Transportation Analysis

Woodstock West, Development of Regional Impact #1245
Breezy Hill, Development of Regional Impact #1271

City of Woodstock, Georgia

January 19, 2007

MARC R. ACAMPORA, PE, LLC

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Breezy Hill, Development of Regional Impact #1271

City of Woodstock, Georgia

study prepared for:

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January 19, 2007

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CONTENTS

TABLES

FIGURES

PHOTOGRAPHS

PROJECT DESCRIPTION

A Transportation Analysis was performed for the two proposed Developments of Regional Impact – Woodstock West, DRI #1245 and Breezy Hill, DRI #1271. The proximity of the two sites to one another, and the concurrency of their applications led to the conclusion by GRTA and the developers, that their transportation impacts should be assessed in one study. The Woodstock West site is located south of Towne Lake Parkway and north of Dupree Road, west of Main Street in downtown Woodstock. Breezy Hill is located along the west side of Main Street, across from Serenade Lane. An area map is presented in Figure 1. The total square footage of each multi-use development will exceed 400,000 square feet, which is one of the DRI thresholds for a multi-use development in a metropolitan region. Therefore these projects each meet the criteria for a Development of Regional Impact. This study was performed to meet the requirements for the Georgia Regional Transportation Authority (GRTA) Development of Regional Impact (DRI) non-expedited review, according to the GRTA DRI Review Package Technical Guidelines.

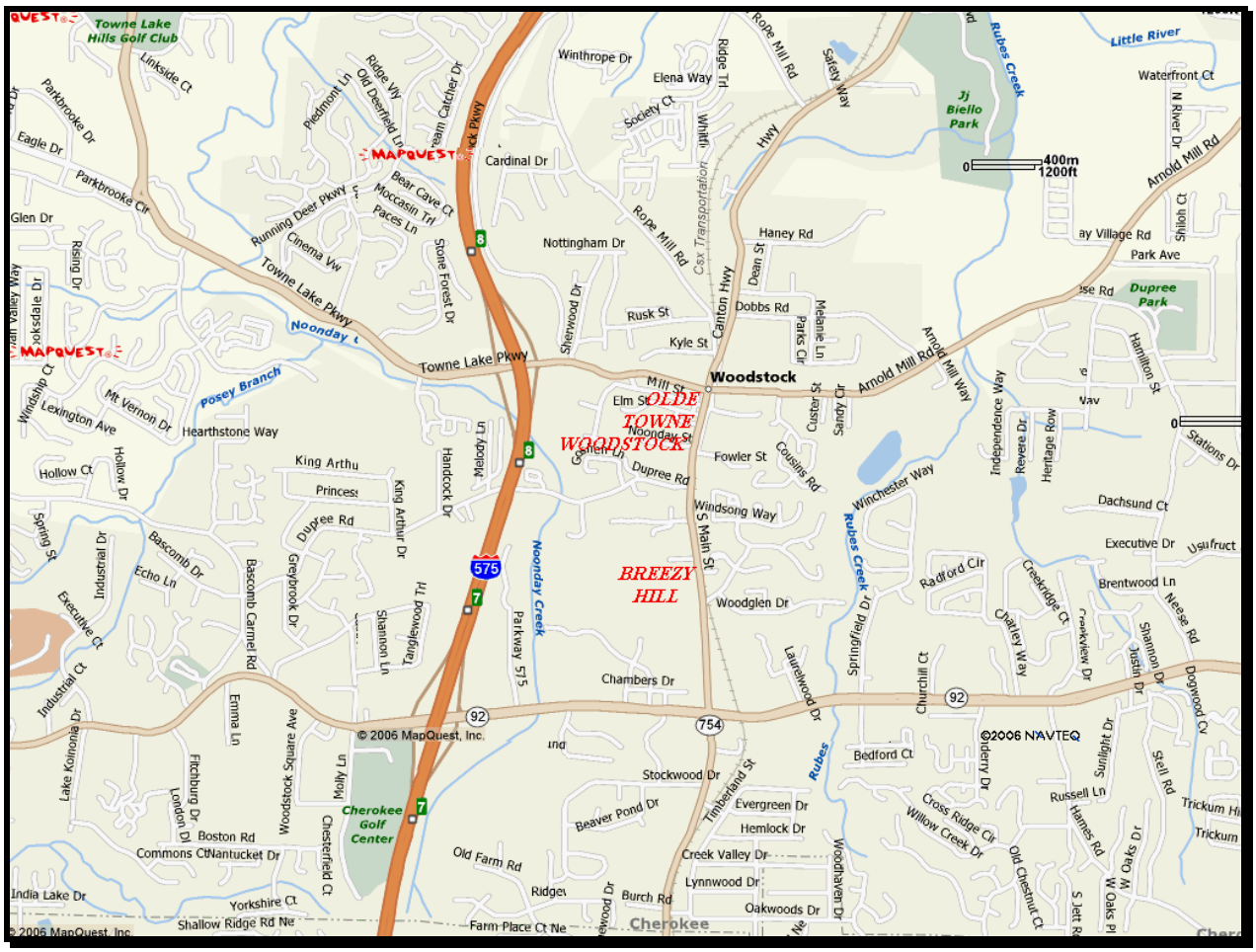


Figure 1 – Area Map

Project Phasing, Pods, and Land Uses

Tables 1 and 2 present the land uses and sizes of Woodstock West and Table 3 summarizes Breezy Hill.

The total site acreage for Woodstock West is approximately 32 acres. The site is located entirely within the City of Woodstock. The current zoning is DT-CBD and DT-MRA. The proposed zoning is DT-CBD with conditions to allow 20 residential units per acre.

The total site acreage for Breezy Hill is 87.19 acres. The site is located entirely within the City of Woodstock and no rezoning is requested.

Table 1 – Detail of Proposed Land Uses and Sizes for Woodstock West

Building	Land Use	Size
A	Retail	7,200 ft²
B	Retail	15,300 ft²
C	Condominium	56 units
D	Office	28,800 ft²
E	Office	5,400 ft²
F	Office	18,000 ft²
	Condominiums	39 units
G	Retail	37,700 ft²
	Condominiums	64 units
H	Civic – City Hall	36,000 ft²
I	Senior Housing	98 units
J	Condominiums	150 units
K	Civic	31,200 ft²
L-1	Condominiums	105 units
L-2	Retail	26,600 ft²
	Condominiums	83 units
	Single Family	44 lots

Table 2 – Summary of Proposed Land Uses and Sizes for Woodstock West

Land Use	Size
Retail	86,800 ft²
Office	52,200 ft²
Civic	67,200 ft²
Condominiums	497 units
Senior Housing	98 units
Single Family	44 units

It is important to note that the land uses and sizes shown in Tables 1 and 2 were taken from the December 21, 2006 site plan and are those used in this analysis. Subsequently, sizes changed slightly. Specifically, the retail was reduced to 79,760 ft², the office was reduced to 51,700 ft², the civic was reduced to 61,400 ft², and the number of single family homes was reduced by 1 to 43. Additionally, the

multi-family will include 315 apartments and 184 condominiums for a total of 499 units, as compared with the 497 condominiums evaluated in this study. All of the land uses, except the multi-family, decreased in size, but the decrease of each was less than 10%. The multi-family saw a minimal increase in the number of units (2), and the trip rates for the apartments are slightly higher than those for condominiums. The net effect of these changes will be very small and less than 10%. Therefore, this study is considered to still be valid and representative of the proposed DRIs. It is also noted that no changes were made to the Breezy Hill uses or sizes.

Table 3 – Summary of Proposed Land Uses and Sizes for Breezy Hill

Land Use	Size	Total Size
Retail	54,980 ft²	54,980 ft²
Office Above Retail	44,080 ft²	94,080 ft²
Office Stand Alone	50,000 ft²	
Condos A	78 units	266 units
Condos B	104 units	
Townhomes	84 units	
Single Family Homes	190 units	190 units

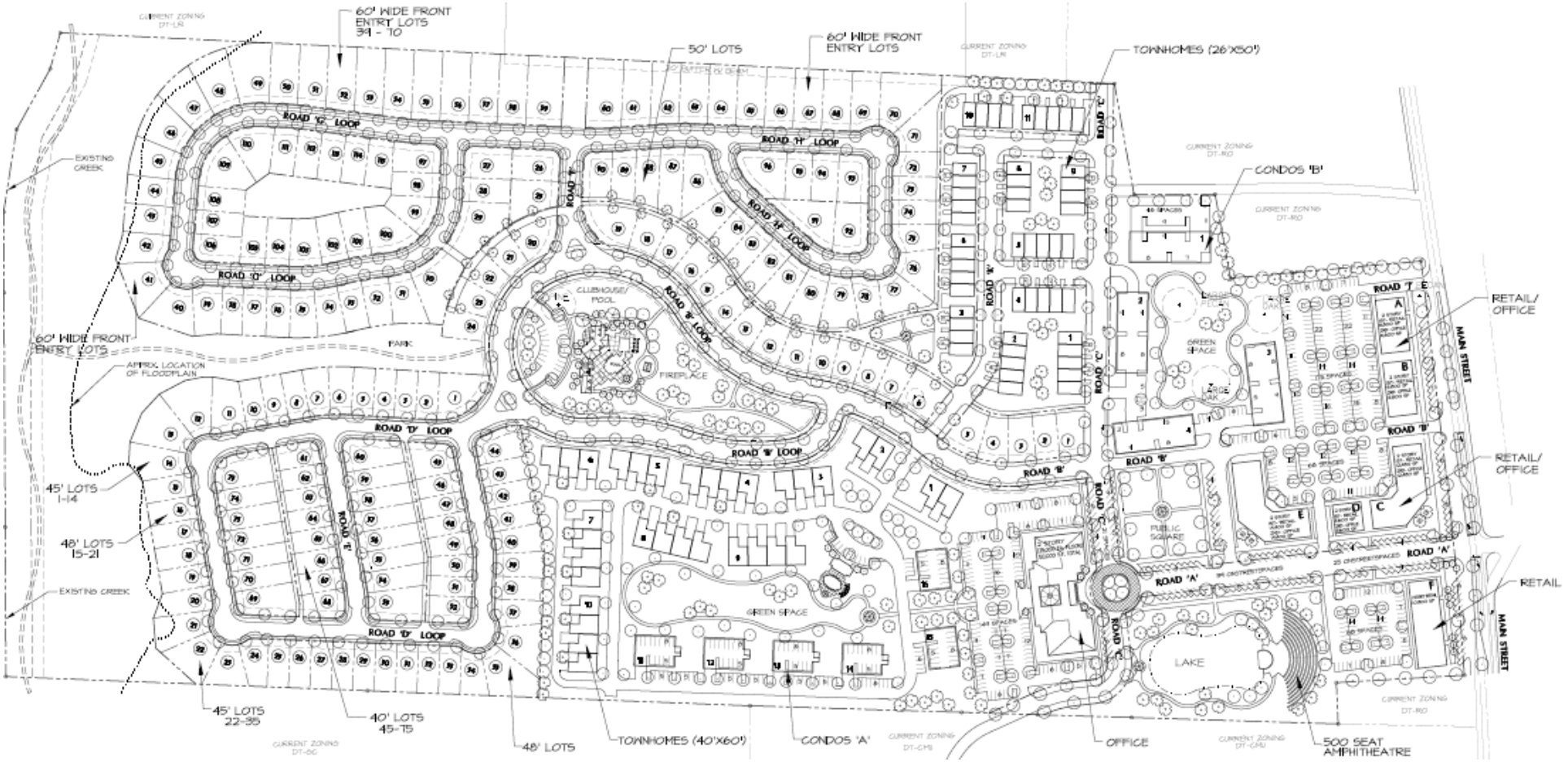
Both projects will be built in one continuous phase, with build-out expected in 2011.

Site Plans

This study is based on the site plan for Woodstock West prepared by Tunnell-Spangler-Walsh & Associates, dated December 21, 2006, and the site plan for Breezy Hill prepared by Site Development Consultants, Inc., dated December 20, 2006. The site plan for Woodstock West is shown in Figure 2 and the plan for Breezy Hill is shown in Figure 3.

site plan provided by Tunnell-Spangler-Walsh & Associates, 12/21/06

Figure 2 – Woodstock West Site Plan



site plan prepared by Site Development Consultants, Inc., 12/20/06

Figure 3 – Breezy Hill Site Plan

Site Access

Woodstock West will be developed as a continuation of the existing grid of streets in downtown Woodstock. As such, there will be no specific project entrances. Two new streets, Street A and Street B will be built paralleling Main Street. The project will be built along Mill Street, Elm Street, Oak Street, and Noonday Street. A new Drive A will be built between Noonday Street and Street B. Street B will connect Towne Lake Parkway, through the project, to Dupree Road.

Breezy Hill will include four accesses along the west side of Main Street. The northern access will continue as an extension of Ingram Street into the townhome portion of Breezy Hill. Road J will be a new access that aligns with Bowles Drive and will serve the retail. Road B will meet Main Street between Bowles Drive and Serenade Lane, and will also serve the retail. Road A will align with signalized Serenade Lane. There is the future potential for Road C, which runs parallel to Main Street, to connect to Dupree Road, to the north, and SR 92, to the south.

On-Site Bicycle and Pedestrian Facilities

Woodstock West is being developed with a grid of streets, with sidewalks on both sides of all streets, when feasible (there are a few existing buildings located very close to the street). New sidewalks will connect to existing sidewalks when possible. No specific bicycle lanes are being built. However, it is recommended that bicycle racks be provided near retail and civic buildings.

In Breezy Hill, sidewalks will be provided on both side of all streets throughout the residential portions of the development. Walking paths will be provided around and through greenspaces. Sidewalks will also be provided along the retail and office frontages. No bicycle lanes are planned for the Breezy Hill streets. It is recommended that bicycle racks be provided in front of the retail portions of the development.

Transit Access

This portion of Cherokee County and the City of Woodstock are currently not served by public transportation.

Parking

Parking will be provided for Woodstock West by a combination of parking decks, surface lots, and on-street parking. All parking is shown on the site plan as submitted with this report. The total number of spaces to be provided is 1,693. Breezy Hill will include surface lots for the two retail portions of the site, a surface lot behind the 50,000 ft² office building, surface lots adjacent to the various multi family residential, and some on-street parking, all of which is shown in the site plan. The retail will have a total of 240 spaces; the office above the retail will have 150 spaces, the stand alone office will be served by 164 spaces, the condos will have a total of 302 spaces, and the townhouses and single family lots will each have their own parking.

STUDY NETWORK

The study network for this project was determined in an analysis performed according to the GRTA Technical Guidelines, Section 4-109. The methodology employed in that analysis included the following steps:

- The twenty-four gross trip generation (unadjusted for mix of land uses, mode split, or pass-by trips) was determined for both DRIs, and assigned to the major roadways in the vicinity of the site.
- Adjusted, two-way generalized roadway service volumes were determined according to GRTA requirements at the appropriate level of service standard for the City of Woodstock and Cherokee County (LOS D).
- The DRI trips were compared with the roadway service volumes. Where the total trips generated by the two proposed DRIs exceeded 7% of the roadway service volumes, that segment, and the major included and adjacent intersections, were identified for inclusion in the study network.

