyze the study area intersections for the current year and design year according to methods put forth by the Transportation Research Board's Highway Capacity Manual (HCM 2000).

The level of service (LOS) of an intersection ranges from A to F characterizing the operational conditions of the traffic flow. LOS A represents the free-flow conditions where vehicles experience little to no delays. LOS F indicates poor conditions with high congestion, a complete breakdown of traffic flow, and high vehicular delays. Although LOS A through D are the desired levels in urban conditions. Traffic conditions with LOS E or F are generally considered

undesirable. Table 4.1 provides the average delays associated with each LOS for an intersection.

Table 4.1 LOS Delay Criteria

Level of Service	Control Delay (seconds per vehicle)	
	Signalized Intersections	Unsignalized Intersections
A	<= 10	<= 10
B	> 10 and <= 20	> 10 and <= 15
C	> 20 and <= 35	> 15 and <= 25
D	> 35 and <= 55	> 25 and <= 35
E	> 55 and <= 80	> 35 and <= 50
F	> 80	> 50

Synchro© was used to analyze LOS and delay at the study area intersections. The following section summarizes the results of the analysis for the 2010 Existing, 2025 No Build, 2025 Build Condition with No Roadway Improvements, and 2025 Build Condition with Roadway Improvements. Detailed Synchro© reports can be found in the Appendices. The HCM does not calculate intersection-wide delay values for two-way stop controlled intersections. Instead, it calculates these values for each approach movement.

For intersections with approaches that are free-flowing, their delay values are at or near zero, and of little value. The stop controlled approach values are the primary focus. Delay and corresponding LOS values for stop controlled approach movements are shown in Table 4.1.

The following sections present the LOS and delay results for the intersections included in this study for the 2010 Existing, 2025 No Build, 2025 Build Condition with No Roadway Improvements, and 2025 Build Condition with Roadway Improvements. Discussion of the traffic flow and queuing results are also presented in the following section for the study area intersections. Intersections with “NR” displayed in the delay column indicate that the reported delay is greater than 10,000 seconds.

4.4 Existing 2010 Conditions

Table 4.2 2010 Existing Levels of Service

#	Intersection	Control	Movement	Levels of Service	
				AM	PM
101	B Whitfield Rd at SR 15 ALT/US 129	Side St Stop Sign	Northbound	C	B
			Eastbound	A	A
			Westbound	A	A
102	B Whitfield Rd at Holiday Cemetery Rd	Side St Stop Sign	Northbound	A	A
			Southbound	A	A
			Eastbound	A	A
103	B Whitfield Rd at Lebanon Church Rd	Side St Stop Sign	Southbound	A	A
			Eastbound	A	A
			Westbound	A	A
104	Brock Rd at Holiday Cemetery Rd	Side St Stop Sign	Northbound	A	A
			Southbound	A	A
			Eastbound	A	A
105	Brock Rd (north) at SR 15 ALT/US 129	Side St Stop Sign	Northbound	B	A
			Southbound	A	A
			Eastbound	C	B
106	Lebanon Church Rd at SR 15 ALT/US 129	Side St Stop Sign	Northbound	B	A
			Southbound	A	A
			Eastbound	B	B
107	US 129 BUS at SR 15 ALT/US 129	Signal	Overall	A	A
108	SR 11 at US 129	Signal	Overall	B	B

The results of the analysis show all study intersections currently operating adequately during peak weekday periods.

4.5 Future 2025 Background Growth Conditions

Table 4.3 2025 No Build with Background Traffic Levels of Service

#	Intersection	Control	Movement	Levels of Service	
				AM	PM
101	B Whitfield Rd at SR 15 ALT/US 129	Side St Stop Sign	Northbound	C	C
			Eastbound	A	A
			Westbound	A	A
102	B Whitfield Rd at Holiday Cemetery Rd	Side St Stop Sign	Northbound	A	A
			Southbound	A	A
			Eastbound	A	A
103	B Whitfield Rd at Lebanon Church Rd	Side St Stop Sign	Southbound	A	A
			Eastbound	A	A
			Westbound	A	A
104	Brock Rd at Holiday Cemetery Rd	Side St Stop Sign	Northbound	A	A
			Southbound	A	A
			Eastbound	A	A
105	Brock Rd (north) at SR 15 ALT/US 129	Side St Stop Sign	Northbound	B	A
			Southbound	A	A
			Eastbound	D	B
106	Lebanon Church Rd at SR 15 ALT/US 129	Side St Stop Sign	Northbound	B	A
			Southbound	A	A
			Eastbound	B	B
107	US 129 BUS at SR 15 ALT/US 129	Signal	Overall	A	A
108	SR 11 at US 129	Signal	Overall	B	B

The results of the analysis show all study intersections are expected to operate adequately during peak weekday periods with 2025 background traffic growth.