Using the results of that analysis, GRTA and Marc R. Acampora, PE, LLC identified the intersections that would be analyzed in this study. The following sections document the study network determination process for the Woodstock DRIs.

GROSS TRIP GENERATION

The uses evaluated in the current study have changed slightly and are notably smaller than those employed in the network determination. Standard ITE trip equations and rates were used to determine the site-generated 24-hour two-way trips. According to GRTA requirements, no adjustments were made to the gross trip numbers for the purpose of determining the scope of the study network. Table 4 presents the gross, unadjusted 24-hour trip generation for the two DRIs that was used in the network determination analysis.

Table 4 – Woodstock DRIs Twenty-Four Hour Gross Trip Generation

Used for Study Network Determination

Land Use	ITE Code	Size	24-Hour Volume
Woodstock West			
Commercial / Retail	820	258,450 ft²	12,588
Office	750	133,200 ft²	1,796
Condominiums	230	291	1,592
Apartments	220	318	2,062
Townhomes	230	71	480
Hotel	310	80	714
Total Commercial / Retail / Office			14,384
Total Residential / Hotel			4,848
Total Woodstock West			19,232
Breezy Hill			
Commercial / Retail	820	57,800 ft²	4,756
Office	750	26,650 ft²	686
Townhomes / Lofts / Quads	230	261	1,450
Single Family	210	197	1,940
Total Commercial / Retail / Office			5,442
Total Residential			3,390
Total Breezy Hill			8,832
Total Commercial / Retail / Office			19,826
Total Residential / Hotel			8,238
Total Both DRIs			28,064

Note – latest numbers have been reduced substantially from those shown in this table. See Table 1 for the land uses and sizes employed in this Transportation Analysis. See Tables 6-8 for the detailed trip generation used in this Transportation Analysis.

Based on the numbers in Table 4, a twenty-four hour two-way unadjusted volume of 19,826 commercial / retail / office trips and 8,238 residential / hotel trips, or a total of 28,064 trips, were used for the study network determination.

TRIP DISTRIBUTION AND ASSIGNMENT

Trip distribution percentages were developed, to determine where project traffic would travel. Two distributions were developed, one for the retail and office uses and one for the residential and hotel uses. The directional trip distribution to and from the site was developed based primarily on the following:

- the location and distance of surrounding residential areas for the retail and office distributions
- the location and distance of employment opportunities, schools, and retail nodes for the residential distribution
- the location of major highways and interstates
- current travel patterns on the area roadways
- the proposed project access locations

Figure 4, presented later in this report, depicts the trip distribution percentages used in the analysis. Appendix B of this report includes the spreadsheet used for the original study network determination calculations. The percentages of project traffic assigned to each roadway segment in the network determination analysis can be found in that spreadsheet.

STUDY NETWORK DETERMINATION

Field review was performed to ascertain the existing lane configuration and other infrastructure in the vicinity of the proposed DRIs. This data was used, in conjunction with level of service tables developed by the Florida Department of Transportation, to determine the service volume of each major roadway segment in the area, according to GRTA requirements. The gross 24-hour trip generation of the proposed DRIs was assigned, by the trip distribution percentages discussed above, in order to obtain site-generated volumes on each major roadway segment in the vicinity of the project. The site traffic was compared with the service volumes on each roadway segment. Those segments on which the proposed DRIs will add 7% or more trips to the service volume, must be included in the study network. Appendix B of this report includes the spreadsheet used to perform the study network calculations and a graphic depicting the limits of the study network. The following sections of this report present the components of the study network, as determined through the above-described process, and agreed upon with GRTA. *It is noted that the study network components presented below and included in this analysis were agreed upon with GRTA and do not necessarily exactly match those components identified in the network determination analysis.*

STUDY ELEMENTS

Twenty one existing intersections were identified for analysis. These intersections are presented in Table 5. The numbering scheme is used throughout this report for convenient reference. In addition to the listed intersections, in the build condition, all major site accesses are analyzed. Appendix A includes a description of the methodology used for the intersection analysis.

Table 5 – Existing Intersections Included in the Analysis

1) Towne Lake Parkway and Stonebridge Parkway (signal)
2) Towne Lake Parkway at I-575 southbound ramp (signal)
3) Towne Lake Parkway at I-575 northbound ramp (signal)
4) Towne Lake Parkway at Woodstock Parkway (signal)
5) Towne Lake Parkway at Mill Street
6) Towne Lake Parkway at Wall Street
7) Towne Lake Parkway /Arnold Mill Road at Main Street (signal)
8) Arnold Mill Road and Neese Road (signal)
9) Main Street at Ridgewalk Parkway (signal)
10) Mill Street at Pinehill Drive
11) Mill Street at Wall Street
12) Main Street at Mill Street (signal)
13) Main Street at Noonday Street (signal planned)
14) Dupree Road and Handcock Drive
15) Main Street at Dupree Road (signal)
16) Main Street at Ingram Street
17) Main Street at Bowles Drive
18) Main Street at Serenade Lane (signal)
19) SR 92 at Parkway 575 (signal)
20) SR 92 at Main Street (signal)
21) SR 92 at Creekview Drive / Hames Road

PEAK TIME PERIODS AND ANALYSIS CONDITIONS

All analyses are performed for the weekday a.m. peak hour, the weekday p.m. peak hour, and the Saturday mid-day peak hour. The existing, 2011 no-build, and 2011 build conditions are evaluated. Appendix A provides more detail about the determination of peak hour volumes.

LEVEL OF SERVICE STANDARD

The level of service standard is that level of service considered to be the minimum that provides acceptable operating conditions. A level of service (LOS) standard of C is typically used for more rural areas, while LOS D is used for suburban and urban areas. For this study, a LOS D standard was applied to all facilities, as agreed upon with GRTA. In the facilities needs analyses, mitigation is developed with LOS D as the minimum goal. However, should the existing LOS be worse than the standard, the existing LOS is taken to be the standard (but not to exceed LOS E) as set forth by GRTA procedures.

EXISTING TRANSPORTATION FACILITIES

This section provides a description of the existing transportation infrastructure that will serve the proposed DRIs. An inventory was performed of the geometrics and control at the existing traffic facilities in the vicinity of the two sites. The availability of transit, bicycle, and pedestrian facilities adjacent to the sites was also reviewed. Figure 6, in the Traffic Analysis section of this report, depicts the existing lane configurations for the roadway and intersection facilities in the study network and includes the locations of signals in the study area. The following is a brief description of each of these facilities.

Towne Lake Parkway / Arnold Mill Road

Towne Lake Parkway an east-west major arterial that begins at Bells Ferry Road, merges with Eagle Drive, has an interchange with I-575, then continues into downtown Woodstock, where it becomes Arnold Mill Road at Main Street. Arnold Mill Road continues to the east and merges to become SR 140, and changes name to Houze Road in Alpharetta. In the study area, Towne Lake Parkway has four lanes with a median west of the I-575 interchange. East of I-575, Towne Lake Parkway and Arnold Mill Road both have two travel lanes. In 2004, the Georgia DOT recorded an AADT of 40,036 vpd on Towne Lake Parkway west of I-575. The 2005 AADT on Arnold Mill Road east of Main Street was 14,140 vpd. Photos 1 through 7 depict sections of Towne Lake Parkway and Arnold Mill Road.

Photograph 1 – Towne Lake Parkway Facing West at Stonebridge Parkway

Photograph 2 – Towne Lake Parkway Facing East Toward the I-575 Southbound Ramps

Photograph 3 – Towne Lake Parkway Facing West Under I-575

Photograph 4 – Towne Lake Parkway Facing East Toward Woodstock Parkway

Photograph 5 – Towne Lake Parkway Facing West, West of Main Street

Photograph 6 – Towne Lake Parkway Facing East at Main Street

Photograph 7 – Arnold Mill Road Facing West at Main Street

Main Street

Main Street is a north / south arterial that roughly parallels I-575, to the east. It changes name from Old Highway 5 and Canton Highway, to the north, to Main Street, then to Canton Road, to the south. Through the study area, Main Street has two travel lanes until just south of Serenade Lane, where it widens to four lanes as it intersects with SR 92. In 2005, the Georgia DOT recorded an AADT of 18,030 vpd on Main Street south of Dupree Road. Canton Highway / Main Street had a 2005 AADT of 14,000 vpd near Ridgewalk Parkway. Photos 8 through 14 show various sections of Main Street in the study network.

Photograph 8 – Main Street / Canton Highway Facing North at Ridgewalk Parkway

Photograph 9 – Main Street Facing North at Mill Street

Photograph 10 – Main Street Facing North at Oak Street

Photograph 11 – Main Street Facing South at Noonday Street

Photograph 12 – Main Street Facing North at Ingram Street

Photograph 13 – Main Street Facing South Toward Serenade Lane

Photograph 14 – Main Street Facing North From SR 92

SR 92

SR 92 is a major east-west arterial with widths varying from eight to six through lanes between its interchange with I-575 and Main Street, the narrowing to four through lanes with a median, a short distance east of Main Street. The SR 92 corridor in this area has recently been widened and the intersection of SR 92 at Main Street has dual left turn lanes and single right turn lanes on all approaches. In 2005 the Georgia DOT recorded an AADT on SR 92 of 60,210 vpd, east of I-575. Photos 15 through 17 show sections of SR 92.

Photograph 15 – SR 92 Facing East at Main Street

Photograph 16 – SR 92 Facing West at Creekview Drive

Photograph 17 – SR 92 Facing West at Parkway 575

Secondary Streets

Most of the secondary streets in the study network have two lanes. Photos in this section show the secondary streets at various locations in the study network.

Photograph 18 – Mill Street Facing East From Pinehill Drive

Photograph 19 – Mill Street Facing West Near Location of Proposed Street B

Photograph 20 – Elm Street From Main Street Looking West

Photograph 21 – Wall Street Has Characteristics of an Alley

Photograph 22 – Noonday Street Facing East Toward Main Street

Photograph 23 – New Railroad Crossing Aligned With Noonday Street

Photograph 24 – Dupree Road Facing West Near Location of Proposed Street B

Photograph 25 – Atypical Configuration of Mill Street Facing South From Towne Lake Parkway

Transit Service

There is currently no public transportation service in this area of Cherokee County or the City of Woodstock.

Pedestrian and Bicycle Facilities

There are no dedicated bicycle lanes in the immediate vicinity of the subject DRIs. Sidewalks are located along some sections, especially in downtown Woodstock. There are no sidewalks on most of the secondary streets.

PROJECT TRAFFIC CHARACTERISTICS

This section provides a description of the traffic characteristics of the proposed development, including the number of trips that will be generated, and where that traffic will travel.

TRIP GENERATION

A discussion of the trip generation methodology is presented, for reference, in Appendix A. This includes a discussion of the multi-use adjustments and pass-by reductions. The appendix also includes the multi-use adjustment worksheets. The trip generation for the subject site was calculated for the weekday a.m. and p.m. peak hours, a weekday 24-hour period, and the Saturday, mid-day peak hour. Table 6 presents a summary of the trip generation for Woodstock West. Table 7 provides Breezy Hill's trip generation. Table 8 summarizes the adjustments applied to the raw trip generation, for both DRIs. Appendix A includes a detailed explanation of the treatment of the multi-use calculations.

It is again noted here that the sizes shown in Table 6 are those used in this study and have changed slightly in the latest Woodstock West site plan. Also, the multi-family includes both apartments and condominiums. See previous text for details.

Table 6 – Woodstock West DRI Trip Generation

Building	Land Use	ITE Code	Size	A.M. Peak Hour			P.M. Peak Hour			24-Hour	Saturday Peak Hour		
				Enter	Exit	2-Way	Enter	Exit	2-Way	2-Way	Enter	Exit	2-Way
A+B	Shopping Center	820	22,500 ft²	39	25	64	112	122	234	2576	171	158	329
G	Shopping Center	820	37,700 ft²	53	34	87	158	171	329	3602	239	220	459
L-2	Shopping Center	820	26,600 ft²	43	28	71	125	136	261	2872	190	176	366
	Retail Total			135	87	222	395	429	824	9050	600	554	1154
	Multi Use Adjustment			-18	-10	-28	-44	-56	-100	-1222	-35	-50	-85
	Subtotal			117	77	194	351	373	724	7828	565	504	1069
	Pass By Adjustment			-35	-23	-58	-140	-149	-290	-2348	-170	-151	-321
	Total			82	54	136	211	224	434	5480	396	353	748
D	Office	710	28,800 ft²	61	8	69	19	92	111	512	7	6	13
E	Office	710	5,400 ft²	7	1	8	1	7	8	60	1	1	2
F	Office	710	18,000 ft²	42	6	48	17	82	99	356	5	4	9
H	Civic	730	36,000 ft²	73	10	83	20	99	119	608	9	7	16
K	Civic	730	31,200 ft²	65	9	74	19	95	114	544	8	6	14
	Office and Civic Total			248	34	282	76	375	451	2080	30	24	54
	Multi Use Adjustment			-7	-2	-9	-5	-13	-18	-359	-11	-5	-16
	Total			241	32	273	71	362	433	1721	19	19	38
C	Condominium	230	56	6	26	32	25	12	37	392	51	43	94
F	Condominium	230	39	4	20	24	19	9	28	288	29	25	54
G	Condominium	230	64	6	30	36	28	14	42	438	33	28	61
J	Condominium	230	150	12	59	71	56	28	84	906	47	39	86
L-1	Condominium	230	105	9	45	54	42	21	63	670	39	34	73
L-2	Condominium	230	83	8	36	44	35	17	52	548	36	31	67
I	Senior Housing	252	98	4	4	8	7	4	11	340	15	14	29
Lots	Single Family	210	44	10	30	40	32	19	51	488	27	23	50
	Residential Total			59	250	309	244	124	368	4070	277	237	514
	Multi Use Adjustment			-8	-29	-37	-56	-36	-92	-947	-39	-30	-69
	Total			51	221	272	188	88	276	3123	238	207	445

Table 7 – Breezy Hill DRI Trip Generation

Building	Land Use	ITE Code	Size	A.M. Peak Hour			P.M. Peak Hour			24-Hour	Saturday Peak Hour		
				Enter	Exit	2-Way	Enter	Exit	2-Way	2-Way	Enter	Exit	2-Way
ABCDE	Shopping Center	820	44,080 ft²	58	38	96	164	178	342	3988	264	244	508
F	Shopping Center	820	10,900 ft²	25	16	41	70	75	145	1608	107	98	205
	Retail Total			83	54	137	234	253	487	5596	371	342	713
	Multi Use Adjustment			-11	-6	-17	-26	-33	-59	-756	-23	-32	-55
	Subtotal			72	48	120	208	220	428	4840	348	310	658
	Pass By Adjustment			-25	-17	-42	-94	-99	-193	-1694	-122	-109	-230
	Total			47	31	78	114	121	235	3146	226	202	428
ABCDE	Office	710	44,080 ft²	86	11	97	22	106	128	710	10	9	19
Office	Office	710	50,000 ft²	95	13	108	23	112	135	782	11	10	21
	Office Total			181	24	205	45	218	263	1492	21	19	40
	Multi Use Adjustment			-5	-1	-6	-3	-9	-12	-226	-8	-4	-12
	Total			176	23	199	42	209	251	1266	13	15	28
Condos A	Condominium	230	78	7	35	42	33	16	49	520	35	30	65
Condos B	Condominium	230	104	9	44	53	42	20	62	664	39	34	73
Townhomes 26x50	Townhouse	230	51	5	25	30	23	12	35	362	31	26	57
Townhomes 40x60	Townhouse	230	33	4	17	21	16	8	24	250	28	24	52
Lots	Single Family < .25 mile retail/office	210	47	9	27	36	30	18	48	468	24	21	45
	Single Family > .25 mile of retail/office		143	27	79	106	90	53	143	1408	73	62	135
	Single Family Total		190	36	106	142	120	71	191	1876	97	83	180
	Residential Total			61	227	288	234	127	361	3672	230	197	427
	Total Raw Multi-Use Adjustment			-5	-14	-19	-34	-21	-55	-590	-24	-19	-43
	Multi Use Adjustment applied at 100%			-3	-9	-12	-21	-12	-33	-364	-16	-13	-29
	Multi Use Adjustment applied at 67%			-1	-3	-5	-9	-6	-15	-152	-5	-4	-9
	Total			57	215	271	204	109	313	3157	209	180	388

Table 8 – Summary of Trip Generation Adjustments and Multi-Use Percentages

	A.M. Peak Hour			P.M. Peak Hour			24-Hour	Saturday Peak Hour		
	Enter	Exit	2-Way	Enter	Exit	2-Way	2-Way	Enter	Exit	2-Way
Woodstock West										
Project Total Raw Trip Generation	442	371	813	715	928	1643	15200	907	815	1722
Total Multi Use Adjustments	-33	-41	-74	-105	-105	-210	-2528	-85	-85	-170
Multi-Use Adjustment Percentages	-7.5%	-11.1%	-9.1%	-14.7%	-11.3%	-12.8%	-16.6%	-9.4%	-10.4%	-9.9%
Total Pass By Trips	-35	-23	-58	-140	-149	-290	-2348	-170	-151	-321
Total New External Trips	374	307	681	470	674	1143	10324	653	579	1231
Breezy Hill										
Project Total Raw Trip Generation	325	305	630	513	598	1111	10760	622	558	1180
Total Multi Use Adjustments	-20	-19	-40	-59	-60	-119	-1497	-52	-53	-106
Multi-Use Adjustment Percentages	-6.2%	-6.4%	-6.3%	-11.4%	-10.1%	-10.7%	-13.9%	-8.4%	-9.5%	-8.9%
Total Pass By Trips	-25	-17	-42	-94	-99	-193	-1694	-122	-109	-230
Total New External Trips	280	269	548	361	439	800	7569	448	396	844

see Appendix A for detailed explanation of multi-use adjustments

TRIP DISTRIBUTION AND ASSIGNMENT

Trip distribution percentages were developed, as discussed in the Study Network section of this report. The trip distribution percentages for this project are shown in Figure 4. The project traffic, shown in Tables 6 and 7, was distributed to the roadway network based on these percentages. The traffic was assigned to each study intersection based on expected routes of travel. The total traffic expected to be generated solely by the DRIs is shown in Figure 5 for the weekday a.m. and p.m. peak hours and in Figure 6 for the Saturday peak hour.

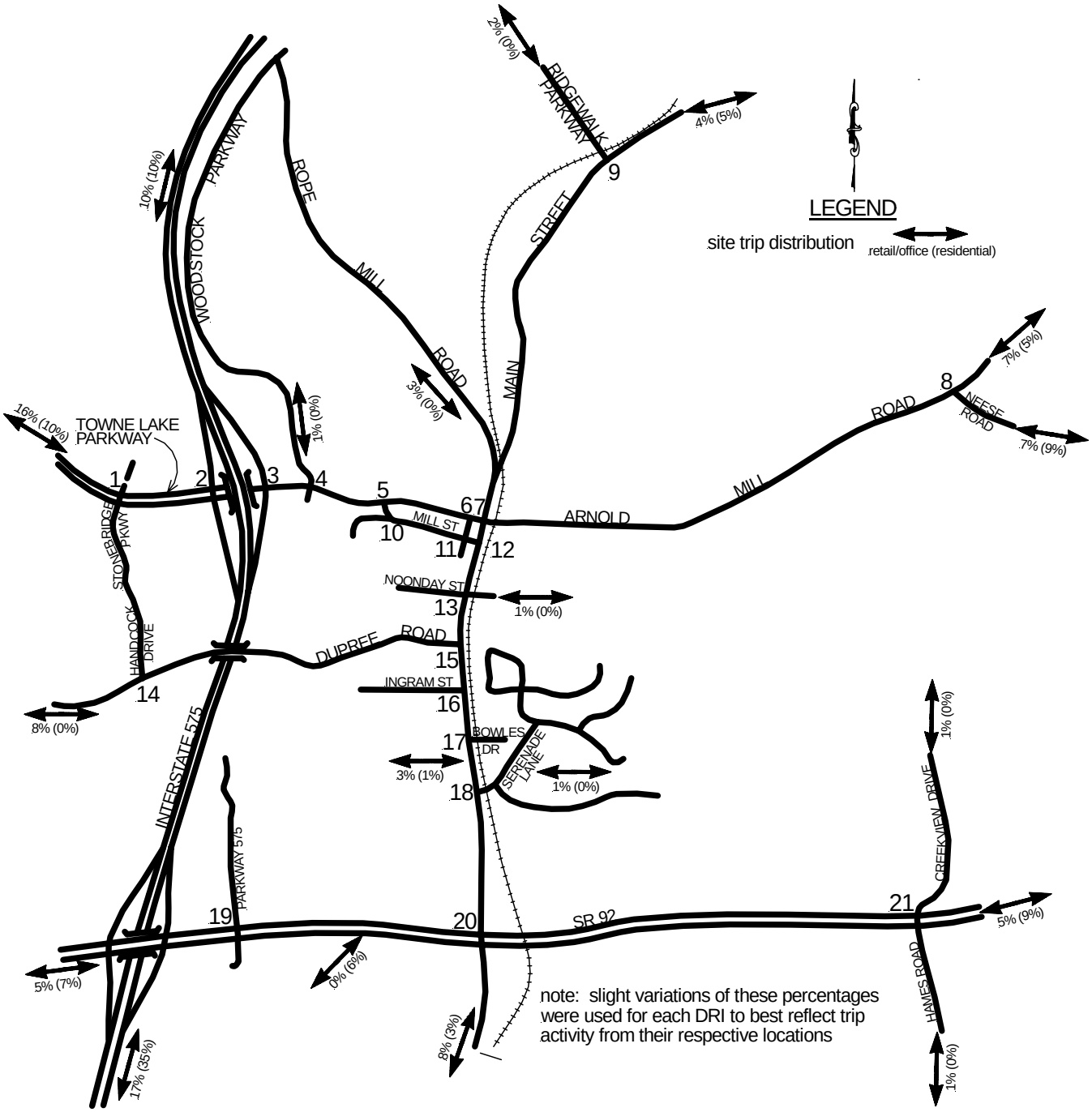


Figure 4 – Trip Distribution Percentages

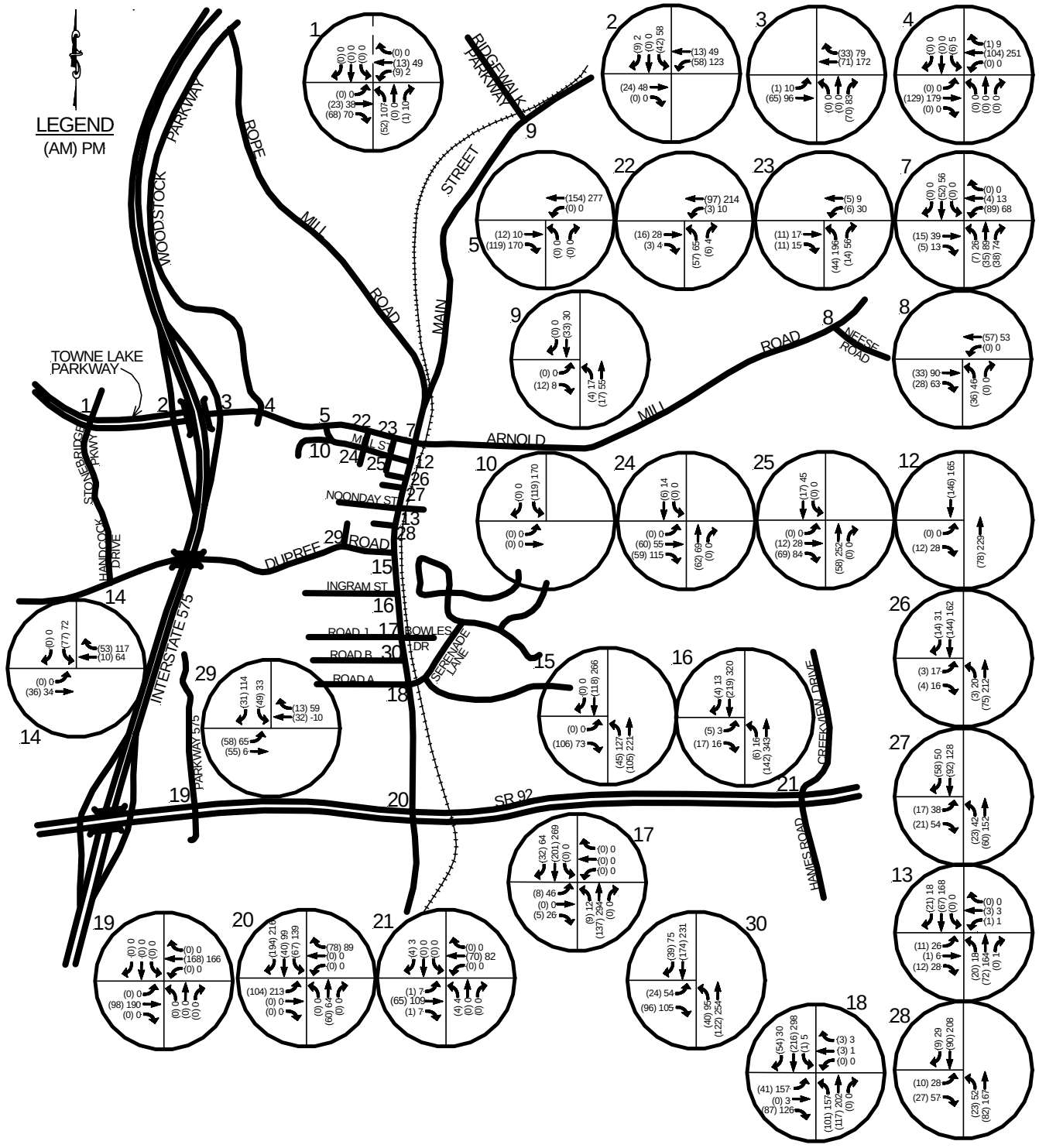


Figure 5 – DRIs A.M. and P.M. Peak Hour Traffic Volumes

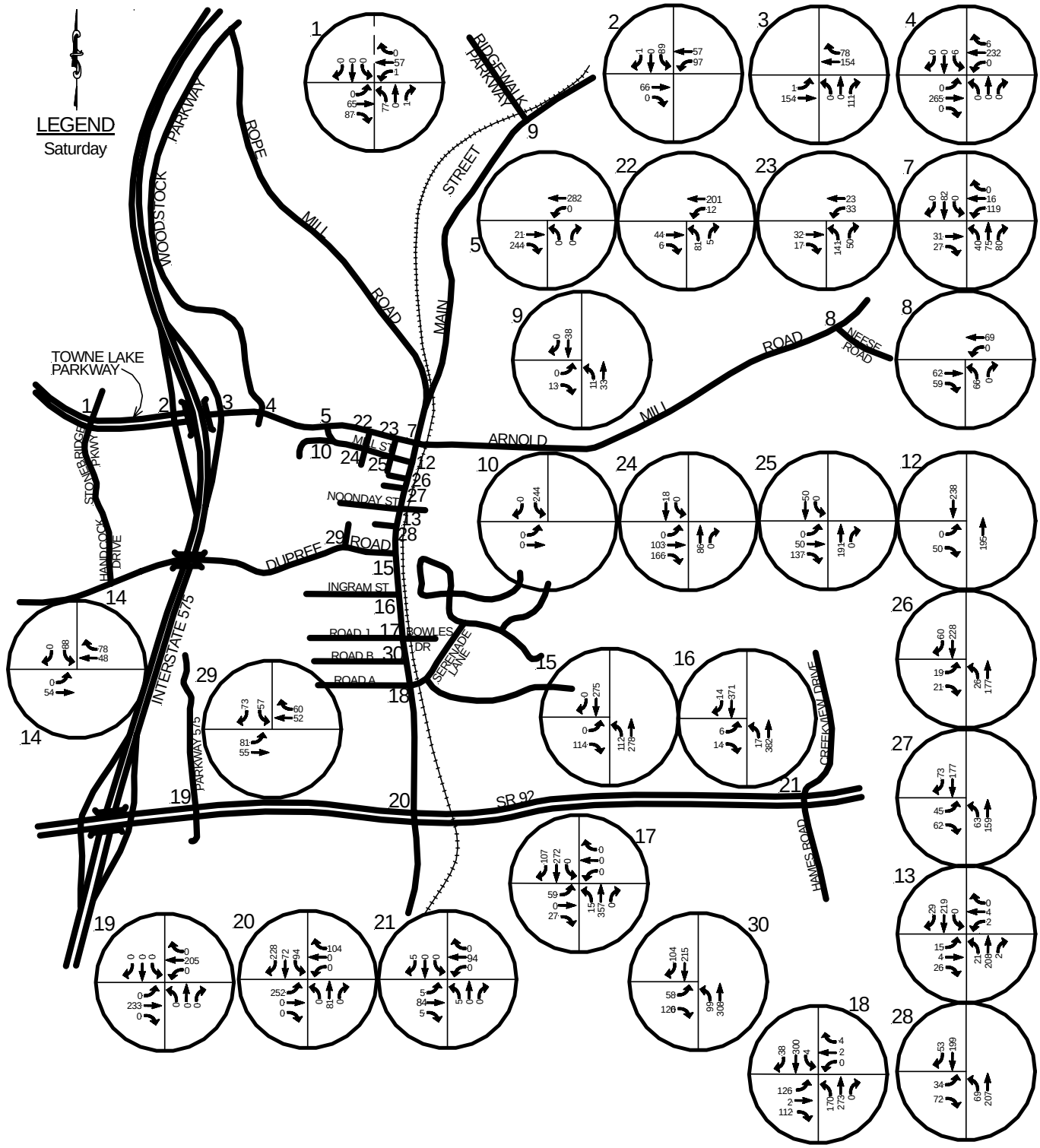


Figure 6 – DRIs Saturday Peak Hour Traffic Volumes

EXISTING TRAFFIC ANALYSIS

This chapter presents the results of the capacity analysis and facilities needs analysis for the existing condition.