4.6 Future 2025 Conditions with Completion of Development

Table 4.4 2025 Existing Intersections with Project Traffic Levels of Service

#	Intersection	Control	Movement	Levels of Service	
				AM	PM
101	B Whitfield Rd at SR 15 ALT/US 129	Side St Stop Sign	Northbound	D	C
			Eastbound	A	A
			Westbound	C	B
102	B Whitfield Rd at Holiday Cemetery Rd	Side St Stop Sign	Northbound	A	A
			Southbound	A	A
			Eastbound	B	B
103	B Whitfield Rd at Lebanon Church Rd	Side St Stop Sign	Southbound	A	B
			Eastbound	B	B
			Westbound	A	A
104	Brock Rd at Holiday Cemetery Rd	Side St Stop Sign	Northbound	A	A
			Southbound	A	A
			Eastbound	B	A
105	Brock Rd (north) at SR 15 ALT/US 129	Side St Stop Sign	Northbound	C	C
			Southbound	A	A
			Eastbound	D	D
106	Lebanon Church Rd at SR 15 ALT/US 129	Side St Stop Sign	Northbound	C	C
			Southbound	A	A
			Eastbound	C	D
107	US 129 BUS at SR 15 ALT/US 129	Signal	Overall	B	B
108	SR 11 at US 129	Signal	Overall	C	D

The results of the analysis show all existing intersections are expected to operate adequately during peak weekday periods with 2025 project traffic when the site is completed. The improvements identified for the site allowed some background growth trips to be relocated to signalized intersections to provide adequate peak hour operations at existing intersections.

Table 4.5 2025 Site Access Points Levels of Service

#	Intersection	Control	Movement	Levels of Service	
				AM	PM
J1	at SR 15 ALT/US 129	Side St Stop Sign	Northbound	C	D
			Eastbound	A	A
			Westbound	A	A
J2	at SR 15 ALT/US 129	Side St Stop Sign	Northbound	F	F
			Eastbound	A	A
			Westbound	C	C
		Signal	Overall	B	C
J3	at SR 15 ALT/US 129	Side St Stop Sign	Northbound	B	C
			Eastbound	A	A
			Westbound	A	A
J4	at SR 15 ALT/US 129	Side St Stop Sign	Northbound	C	C
			Eastbound	A	A
			Westbound	D	C
J5	at SR 15 ALT/US 129	Side St Stop Sign	Northbound	C	C
			Eastbound	A	A
			Westbound	A	A
J6	at SR 15 ALT/US 129	Side St Stop Sign	Northbound	C	C
			Eastbound	A	A
			Westbound	C	C
J7	at SR 15 ALT/US 129	Side St Stop Sign	Northbound	B	C
			Eastbound	A	A
			Westbound	A	A
J8	at SR 15 ALT/US 129	Side St Stop Sign	Northbound	F	F
			Eastbound	A	A
			Westbound	D	E
		Signal	Overall	B	D
J9	at SR 15 ALT/US 129	Side St Stop Sign	Northbound	A	B
			Eastbound	A	A
			Westbound	A	A
W1-H5	Site Accesses on B Whitfield Rd and Holiday Cemetery Rd	Side St Stop Sign	All Movements	A,B,C	A,B,C

The results of the analysis show all site access on SR 15 ALT/US 129 intersections are expected to operate adequately during peak weekday periods with 2025 project traffic when the site is completed, with two roundabouts or traffic signals, with dual northbound left turn lanes leaving the site, installed at driveways J2 and J8.

Since the increase in through traffic on SR 15 ALT/US 129 adjacent to the site will probably not allow left turning vehicles to exit the site at the other intersections with stop sign control, most of the exiting vehicles are assumed to use the roundabout or signal controlled intersections during the peak traffic hours of the day. Some trips were also assumed to be reassigned to these intersections from existing intersections on SR 15 ALT/US 129, where inadequate peak hour operations were expected to provide adequate LOS at those intersections.