EXISTING LANE CONFIGURATION

A detailed description, along with photographs documenting the existing conditions, was provided previously in this report. Figure 7 presents the existing lane configuration at each study intersection.

EXISTING TRAFFIC VOLUMES

Traffic counts were obtained at each of the existing study intersections in December 2006. The dates of the counts are shown for each intersection in Table 9. The methodology for collecting the count data is presented in Appendix A and the raw count data is located in Appendix C. The existing a.m. and p.m. peak hour volumes are presented in Figure 8. The existing Saturday peak hour volumes are shown in Figure 9.

Table 9 – Count Dates

Intersection	Weekday Count Date	Day of Week	Saturday Count Date
1) Towne Lake Pkwy and Stonebridge Pkwy	Dec 5	Tuesday	Dec 2
2) Towne Lake Pkwy at I-575 SB ramp	Dec 6	Wednesday	Dec 2
3) Towne Lake Pkwy at I-575 NB ramp	Dec 6	Wednesday	Dec 2
4) Towne Lake Pkwy at Woodstock Pkwy	Dec 5	Tuesday	Dec 2
5) Towne Lake Pkwy at Mill St	Dec 5	Tuesday	Dec 2
6) Towne Lake Pkwy at Wall St	Dec 4	Monday	Dec 16
7) Towne Lake Pkwy /Arnold Mill Rd at Main St	Dec 6	Wednesday	Dec 9
8) Arnold Mill Rd and Neese Rd	Dec 7	Thursday	Dec 16
9) Main St at Ridgewalk Pkwy	Dec 12	Tuesday	Dec 16
10) Mill St at Pinehill Dr	Dec 4	Monday	Dec 2
11) Mill St at Wall St	Dec 4	Monday	Dec 2
12) Main St at Mill St	Dec 7	Thursday	Dec 9
13) Main St at Noonday St	Dec 14	Thursday	Dec 9
14) Dupree Rd and Handcock Dr	Dec 5	Tuesday	Dec 2
15) Main St at Dupree Rd	Dec 7	Thursday	Dec 9
16) Main St at Ingram St	Dec 14	Thursday	Dec 9
17) Main St at Bowles Dr	Dec 14	Thursday	Dec 9
18) Main St at Serenade Ln	Dec 7	Thursday	Dec 9
19) SR 92 at Pkwy 575	Dec 13	Wednesday	Dec 16
20) SR 92 at Main St	Dec 13	Wednesday	Dec 9
21) SR 92 at Creekview Dr / Hames Rd	Dec 11	Monday	Dec 16

Due to the proximity of the data collection to the Christmas holiday, and the associated changes in traffic volumes and travel patterns, it was decided that counts collected after December 8 would be reviewed to ensure that they balance reasonably well with those counts collected by that date. Marc R. Acampora, PE, LLC also decided that the counts on Saturday December 9 would be far enough in advance of the holiday to be considered representative. Due to time constraints, some counts were collected on weekdays after December 8 and on Saturdays after December 9. In addition, a few weekday counts were collected on a Monday, rather than the standard Tuesday through Thursday. All counts that are denoted with an asterisk in Table 8 were collected on days that were outside the designated dates, and were reviewed.

After reviewing the noted intersections, it was concluded that almost all locations balanced reasonably well with adjacent intersections that were counted on acceptable dates. The only intersection at which a "seasonal" adjustment was applied was Mill Street at Wall Street. Adjustments were applied to all three time periods, and are shown in the intersection volume worksheet for that intersection, in the appendix.

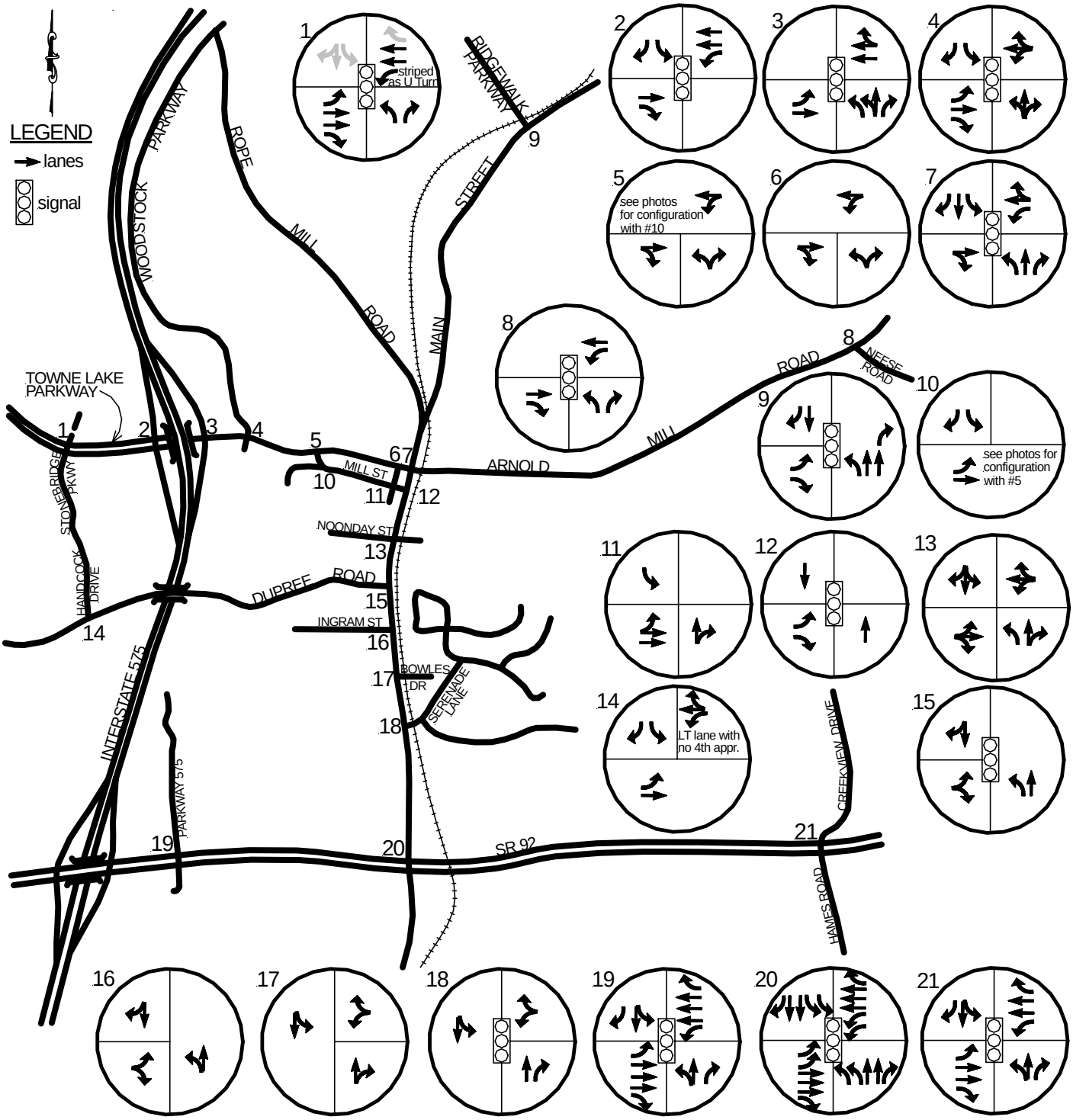


Figure 7 – Existing Lanes

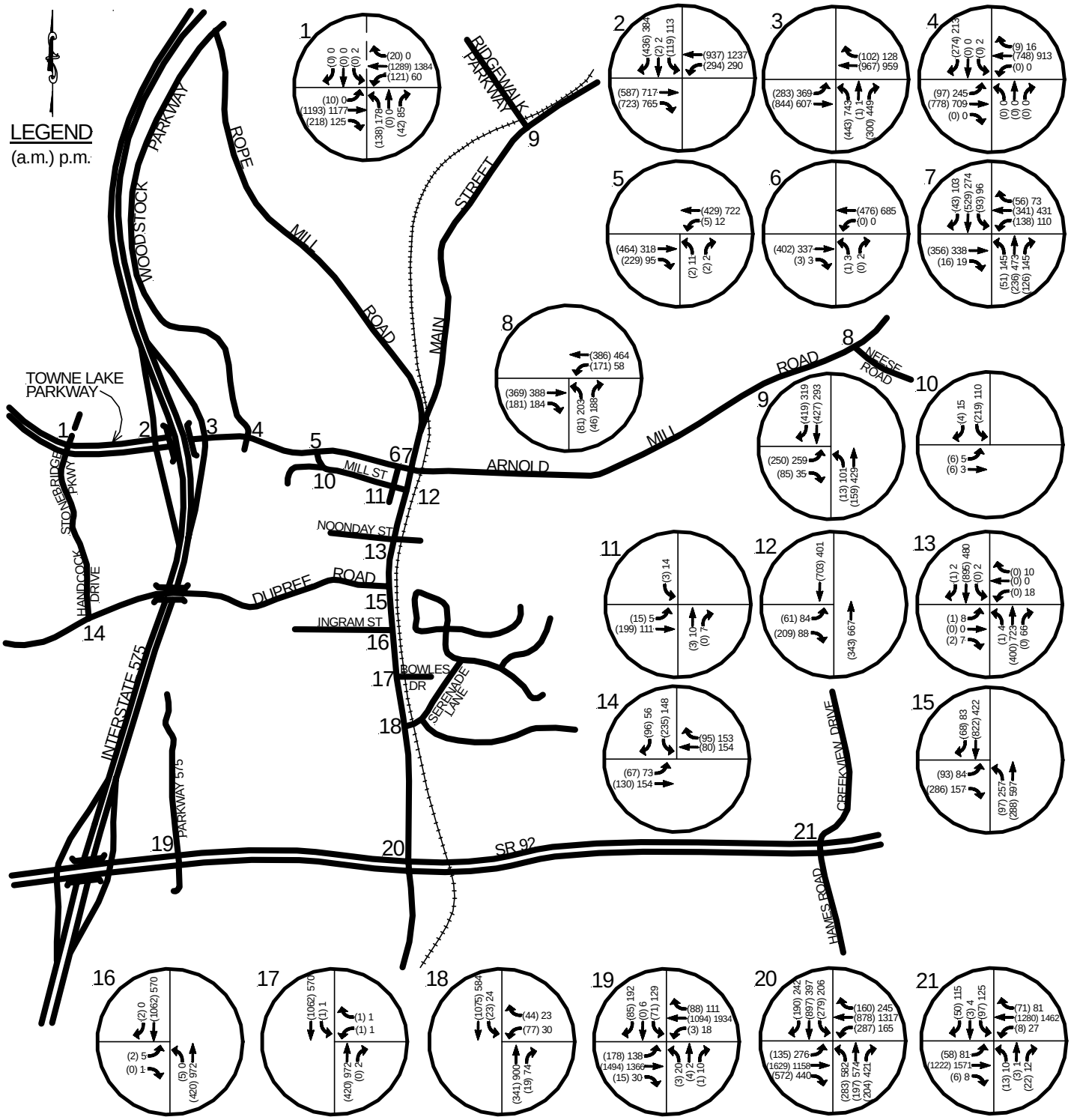


Figure 8 – Existing A.M. and P.M. Peak Hour Traffic Volumes

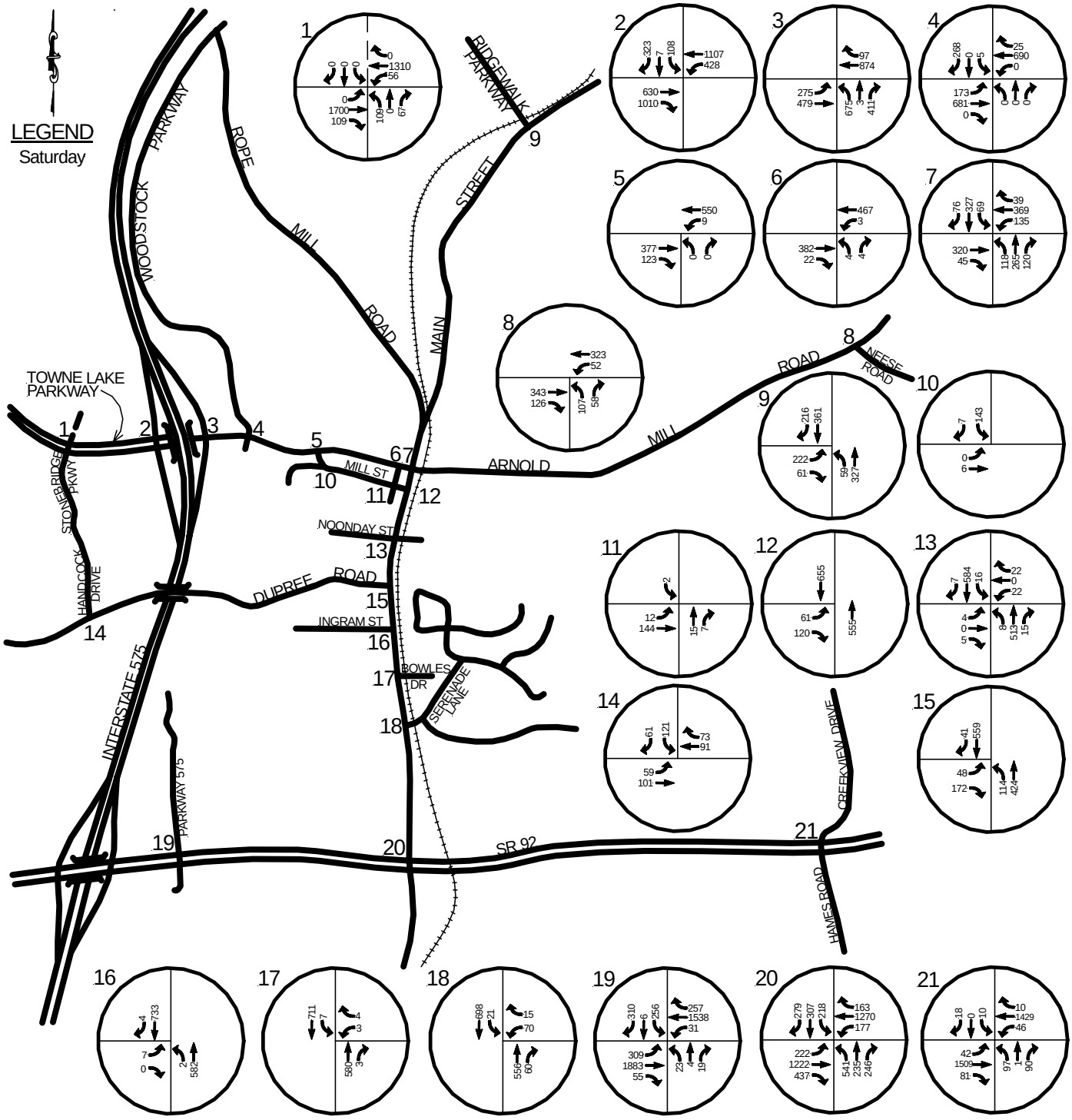


Figure 9 – Existing Saturday Peak Hour Traffic Volumes

EXISTING OPERATING CONDITIONS

Analyses were performed for each study intersection, based on the existing traffic volumes, lane configurations, and method of traffic control (lanes and method of control shown previously in Figure 7). The results of the analyses are shown in Table 10. The Synchro computer printouts, which provide detailed analysis information, are included in Appendix E.

Table 10 – Existing Intersection Levels of Service

Intersection	A.M. Peak Hour	P.M. Peak Hour	Sat. Peak Hour
1) Towne Lake Pkwy and Stonebridge Pkwy	B	B	B
2) Towne Lake Pkwy at I-575 SB ramp	B	B	B
3) Towne Lake Pkwy at I-575 NB ramp	B	C	B
4) Towne Lake Pkwy at Woodstock Pkwy	C	C	B
5) Towne Lake Pkwy at Mill St	A	B	A
northbound approach	c	d	c
westbound left turn	a	a	a
6) Towne Lake Pkwy at Wall St	A	A	A
northbound approach	c	c	b
7) Towne Lake Pkwy /Arnold Mill Rd at Main St	C	B	B
8) Arnold Mill Rd and Neese Rd	B	B	B
9) Main St at Ridgewalk Pkwy	B	B	A
10) Mill St at Pinehill Dr	A	A	A
eastbound left turn from Pinehill Dr	b	a	a
11) Mill St at Wall St	A	A	A
northbound approach	b	a	a
southbound left turn	b	a	a
12) Main St at Mill St	A	A	A
13) Main St at Noonday St	B	A	A
northbound left turn	b	a	a
southbound left turn	a	a	a
eastbound approach	d	d	c
westbound approach	a	**f**	d
14) Dupree Rd and Handcock Dr	A	A	A
southbound left turn	c	c	b
southbound right turn	b	b	a
eastbound left turn	a	a	a
15) Main St at Dupree Rd	C	B	A
16) Main St at Ingram St	C	B	A
northbound left turn	a	a	a
eastbound approach	**e**	**f**	**e**
17) Main St at Bowles Dr	C	B	A
southbound left turn	a	a	a
westbound approach	d	**f**	c
18) Main St at Serenade Ln	A	A	A
19) SR 92 at Pkwy 575	A	B	B
20) SR 92 at Main St	D	C	C
21) SR 92 at Creekview Dr / Hames Rd	B	B	B

note: capital letters denote intersection LOS, lowercase letters denote approach or movement LOS

EXISTING FACILITIES NEEDS ANALYSIS

The following locations do not meet the LOS D standard in the existing condition:

13) Main Street at Noonday Street westbound approach – p.m. (F)
16) Main Street at Ingram Street eastbound approach – a.m. (E), p.m. (F), Sat. (E)
17) Main Street at Bowles Drive westbound approach – p.m. (F)

City of Woodstock officials have indicated that the signalization of Main Street at Noonday Street is imminent. Therefore, that improvement was added in the existing facilities needs analysis. The existing condition was re-evaluated at this intersection, with signalization in place. The intersection will operate at LOS A in all time periods once the signal is operational. The no-build and build analyses will assume that this signal has been installed.

The side street approaches of both Ingram Street and Bowles Drive operate at poor levels of service. However, this is not unusual on minor approaches at a major thoroughfare such as Main Street. The volumes on these side streets are negligible (On Ingram the eastbound approach volume is 2, 6, and 7 in the a.m., p.m., and Saturday peak hours, respectively. On Bowles, the westbound approach volumes are 2, 2, and 7). In order to improve the side street levels of service, signalization of these intersections would be necessary. However, based on the minimal volumes, these signalizations would not be warranted and are not recommended at this time.

A few other improvements were identified for the existing condition, even though they are not required to meet the LOS D standard. These improvements are as follows:

1) Towne Lake Parkway at Stonebridge Parkway – the westbound exclusive left turn lane on Towne Lake Parkway is striped as a U-Turn Lane. This may be intentional to reinforce that U-Turns are permitted, or it may be a remnant of conditions before Stonebridge Parkway was constructed. It is recommended that this striping be converted to standard left turn arrows. The crosswalk across Stonebridge Parkway is very unusual and requires pedestrians to walk perilously close to the travel lanes on Towne Lake Parkway. There are no crosswalks or pedestrian signal heads to cross Towne Lake Parkway. It is recommended that, in conjunction with the arrival of the new development currently under construction on the north side of Towne Lake Parkway, this intersection be brought up to standards with pedestrian facilities, specifically crosswalks and pedestrian signal heads on all approaches.

2 and 3) Towne Lake Parkway at the I-575 southbound and northbound ramps – the crosswalks are faded in several locations and should be refreshed once the current lane construction project is completed.

5) and 10) The two adjacent intersections of Towne Lake Parkway at Mill Street and Mill Street at Pinehill Drive have a very unorthodox design. Since volumes are minimal on Pinehill Drive, the intersection pair operates acceptably. However, as volumes build, improvements may be desirable. At a minimum, the striping can be improved to clarify the path for the heavy flow of the eastbound right turn from Towne Lake Parkway to eastbound Mill Street. Consideration might be given to designing Mill Street as the major thoroughfare, with Pinehill Drive as a more traditional T-intersection, with stop sign control. At the time of this study, the City of Woodstock was considering redesign options at the Towne Lake Parkway / Mill Street intersection, including the possibility of a roundabout. However, no funding had been established for this project and so, according to GRTA standards, it was not included in this analysis.

Wall Street operates more as an alley than a thoroughfare. Observations reveal truck delivery operations and parking activity, but minimal through traffic. The section south of Mill Street is one-way northbound, possibly to eliminate cut-through activity. Depending on the desires of the City and the adjacent property owners, this street can continue to be treated as an alley, it can be improved to look and feel more like a city street, or it can be converted into a service drive and parking area, with no through traffic allowed. Once the proposed Woodstock West DRI is developed, volumes in the area will increase, but, parallel, new, north/south streets, to the west will minimize the need for Wall Street to function as a public thoroughfare. Due to the proximity of this street to Main Street, the elimination of the intersections of Wall Street at Towne Lake Parkway and at Mill Street could be beneficial for both a safety and operations standpoint.

As volumes continue to increase on Main Street, the angled parking on Main Street just north of Arnold Mill Road, which requires vehicles to back into the through lane of traffic, will become less desirable. Also, the frequency of train traffic was not observed, but, if the rails are operational it is recommended that crossing gates be installed at the railroad crossing of Main Street at Rope Mill Road.

9) On northbound Main Street at Ridgewalk Parkway, a second northbound through lane begins, just south of the intersection. However, once through the intersection, this lane feeds directly into an exclusive right turn lane. Because the northbound approach is on an uphill grade, this may not be apparent to motorists who are not familiar with the intersection. It is suggested that either right turn arrows be added to the northbound rightmost lane in advance of the signal, or the lane be hatched out so that it still can be used by right turning vehicles, but other motorists won't be confused into erroneously entering that lane.

13) The northern of the two westbound approaches of Fowler Street, crossing the railroad tracks at Noonday Street should be closed off, so that there is one street that aligns with Noonday Street. This four leg intersection is that which should be signalized.

14) The westbound approach of Dupree Road at Handcock Drive includes an exclusive left turn lane that serves nothing. This does not appear to be a problem, and the lane should be preserved to serve a future fourth leg. However, consideration could be given to hatching out the lane until it is functional.

15) While the LOS D standard is meet at the Main Street / Dupree Road intersection, there would be a benefit to adding an eastbound left turn lane on Dupree. The striping of the northbound left turn lane on Main Street need to be refreshed.

18) The southbound approach of Main Street at Serenade Lane has a protected / permitted left turn phase, but no exclusive left turn lane. This phasing is presumably operating in conjunction with the railroad crossing gates immediately to the east on Serenade Lane. While not critical, since the southbound left turn volumes are moderate, but there would be some benefit to adding a southbound exclusive left turn lane on Main Street at Serenade.

19) The southbound approach of Parkway 575 at SR 92 should have its striping refreshed. An additional set of directional arrows, closer to the intersection would be desirable.

21) The side street approaches of Creekview Drive and Hames Road at SR 92 could be clearly striped with separate left/through and right turn lanes.

NO-BUILD TRAFFIC ANALYSIS

A base, or no-build analysis condition was developed for the DRIs' build-out year of 2011. This analysis provides a reference by which to measure the traffic impact of the proposed DRIs. The no-build infrastructure assumes the signal at Main Street / Noonday Street will be installed. Because the roadway improvements programmed for Towne Lake Parkway at I-575 are already well under construction, the no-build analysis assumes that these lanes will also be in place by 2011. These improvements include the addition of storage capacity to the eastbound and westbound left turns at both the northbound and southbound on-ramps. In addition, a second eastbound through lane is being added to improve capacity under the I-575 overpass.

NO-BUILD TRAFFIC VOLUMES

This condition includes background increases in traffic volumes that will occur whether or not the two subject DRIs are built. A general background growth factor of 1% per year was applied to all locations except along SR 92, to which an annual factor of 2.5% was applied. Over the build-out period, this equates to 5.1% and 13.1% respectively. In addition, due to their proximity to this study area, two specific developments that are currently under construction, were factored into the analysis. These developments are the Hedgewood multi-use project on the east side of the railroad tracks in downtown Woodstock, and the Madison Realty multi-use project being built on the north leg of Stonebridge Parkway at Towne Lake Parkway.

The traffic volumes from the Hedgewood development were developed from projections made in a traffic impact study for that project by Jordan Jones & Goulding in June 2004. Trip projections for the Madison Realty development were calculated based on site data provided by the City of Woodstock. The specific trips that were added for each of these projects are shown in the traffic volume worksheets in Appendix D.

The 2011 no-build volumes are presented in Figure 10 for the weekday a.m. and p.m. peak hours, and in Figure 11 for the Saturday peak hour.

NO-BUILD OPERATING CONDITIONS

Each study intersection was evaluated for the 2011 no-build condition. The no-build levels of service at each intersection are shown in Table 11. The Synchro computer printouts are included in Appendix F. In reviewing the field conditions and the traffic counts, it was noted that Wall Street is, effectively, an alley. This was discussed previously in the Existing Facilities Needs Analysis section. The intersections of Wall Street at Towne Lake Parkway and at Mill Street have minimal side street traffic, and no additional traffic is projected on Wall Street due to the other developments under construction, or the two proposed DRIs. It was decided that detailed analysis of these two intersections through the no-build and build conditions would have limited value. Therefore, in the no-build condition, these two intersections are eliminated. However, in the build condition, several new intersections on Towne Lake Parkway and Mill Street, as well as others, which are of greater significance to this analysis, are included for evaluation. This is discussed further in the Build Traffic Analysis section.