Some exiting trips from the western portion of the site are expected to travel to the northwest on SR 15 ALT/US 129 after exiting to the right, then making a U turn at the roundabout or signalized intersection. During the non-peak hours of the day, left-turning vehicles are expected to be able to exit the site at the access points with existing median crossovers.

It is reasonable to assume residents, shoppers, workers, and local visitors to the site will recognize the available capacity at the roundabout or signalized intersections during peak hours, but additional signs should be deployed within the site directing infrequent visitors to the available opportunities to travel to the northwest to avoid delays and inappropriate left turn gap acceptance at the stop sign controlled intersections.

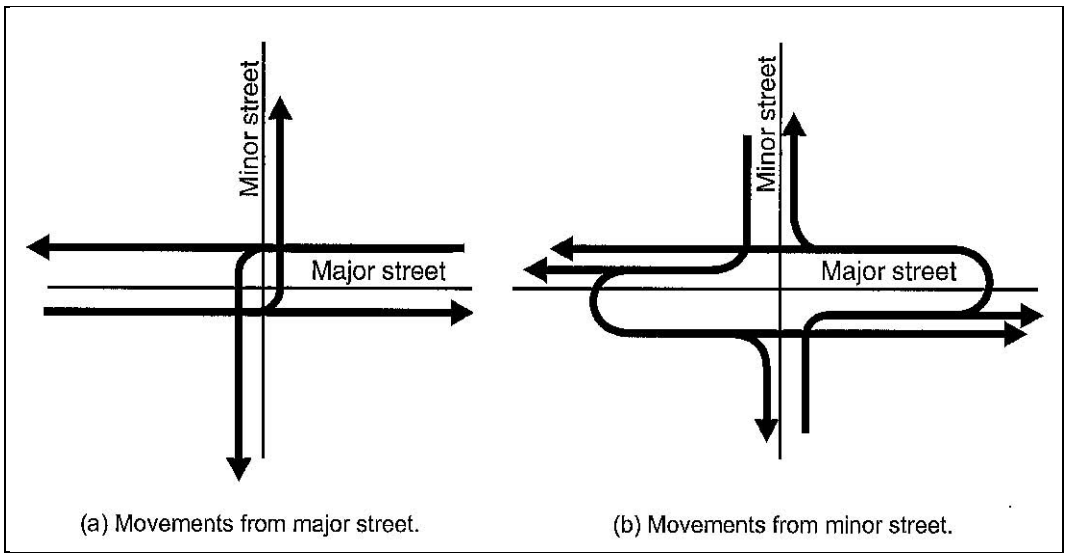
4.7 Development Phases Capacity Analysis Overview

The expected traffic impacts of the nine spatially determined phases of construction of the development were analyzed in three intermediate groups at the site access points expected to be constructed with those phases and the external study intersections. The impact of phases 1 and 2, phases 1, 2, and 3 together, and phases 1, 2, 3, 4A, 4B, and 5 together were analyzed. Based on the analyses results, the traffic signal or roundabout at J8 would be needed to provide adequate peak hour traffic control for all three intermediate phases of construction. However, sufficient exiting left-turning hourly volumes may not exist during sufficient hours of the day to meet the minimum signal warrant requirements, and installation may not be permitted.

4.8 SR 15 ALT/US 129 Superstreet Analysis

A Superstreet configuration is an intersection layout that allows the main street to operate in near free-flow conditions through the intersection, while forcing all side-street traffic to make a right-turn at the intersection. The side-street traffic that was destined to make a left-turn or travel through the intersection would then make a U-turn at a point downstream of the intersection along the major route, and then complete their movement through the intersection by continuing through on the main street (original side-street left-turn movement) or making a right-turn at the intersection (original side-street through movement).

This configuration removes the need of green time for the side-street left-turn or through movements at the intersection, which provides the main street the majority of intersection green time. The opposing main-street left-turn movement would be the only conflicting movement for the main-street through traffic. The following diagram from the FHWA Signalized Intersections: Informational Guide (FHWA-HRT-04-091) illustrates the operation of the Superstreet configuration.



There are ten (10) existing access points to the site on SR 15 ALT/US 129. Five (5) of the existing driveways align with existing median crossovers allowing vehicles to turn left into and out of the site. The full build out 2025 peak weekday conditions analyses indicated that vehicles turning into the site would experience acceptable delays, while left turning vehicles exiting the

site will not be likely to find sufficient gaps in through traffic without either signalization or roundabouts installation. However, during non-peak traffic volumes hours of the day, left-turning vehicles would probably be able to utilize all five full-movement access points. The expected right-turning vehicles into and out of the site are not expected to experience significant delays during peak hours.