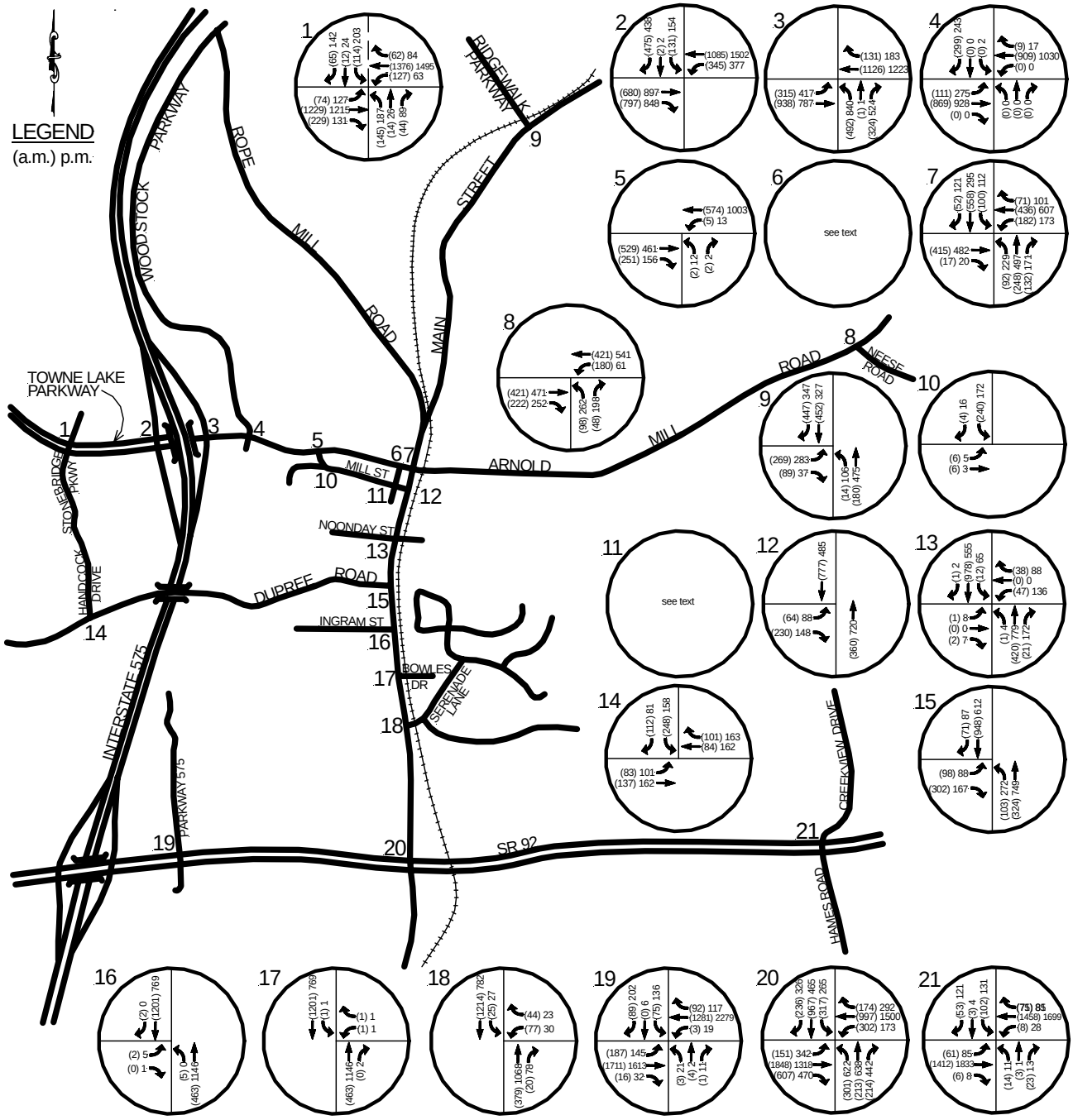


Figure 10 – No Build A.M. and P.M. Peak Hour Traffic Volumes

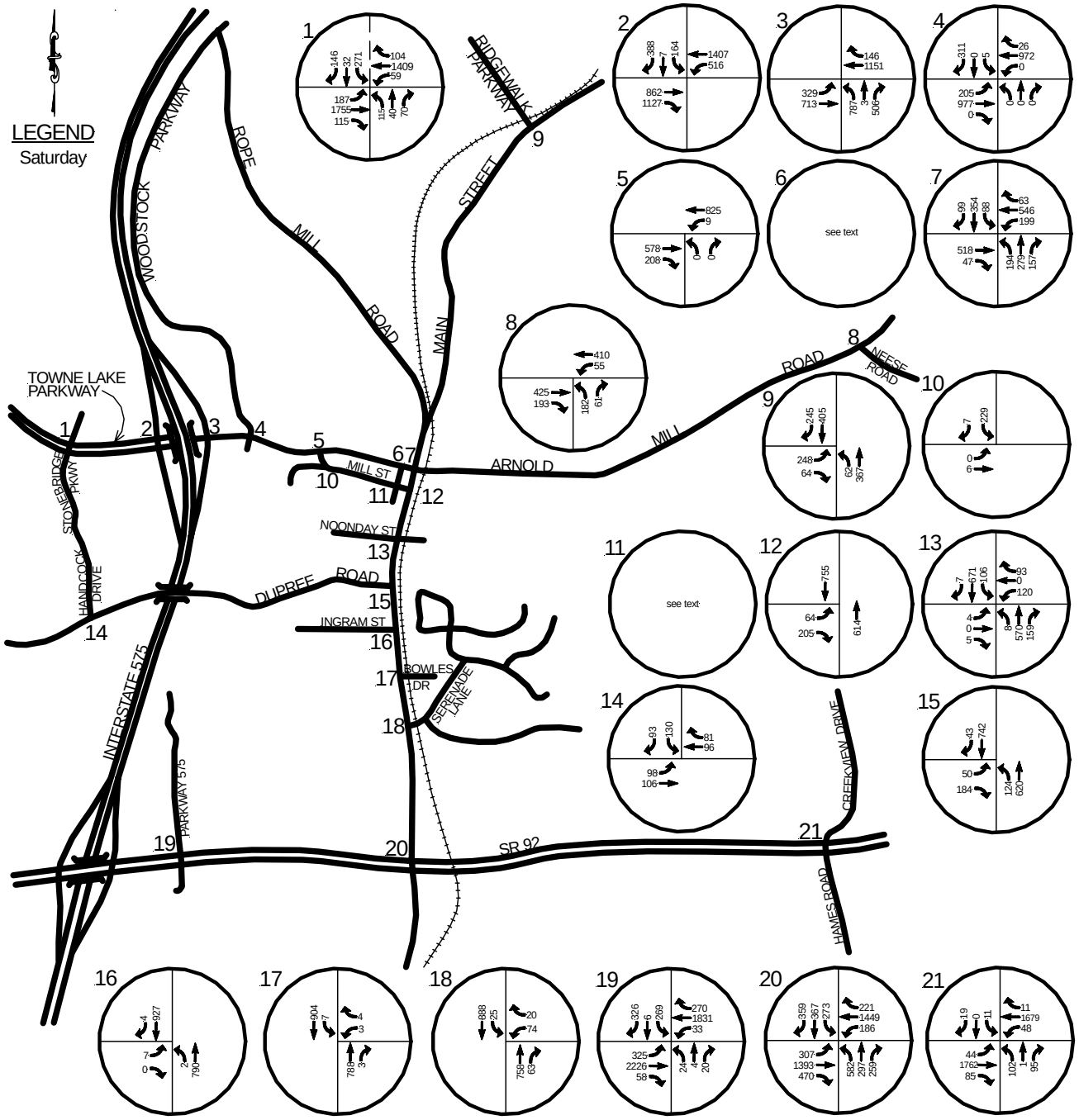


Figure 11 – No Build Saturday Peak Hour Traffic Volumes

Table 11 – No-Build Intersection Levels of Service

Intersection	A.M. Peak Hour	P.M. Peak Hour	Sat. Peak Hour
1) Towne Lake Pkwy and Stonebridge Pkwy	B	C	D
2) Towne Lake Pkwy at I-575 SB ramp	B	B	B
3) Towne Lake Pkwy at I-575 NB ramp	C	C	C
4) Towne Lake Pkwy at Woodstock Pkwy	C	D	C
5) Towne Lake Pkwy at Mill St	A	D	A
northbound approach	d	**f**	**f**
westbound left turn	a	a	a
7) Towne Lake Pkwy /Arnold Mill Rd at Main St	C	C	D
8) Arnold Mill Rd and Neese Rd	B	B	B
9) Main St at Ridgewalk Pkwy	B	B	B
10) Mill St at Pinehill Dr	A	A	A
eastbound left turn from Pinehill Dr	b	a	a
12) Main St at Mill St	A	A	B
13) Main St at Noonday St	A	B	B
14) Dupree Rd and Handcock Dr	A	A	A
southbound left turn	c	d	c
southbound right turn	b	b	a
eastbound left turn	a	a	a
15) Main St at Dupree Rd	C	B	B
16) Main St at Ingram St	D	C	B
northbound left turn	a	a	a
eastbound approach	**f**	**f**	**f**
17) Main St at Bowles Dr	D	C	B
southbound left turn	a	a	a
westbound approach	d	**f**	**f**
18) Main St at Serenade Ln	B	A	A
19) SR 92 at Pkwy 575	B	B	B
20) SR 92 at Main St	**E**	D	D
21) SR 92 at Creekview Dr / Hames Rd	B	B	B

notes: capital letters denote intersection LOS, lowercase letters denote approach or movement LOS
see text for explanation of missing intersections 6 and 11

NO-BUILD FACILITIES NEEDS ANALYSIS

In general, there are a few deteriorations in LOS between the existing and no-build conditions. However, most intersections will continue to operate acceptably. The locations that will not meet the LOS D standard are as follows:

5) Towne Lake Parkway at Mill Street northbound approach – p.m. (F)
16) Main Street at Ingram Street eastbound approach – a.m. (F), p.m. (F), Saturday (F)
17) Main Street at Bowles Drive westbound approach – p.m. (F), Saturday (F)
20) SR 92 at Main Street – a.m. (E)

5) The northbound approach of Mill Street at Towne Lake Parkway operates at LOS F in the p.m. and Saturday peaks. This is not unusual on a minor side street approach at a busy thoroughfare such as Towne Lake Parkway. In order to eliminate the LOS F, signalization would be required. However, since the northbound approach volumes are minimal (4 in the a.m., 13 in the p.m., and 0 on Saturday), this signalization would not be warranted and is not recommended. As noted previously, at the time of this study, the City of Woodstock was considering redesign options at the Towne Lake Parkway / Mill Street intersection, including the possibility of a roundabout. However, no funding had been established for this project and so, according to GRTA standards, it was not included in this analysis.

16) and 17) As with the existing condition, the stop sign controlled side street approaches on Ingram Street and Bowles Drive will not meet the LOS D standard unless the intersections are signalized. Due to minimal side street volumes, no signalization is recommended at this time.

20) In the a.m. peak hour the massive intersection of SR 92 at Main Street will operate at LOS E. The size of this intersection is already at a maximum with dual exclusive left turn lanes and single exclusive right turn lanes on all approaches. There are three through lanes in each direction on SR 92 and two through lanes in each direction on Main Street. The addition of a second exclusive right turn lane and a right turn overlap phase on both the eastbound and northbound approaches will have some benefit, but will not eliminate the a.m. LOS E. Widening of SR 92 to eight through lanes would be a potential solution, but is not likely to be considered feasible in the near term, especially since SR 92 was recently improved through this corridor. Since the intersection is not failing (LOS F) in the a.m. and is at LOS D in the other peak periods, it is suggested that this LOS E is not unreasonable and should be considered acceptable.

Based on the discussion above, no mitigation is recommended for the no-build condition.

BUILD TRAFFIC ANALYSIS

The analysis of the 2011 build scenario identifies the traffic impacts of the two proposed Woodstock DRIs. A 2011 build analysis condition was developed for the Woodstock DRIs build-out year of 2011. This future condition includes all traffic from the 2011 no-build scenario, plus the specific traffic that will be added by the two proposed DRIs.

As noted in the no-build section, the two Wall Street intersections evaluated in the existing condition, were eliminated from future analysis, as Wall Street operates as a low-volume alley. However, several new intersections were added to the build analysis since they provide direct access to the two proposed DRIs from the street network. Typically, in a DRI Transportation Analysis, a separate chapter is devoted to an analysis of site accesses. However, in this case, the DRIs, and especially Woodstock West, will be incorporated into the existing grid of streets. Therefore, future accesses for each project out to major streets will occur either at existing intersections, or at new intersections that will be created by the construction of new streets. Table 12 lists the new intersections, or new approaches to existing intersections, that will be added to the study network in the future condition in order to evaluate access for the two DRIs. For reference, the numbering continues from the list of counted intersections.

Table 12 – New Intersections or Approaches Which Will Provide Access to the DRIs

New Intersection or Approach	Comments
22) Towne Lake Parkway at Street A	new intersection created by the construction of Street A; provides access for Woodstock West to Towne Lake Parkway
23) Towne Lake Parkway at Street B	new intersection created by the construction of Street B; provides access for Woodstock West to Towne Lake Parkway
24) Mill Street at Street A	new intersection created by the construction of Street A; provides access for Woodstock West to Mill Street
25) Mill Street at Street B	new intersection created by the construction of Street B; provides access for Woodstock West to Mill Street
26) Main Street at Elm Street	existing intersection which will provide access for Woodstock West to Main Street
27) Main Street at Oak Street	existing intersection which will provide access for Woodstock West to Main Street
28) Main Street at Drive A	new intersection which will provide direct access for Woodstock West to Main Street
29) Dupree Road at Street B	new intersection which will provide access for Woodstock West to Dupree Road
16) Main Street at Ingram Street	Breezy Hill will have a connection at the western terminus of Ingram Street
17) Main Street at Bowles Drive / Breezy Hill Road J	Breezy Hill will add a 4th approach to this existing intersection
30) Main Street at Breezy Hill Road B	new intersection to provide access for Breezy Hill to Main Street
18) Main Street at Serenade Lane / Breezy Hill Road A	Breezy Hill will add 4th approach to this existing signalized intersection

The 2011 build volumes are depicted at each intersection in Figure 12 for the a.m. and p.m. peak hours and Figure 13 for the Saturday peak hour. The spreadsheets showing the components of all intersection volumes, by movement, are located in Appendix D.

BUILD OPERATING CONDITIONS

The build levels of service at each intersection are shown in Table 13. The Synchro computer printouts are included Appendix G. A discussion of future lane configurations and control is provided later in this report.

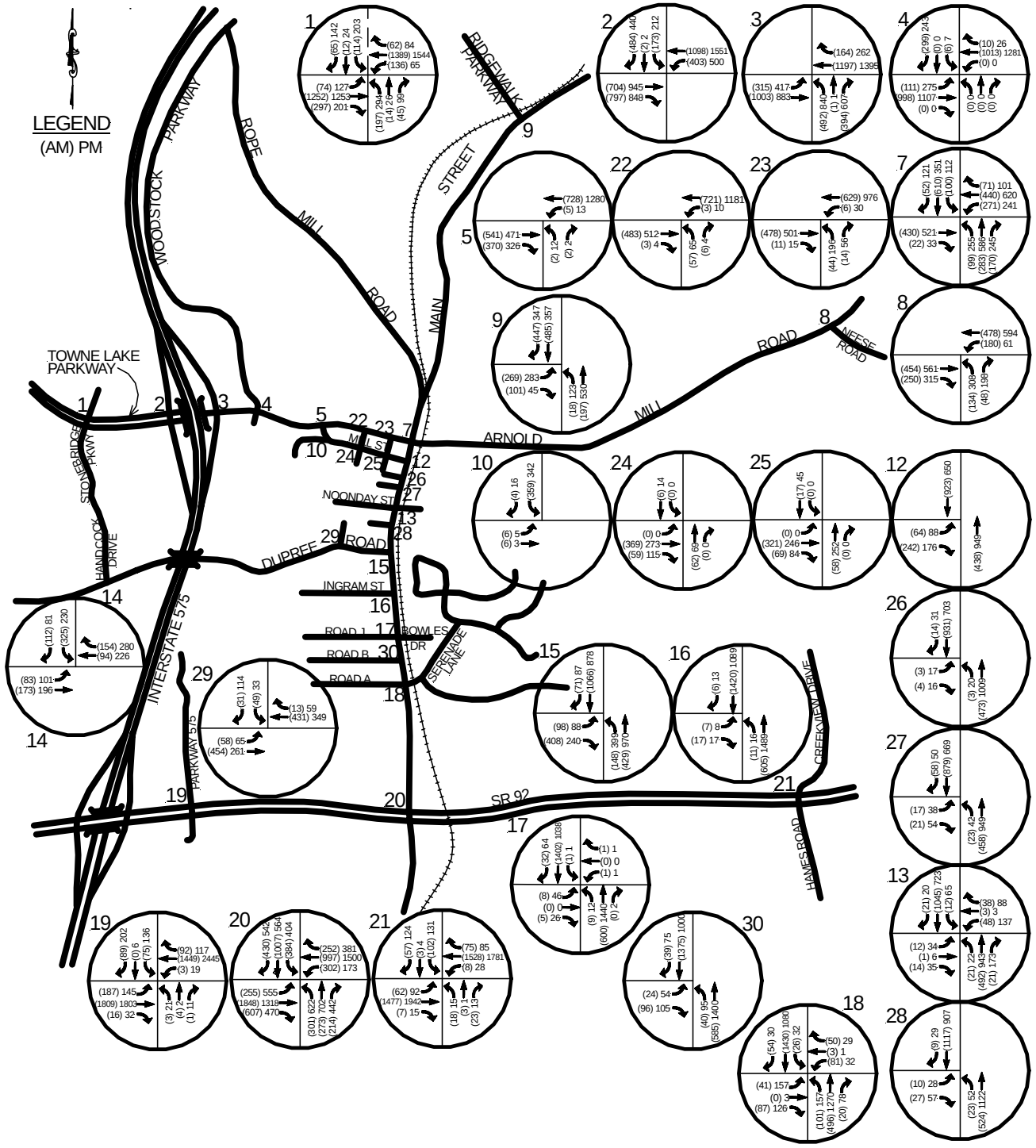


Figure 12 – Build A.M. and P.M. Peak Hour Traffic Volumes

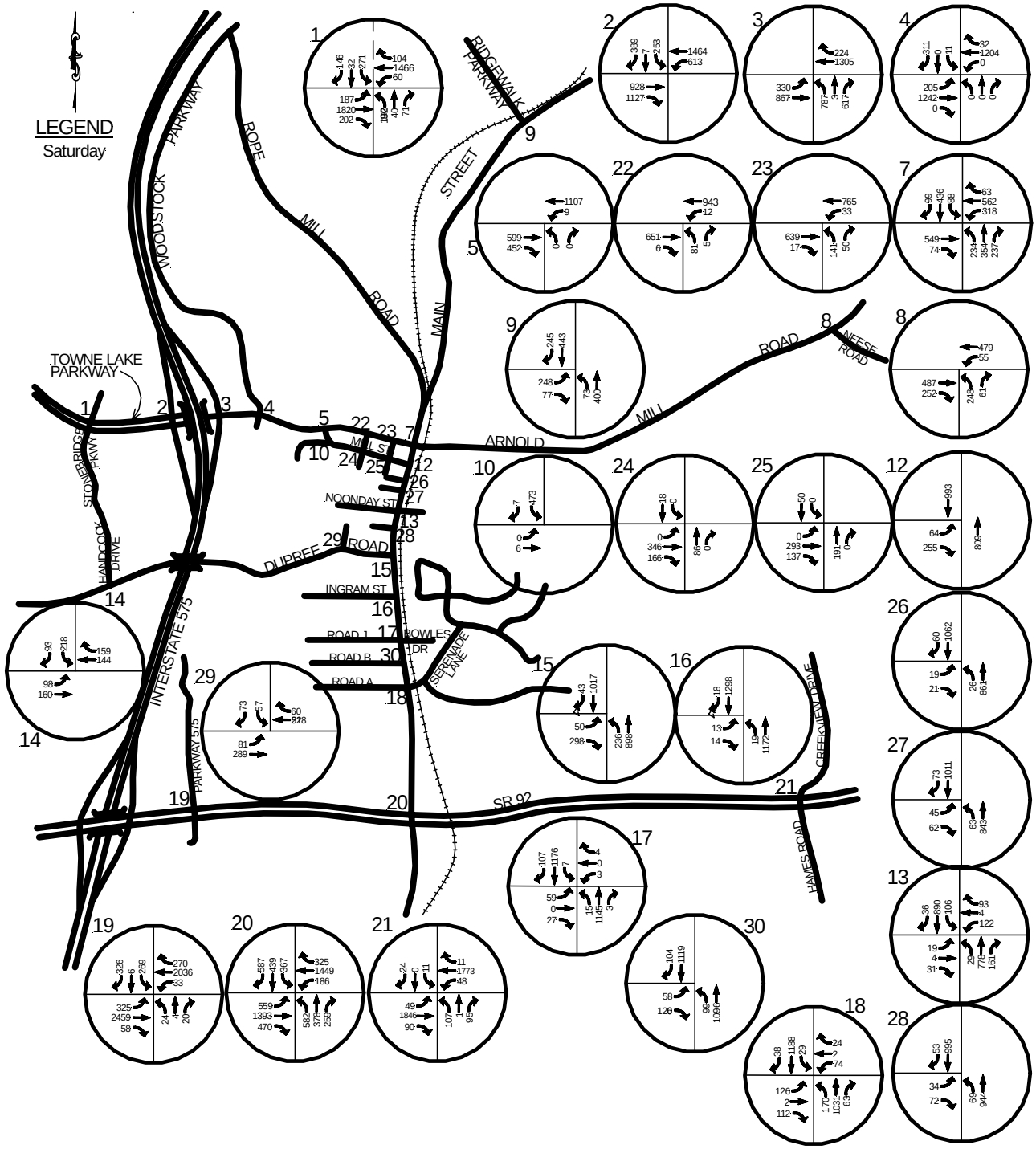


Figure 13 – Build Saturday Peak Hour Traffic Volumes

Table 13 – Build Intersection Levels of Service

Intersection	A.M. Peak Hour	P.M. Peak Hour	Sat. Peak Hour
1) Towne Lake Pkwy and Stonebridge Pkwy	C	D	**E**
2) Towne Lake Pkwy at I-575 SB ramp	B	B	B
3) Towne Lake Pkwy at I-575 NB ramp	C	D	D
4) Towne Lake Pkwy at Woodstock Pkwy	**E**	**E**	D
5) Towne Lake Pkwy at Mill St	B	**E**	D
northbound approach	**f**	**f**	**f**
westbound left turn	a	a	b
22) Towne Lake Parkway at Street A	A	D	C
northbound left turn	**f**	**f**	**f**
northbound right turn	b	b	b
westbound left turn	a	a	a
23) Towne Lake Parkway at Street B	a	**F**	D
northbound left turn	**e**	**f**	**f**
northbound right turn	b	b	b
westbound left turn	a	a	a
7) Towne Lake Pkwy /Arnold Mill Rd at Main St	D	D	**E**
8) Arnold Mill Rd and Neese Rd	B	B	B
9) Main St at Ridgewalk Pkwy	B	B	B
10) Mill St at Pinehill Dr	A	A	A
eastbound left turn from Pinehill Dr	b	b	b
24) Mill Street at Street A	A	A	A
northbound approach	b	b	b
southbound approach	b	b	b
25) Mill Street at Street B	A	A	A
northbound approach	b	c	c
southbound approach	b	b	b
12) Main St at Mill St	B	A	B
26) Main Street at Elm Street	B	B	C
northbound left turn	b	a	c
eastbound approach	d	**f**	**f**
27) Main Street at Oak Street	B	B	C
northbound left turn	b	b	c
eastbound left turn	**e**	**f**	**f**
eastbound right turn	c	c	**e**
13) Main St at Noonday St	A	**E**	**E**
28) Main Street at Drive A	C	C	C
northbound left turn	**f**	b	**e**
eastbound left turn	**f**	**f**	**f**
eastbound right turn	**f**	d	**f**
14) Dupree Rd and Handcock Dr	A	B	A
southbound left turn	**f**	**f**	d
southbound right turn	b	b	b
eastbound left turn	a	a	a
29) Dupree Road at Street B	A	A	A
southbound left turn	d	c	c
southbound right turn	b	b	b
eastbound left turn	a	a	a
15) Main St at Dupree Rd	**E**	D	C

16) Main St at Ingram St (Breezy Hill Access)	**E**	**G**	**E**
northbound left turn	a	a	a
eastbound approach	**f**	**f**	**f**
17) Main St at Bowles Dr / Breezy Hill Road J	**E**	**F**	D
northbound left turn	b	b	b
southbound left turn	a	**f**	d
eastbound left turn	**f**	**f**	**f**
eastbound right turn	d	c	d
westbound approach	**f**	**f**	**f**
30) Main Street at Breezy Hill Road B	**E**	**E**	D
northbound left turn	b	b	b
eastbound left turn	**f**	**f**	**f**
eastbound right turn	**f**	d	**e**
18) Main St at Serenade Ln / Breezy Hill Road A	**E**	**E**	**E**
19) SR 92 at Pkwy 575	B	B	C
20) SR 92 at Main St	**E**	**E**	**E**
21) SR 92 at Creekview Dr / Hames Rd	B	C	B

notes: capital letters denote intersection LOS, lowercase letters denote approach or movement LOS
see text for explanation of missing intersections 6 and 11
see Table 11 for description of new intersections and approaches

BUILD FACILITIES NEEDS ANALYSIS

With the addition of the traffic generated by Woodstock West and Breezy Hill, there will be deteriorations in levels of service at most study intersections. Many of the failing levels of service are on side street stop sign controlled approaches at major thoroughfares such as Main Street and Towne Lake Parkway, which is not unusual. The locations that will not meet the LOS D standard are as follows:

1) Towne Lake Parkway at Stonebridge Parkway – Saturday (E)
4) Towne Lake Parkway at Woodstock Parkway – a.m. (E), p.m. (E)
5) Towne Lake Parkway at Mill Street overall intersection p.m. (E); northbound approach - a.m. (F), p.m. (F), Saturday (F)
22) Towne Lake Parkway at Street A northbound left turn – a.m. (F), p.m. (F), Saturday (F)
23) Towne Lake Parkway at Street B northbound left turn – a.m. (E), p.m. (F), Saturday (F)
7) Towne Lake Parkway at Main Street – Saturday (E)
26) Main Street at Elm Street eastbound approach – p.m. (F), Saturday (F)
27) Main Street at Oak Street eastbound left turn – a.m. (E), p.m. (F), Saturday (F)
13) Main Street at Noonday Street – p.m. (E), Saturday (E)
28) Main Street at Drive A northbound left turn a.m. (F), Saturday (E); eastbound left turn – a.m. (F), p.m. (F), Saturday (F); eastbound right turn – a.m. (F), Saturday (F)
14) Dupree Road at Handcock Drive southbound left turn – a.m. (F), p.m. (F)
15) Main Street at Dupree Road – a.m. (E)
16) Main Street at Ingram Street overall intersection – a.m. (E), p.m. (G), Saturday (E); eastbound approach – a.m. (F), p.m.(F), Saturday (F)

17) Main Street at Bowles Drive overall intersection – a.m. (E), p.m. (F); southbound left turn – p.m. (F); eastbound left turn – a.m. (F), p.m. (F), Saturday (F); westbound approach – a.m. (F), p.m. (F), Saturday (F)
30) Main Street at Breezy Hill Road B overall intersection – a.m. (E), p.m. (E); eastbound left turn – a.m. (F), p.m. (F), Saturday (F); eastbound right turn – a.m. (F), Saturday (F)
18) Main Street at Serenade Lane – a.m. (E), p.m. (E), Saturday (E)
20) SR 92 and Main Street – a.m. (E), p.m. (E), Saturday (E)

The following is a discussion of each location listed above.

1) At the intersection of Towne Lake Parkway at Stonebridge Parkway, the Saturday peak hour LOS will become LOS E. At this time, although this is technically below the LOS D standard, no changes are recommended. The north leg is currently under construction in conjunction with a new multi-use development and is not operational at this time. Rather than developing recommendations for modifications to an intersection that is currently being improved, it is suggested that the construction and new development be completed, then monitored by the City to ensure that acceptable operations are maintained as volumes increase.

4) At the Towne Lake Parkway / Woodstock Parkway intersection, the southbound left and through volumes from Woodstock Parkway are minimal, but the right turn volumes are substantial. Consideration should be given to widening Towne Lake Parkway to two westbound travel lanes from Woodstock Parkway, west. This would provide two westbound receiving lanes for dual right turns from Woodstock Parkway. The second lane on the southbound approach could be striped to allow lefts, through, and rights, and the curb lane would be, as today, an exclusive right turn lane. This would give the right turns substantially increased capacity.

5) The northbound approach of Mill Street at Towne Lake Parkway will experience high delays without signalization. However, the volumes making this movement are minimal, so, it is unlikely that signalization would be warranted. However, it is recommended that an eastbound exclusive right turn lane be added on Towne Lake Parkway at Mill Street. It is recognized that there are topographic constraints at this location. This could potential be done in conjunction with a reconfiguration of the segment of Mill Street between Towne Lake Parkway and Pinehill Drive, so that Mill Street becomes a more typically designed thoroughfare, and Pinehill Drive becomes a side street. In addition, while it may inconvenience some residents on Pinehill Drive, it is suggested that westbound left turns be prohibited from Towne Lake Parkway at Mill Street, so as to minimize impedance to westbound through traffic. As noted previously, at the time of this study, the City of Woodstock was considering redesign options at the Towne Lake Parkway / Mill Street intersection, including the possibility of a roundabout. However, no funding had been established for this project and so, according to GRTA standards, it was not included in this analysis.

22) and 23) The side street approaches from Street A and Street B will incur notable delays at Towne Lake Parkway. Signalization will be required to make these delays acceptable. However, signalization

of both intersections may not be desirable. It is recommended that a warrant analysis be performed, considering both intersections, to determine which, if either, should be signalized. Street B will provide a connection through Woodstock West to Dupree Road, and will have the higher volume of project traffic, and so is considered the more likely candidate for a signal. Any signal should be interconnected and coordinated with the signal at Main Street / Towne Lake Parkway. The analysis of these two intersections assumed that no exclusive left or right turn lanes would be added to Towne Lake Parkway, due to right of way, existing development, and topography constraints. Much of the eastbound right turn traffic to Woodstock West will use Mill Street and much of the westbound left turns will be intercepted at Main Street. However, it would be desirable for left and right turn lanes to be constructed on Towne Lake Parkway at both Street A and Street B. Should left turn lanes not be feasible at either location, consideration should be given to prohibiting that westbound left turn movement at that location. The northbound approach of both Street A and Street B should include separate left and right turn lanes.

7) The intersection of Towne Lake Parkway at Main Street is constrained by existing buildings and the proximity to the railroad crossing. One potential improvement would be to widen the eastbound approach of Towne Lake Parkway right at the intersection to provide a short right turn lane. The widening would occur into a small patch of grassed area, which can be seen in Photo 26, while the south side of the street would remain untouched. This would also have the benefit of slightly realigning Towne Lake Parkway to better align with the receiving approach of Arnold Mill Road. It is noted that no survey or design study was performed to assess the feasibility of this suggestion. The implementation of this change would allow this intersection to operate at LOS D in the Saturday peak.

Photograph 26 – Facing East on Towne Lake Parkway at Main Street

26) and 27) The two side streets of Elm Street and Oak Street will experience high delays. Signalization will be necessary to attain the LOS D goals on each side street. However, due to their proximity to one another, and the delays that would be introduced to Main Street, it is recommended that only one location be considered for signalization. The better candidate would be Oak Street since it will carry greater traffic, it farther from the existing signal at Mill Street, and the street can be constructed with separate eastbound left and right turn lanes, which would maximize the efficiency of a signal (Elm Street is constrained by two existing buildings which will limit the road to one eastbound and one westbound lane at Main Street). A signal needs study (warrant analysis) should be performed to determine if this signalization will be justified. Any signal should be interconnected and coordinated with adjacent signals. The eastbound approach of Oak Street should include separate left and right turn lanes. The northbound approach of Main Street has an existing left turn lane at both intersections; the striping should be refreshed at each. No southbound exclusive right turn lane was modeled at either intersection, as they would conflict with existing on-street parking. However, southbound right turn lanes would improve capacity and reduce impedance to through traffic on Main Street. The City will have to consider if elimination of the on-street parking to improve capacity on Main Street is consistent with its goals for the downtown area.

13) There are several improvements that should be made to the Main Street / Noonday Street intersection. The newly realigned east leg should have a shared left/through and exclusive right turn lane on the westbound approach. The eastbound approach should be widened to mirror that configuration. Two lanes (one per direction) will be sufficient along Noonday Street. However, the proximity of the access of Parking Deck 1 to the Main Street intersection is of concern. Consideration should be given to moving the access to the deck either west on Noonday, or to Street B, perhaps aligning with the small east-west street north of Building i. The southbound approach on Main Street should include an exclusive left turn lane which would oppose the existing northbound left turn lane. The northbound left turn lane should be extended and the striping should be refreshed. The volumes for the northbound left turn were developed when the site plan had no access to Deck 1 directly to Noonday Street, and so are very low. The volume projections at this location were not modified due to the above-mentioned concern about the connection of the deck to Noonday. However, extending the northbound left turn lane is recommended regardless of the deck access scenario, to ensure that hose left turners do not impede Main Street. It would also be very desirable to add a northbound right turn lane on Main Street. However, the proximity of the railroad tracks may prevent its construction.