Implementation of the Superstreet configuration would require all exiting vehicles to turn right leaving the site. Effectively doubling the right-turning volumes at the site access points could result in inadequate operations and excessive delays. Approximately half of the exiting vehicles would be turning right, accelerating, merging across both though lanes of traffic, decelerating to make a U-turn, then accelerating to merge right into the through traffic flow. Since the peak hour through traffic flow volumes are not expected to provide adequate gaps, signals will probably be needed during weekday peak volume periods, although the hourly volumes throughout the day will probably not meet the minimum signal warrant volumes to allow installation of traffic signals to be approved by the Georgia Department of Transportation until adequate volumes are actually counted at the median crossovers. Acceleration lanes on the left side of the through lanes would need to be constructed; however, merging to the right into the through traffic is less safe than normal merging patterns.

During weekday peak volume periods, particularly the evening peak hour, vehicles attempting to turn left from B Whitfield Road and from site driveway J1, would probably need to turn right and make U-turns at the signalized intersection at J2 because of insufficient gaps in the through traffic flow. Similar vehicular movements from the other right-in/out site driveways at J5, J7, and J9 will allow some exiting vehicles to make U-turns at nearby median crossovers.

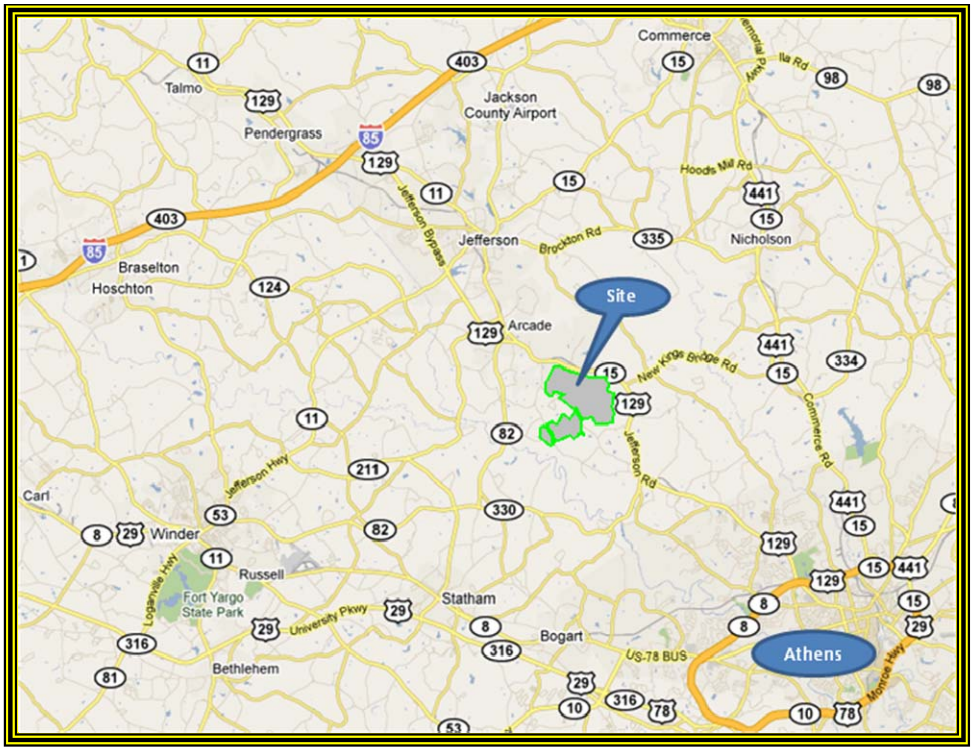
Due to the close spacing and configuration of the site access points and the 55 mph speed limits on SR 15 ALT/US 129, it was determined that while the southbound through traffic might benefit from this configuration, the new trips attempting to travel north from the site would not be likely to have sufficient openings in the traffic flow, when the site is fully built out, to accommodate the demand without excessive queuing. Installation of traffic signals at each pair of median crossovers, as well as construction of left-side acceleration lanes and reconfiguration of the existing access points would be likely to be required for adequate peak hour operations.

5.0 Executive Summary and Recommendations

5.1 Project Description

This Traffic Impact Analysis (TIA) evaluates the existing and future traffic operations for the proposed development to be located in Arcade, Georgia. The proposed site is located along SR 15 ALT/US 129 between B Whitfield Road and Brock Road as shown in Figure 5.1. The proposed development totals approximately 1,604 acres and will consist of a mixture of land uses. These uses include approximately 3,999 residential units, 1,156,000 square feet of retail and service building space, and 2,604,000 square feet of office space. Other proposed land uses include two schools as well as an area designated for parks and recreational ball fields. The site plan shown in Figure 1.2 shows the proposed land uses and locations of access drives. Current plans call for the proposed development to have multiple access points along SR 15 ALT/US 129 as well as several entrances on Holiday Cemetery Road and B Whitfield Rd.

Figure 5.1 – Project Location Map



5.2 Study Objectives

The purpose of this study is to evaluate the impacts of the proposed development on the operation of the roadway network in the vicinity of the proposed site as well as the site entrances to the development. The principal objectives of this study include:

- Review the existing roadway network and weekday AM and PM peak hour traffic conditions in the study area
- Estimate the magnitude and characteristics of new traffic generated by the proposed development during the weekday AM and PM peak hours
- Assign the site generated traffic to the adjacent street system at existing and proposed access points
- Calculate the pre and post-development Levels of Service and turn lane configuration requirements for all intersections and access points
- Identify any changes to existing or proposed access, intersection of roadway geometry and/or traffic control improvements required to properly accommodate pre and post-development traffic volumes and mitigate unacceptable impacts

This study evaluates the level-of-service (LOS) and delays for the following scenarios:

- Base Year 2010: **Existing** Conditions
- Design Year 2025: **No Build** Traffic Conditions with the background growth
- Design Year 2025: **Build** Traffic Conditions with the new site generated trips.

5.3 Study Parameters and Roadway Network

This study conservatively uses traffic volumes generated by the proposed development if the development is completely developed (full build-out). Full build-out is assumed to occur in 2025. Ultimately, the project may or may not reach its full build-out potential.

At full build-out, the development will have multiple access points along SR 15 ALT/US 129 and additional access points on Holiday Cemetery Road and B Whitfield Road. SR 15 ALT/US 129 is a four-lane divided highway that provides convenient access to I-85 north of the proposed site

and to city of Athens south of the proposed site. SR 15 ALT/US 129 is therefore expected to serve a majority of the new traffic generated by the proposed development. Other roadways expected to serve smaller portions of the site generated traffic include:

- SR 15 ALT/US 129 Business
- SR 11
- Holiday Cemetery Road
- B Whitfield Road
- Lebanon Church Road
- Brock Road

5.4 Recommended Roadway Network Improvements

This study's recommendations are largely dependent on the number of site trips generated by the development. The number of site trips is based on the proposed land uses which are preliminary and may be largely driven by market conditions. This means that the land uses are subject to change and therefore it should be noted that a significant change in proposed land use could alter the recommended improvements.

The recommended intersection configuration and traffic controls will include installation of modern design roundabouts or traffic signals with dual left-turn lanes exiting the site at site access points J2 and J8 on SR 15 ALT/US 129. If traffic signals are to be installed, sufficient left-turning vehicles exiting the site at each of these intersections throughout the day to meet minimum signal warrant volumes would be required before consideration of the City of Arcade to request and receive permission from the Georgia Department of Transportation (GDOT) for their installation. Installation of a roundabout would also require approval from GDOT; however, usually if it can be demonstrated that through traffic flow would not be unnecessarily delayed, and that the roundabout could be expected to continue to provide adequate service levels twenty years after construction, roundabouts could be installed at the beginning of the construction process to provide adequate access to and from the site. The analyses assumed

dedicated left and right turn lanes would be provided at all site access points (where left turns are permitted on SR 15 ALT/US 129) of sufficient length to accommodate peak hour queuing.

Because of the heavy existing and expected weekday peak hours through traffic volumes on SR 15 ALT/US 129 that result in inadequate Levels of Service for side street approaches and excessive delays that may result in increased crashes, the existing (or presumed) side-street stop sign controls would not be adequate to allow left-turning vehicles access to SR 15 ALT/US 129. By 2025 with full build out of the project, single lane roundabouts are not expected to provide sufficient peak hour capacity. However, roundabouts with right-turn bypass lanes into and out of the site would be expected to provide adequate operations.

Improvements inside the state right-of-way include requirements set forth by the GDOT **Regulations for Driveway and Encroachment Control** and changes to SR 15 ALT/US 129 would be expected to require adherence to the GDOT **Design Policy Manual** requirements.