28) Main Street at Drive A will operate with high delays exiting Drive A unless the intersection is signalized. However, due to the proximity of this intersection to the signal at Noonday, this signalization is not recommended at this time. It is noted that motorists using this access have several alternative routes which allow them to access Main Street at a signal. This intersection should be built with separate eastbound left and right turn lanes. A northbound left turn lane and a southbound right turn lane should be added on Main Street at this access.

14) The intersection of Dupree Road and Handcock Drive will begin to experience high delays on the southbound approach. This intersection will become a candidate for signalization as the subject DRIs

are developed. A signal needs study should be performed to determine if and when this signalization should be implemented.

15) A second eastbound lane should be added on Dupree Road at Main Street, to provide separate left and right turn lanes. If feasible, a southbound right turn lane should be added on Main Street at Dupree.

1. 16), 17), 30), and 18) These four intersections will provide access for Breezy Hill. Without signals, the stop controlled intersections will experience high delays on the side street approaches. The intersection at Serenade Lane is already signalized, and is somewhat central to the site frontage. This will likely preclude the ability to signalize Road J or Road B, and the need for a signal at Ingram Street is less critical than at Roads J and B. Due to the low through volumes expected between Serenade Lane and Road A, it is recommended that the eastbound approach be built with two lanes and striped with exclusive left and right turn lanes. Ideally, the westbound approach would have a second lane added and the left turn lanes would oppose one another. The new approach of Road A will require new signal heads to be added to the existing signal. Through movements should be prohibited, and the east and west approaches should have protected / permitted phasing. As mentioned in the existing analysis, there would be great benefit to adding a southbound left turn lane on Main Street at Serenade Lane. Roads J and B should each have two exiting lanes. Northbound left turn and southbound right turn lanes should be provided at both of these accesses. If feasible, exclusive left and right turn lanes should also be provided on Main Street at Ingram.

The north and south through volumes on Main Street are at the point where its widening to four lanes should be considered. It is recommended that any development in Breezy Hill along Main Street be such that it does not preclude the future widening of Main Street, especially in light of the constraint of the railroad tracks on the east side of the road.

20) The intersection of SR 92 at Main Street will operate at LOS E in all peak time periods in the future. However, as noted in the no-build analysis, this intersection is already massive. It is suggested that LOS E in the future build condition is not unreasonable, given the size and volumes. Improving the LOS to D or better would require major reconstruction including possibly widening SR 92 to eight through lanes. It is considered beyond the scope of this study to make definitive recommendations of such magnitude.

SUMMARY OF RECOMMENDATIONS OF BUILD FACILITIES NEEDS ANALYSIS

1. At the Towne Lake Parkway / Woodstock Parkway intersection, consider widening Towne Lake Parkway to two westbound travel lanes from Woodstock Parkway, west. The second lane on the southbound approach of Woodstock Parkway could be striped to allow lefts, through, and rights, and the curb lane would be an exclusive right turn lane.

2. Add an eastbound exclusive right turn lane on Towne Lake Parkway at Mill Street. It is noted that there are topographic constraints that may make this difficult. The new lane could potentially be built in conjunction with a reconfiguration of the segment of Mill Street between Towne Lake Parkway and Pinehill Drive, so that Mill Street becomes a more typically designed thoroughfare, and Pinehill Drive becomes a side street. It is also suggested that westbound left turns be prohibited from Towne Lake Parkway at Mill Street.

3. Signalize Towne Lake Parkway at Street B, if warranted. Add left and right turn lanes on Towne Lake Parkway at both Street A and Street B. Should left turn lanes not be feasible at either location, prohibiting the westbound left turn movement at that location. The northbound approach of both Street A and Street B should include separate left and right turn lanes.

4. Consider widening the eastbound approach of Towne Lake Parkway right at Main Street to provide a short right turn lane.

5. Perform a signal needs study on Main Street at Oak Street. The eastbound approach of Oak Street should include separate left and right turn lanes. The northbound approach of Main Street has an existing left turn lane at both Oak and Elm; the striping should be refreshed at each.

6. At Main Street / Noonday Street, the newly realigned east leg should have a shared left/through and exclusive right turn lane on the westbound approach. The eastbound approach should be widened to mirror that configuration. The southbound approach on Main Street should include an exclusive left turn lane which would oppose the existing northbound left turn lane. The northbound left turn lane should be extended and the striping should be refreshed. It would also be very desirable to add a northbound right turn lane on Main Street. However, the proximity of the railroad tracks may prevent its construction.

7. Two lanes (one per direction) will be sufficient along Noonday Street. Consider moving the access to Deck 1 to the west on Noonday Street, or to Street B.

8. Main Street at Drive A should be built with separate eastbound left and right turn lanes. A northbound left turn lane and a southbound right turn lane should be added on Main Street at this access.

9. A signal needs study should be performed to determine if and when this signalization of the intersection of Dupree Road and Handcock Drive should be implemented.

10. A second eastbound lane should be added on Dupree Road at Main Street, to provide separate left and right turn lanes. If feasible, a southbound right turn lane should be added on Main Street at Dupree.

11. The eastbound approach of Breezy Hill Road A should be built with two lanes, striped with exclusive left and right turn lanes. Ideally, the westbound approach should be configured the same way so as to allow the left turn lanes to oppose one another; through movements should be prohibited, and the east and west approaches should have protected / permitted phasing. There would be great benefit to adding a southbound left turn lane on Main Street at Serenade Lane. The new approach of Road A will require new signal heads to be added to the existing signal.

12. Breezy Hill Roads J and B should each have two exiting lanes. Northbound left turn and southbound right turn lanes should be provided at both of these accesses. If feasible, exclusive left and right turn lanes should also be provided on Main Street at Ingram.

13. Any development in Breezy Hill along Main Street be such that it does not preclude the future widening of Main Street.

Figure 14 provides a graphic depiction of the recommended improvements. Table 14 presents the operations at each intersection assuming the improvements discussed above have been implemented.

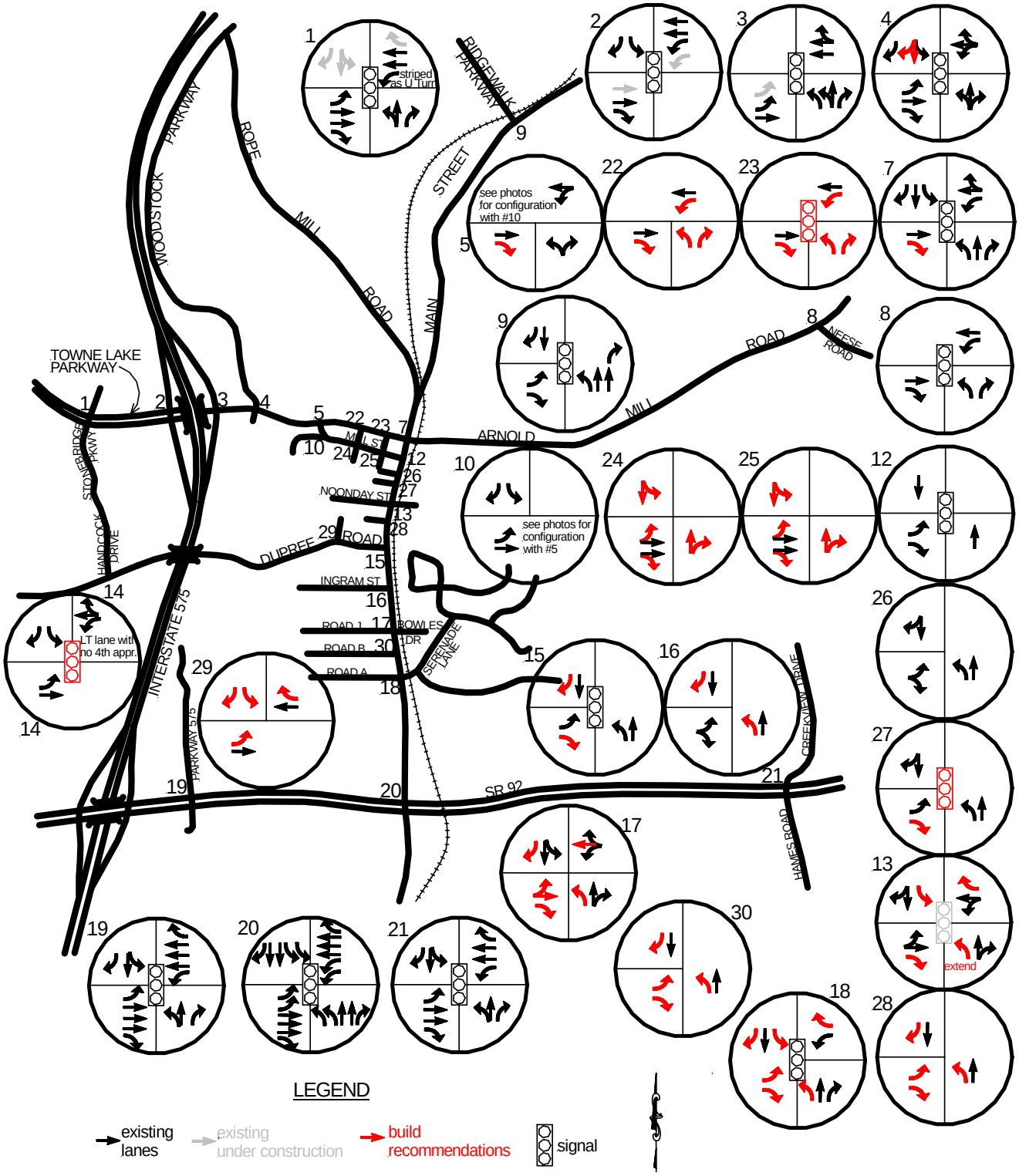


Figure 14 – Build Recommended Improvements

Table 14 – Build Intersection Levels of Service With Recommended Improvements

Intersection	A.M. Peak Hour	P.M. Peak Hour	Sat. Peak Hour
1) Towne Lake Pkwy and Stonebridge Pkwy	C	D	**E**
2) Towne Lake Pkwy at I-575 SB ramp	B	B	B
3) Towne Lake Pkwy at I-575 NB ramp	C	D	D
4) Towne Lake Pkwy at Woodstock Pkwy	D	**E**	D
5) Towne Lake Pkwy at Mill St	A	D	C
northbound approach	c	**f**	d
22) Towne Lake Parkway at Street A	A	C	B
northbound left turn	**f**	**f**	**f**
northbound right turn	b	b	b
westbound left turn	a	a	a
23) Towne Lake Parkway at Street B	A	B	B
7) Towne Lake Pkwy /Arnold Mill Rd at Main St	D	D	D
8) Arnold Mill Rd and Neese Rd	A	B	B
9) Main St at Ridgewalk Pkwy	B	B	B
10) Mill St at Pinehill Dr	A	A	A
eastbound left turn from Pinehill Dr	b	b	b
24) Mill Street at Street A	A	A	A
northbound approach	b	b	b
southbound approach	b	b	b
25) Mill Street at Street B	A	A	A
northbound approach	b	c	c
southbound approach	b	b	b
12) Main St at Mill St	A	A	B
26) Main Street at Elm Street	B	B	C
northbound left turn	b	b	c
eastbound approach	d	**f**	**f**
27) Main Street at Oak Street	A	A	A
13) Main St at Noonday St	A	A	B
28) Main Street at Drive A	C	C	C
northbound left turn	**f**	b	c
eastbound left turn	**f**	**f**	**f**
eastbound right turn	**f**	d	**f**
14) Dupree Rd and Handcock Dr	A	A	A
29) Dupree Road at Street B	A	A	A
southbound left turn	d	c	c
southbound right turn	b	b	b
eastbound left turn	a	a	a
15) Main St at Dupree Rd	D	D	C
16) Main St at Ingram St (Breezy Hill Access)	**E**	**E**	D
northbound left turn	b	b	a
eastbound approach	**f**	**f**	**f**
17) Main St at Bowles Dr / Breezy Hill Road J	**E**	**F**	D
northbound left turn	b	b	b
southbound left turn	a	**e**	d
eastbound left turn	**f**	**f**	**f**
eastbound right turn	d	c	d
westbound approach	**f**	**f**	**f**
30) Main Street at Breezy Hill Road B	**E**	**E**	D

northbound left turn	b	b	b
eastbound left turn	**f**	**f**	**f**
eastbound right turn	**f**	d	**e**
18) Main St at Serenade Ln / Breezy Hill Road A	**E**	C	C
19) SR 92 at Pkwy 575	B	B	C
20) SR 92 at Main St	D	D	**E**
21) SR 92 at Creekview Dr / Hames Rd	B	C	B

notes: capital letters denote intersection LOS, lowercase letters denote approach or movement LOS
see text for explanation of missing intersections 6 and 11
see Table 11 for description of new intersections and approaches

PLANNED / PROGRAMMED INFRASTRUCTURE IMPROVEMENTS

There are several improvements programmed in the study network, as shown in Table 14.

Table 14: Programmed Infrastructure Improvements

Project ID	Description	Sponsor	Completion Date	Included in Study
AR-917	widening of I-575 from 4 to 6 lanes from I-75 to SR 5 Bus.	GDOT	2025	No
AR-H-005	add HOV lanes on I-575 from I-75 to Sixes Road	GDOT	2015	No
CH-167	Arnold Mill Road Extension to connect Main Street near Ridgewalk Parkway to Arnold Mill Road at Neese Road, 2 lanes	Cherokee County	2020	No
CH-AR-225	I-575 at Rope Mill Connector – new interchange	GDOT	2030	No
CH-AR-259	Main Street Pedestrian Improvements (sidewalks, lighting, benches, crosswalks, bike racks) from Towne Lake Parkway to Serenade Lane	City of Woodstock	2009	Yes
CH-AR-260	I-575 at Towne Lake Parkway intersection improvements including additional EB/WB left turn storage and additional EB lane under I-575	Cherokee County	2008	Yes
CH-AR-BP010	Main Street from Woodstock Library to Cherokee south annex – adding sidewalks along one side of street to connect to downtown	City of Woodstock	2007	Yes

Note: taken from Atlanta Region Mobility2030 Transportation Plan

The intersection improvements on Towne Lake Parkway at I-575 were under construction at the time of this study. In addition, City of Woodstock officials have indicated that the intersection of Main Street at Noonday Street is programmed to be signalized in the very near future. Therefore, both of these improvements were assumed to be in place between the existing and 2011 no-build condition.

City of Woodstock officials have indicated that additional improvements are anticipated in the near future, including a new interchange with I-575 at Rope Mill Road, and an extension from the area of that interchange to Arnold Mill Road. However, GRTA requires that an improvement be funded in order to be included in the analysis, and as of the date of this report, these improvements had not received funding.

Finally, as noted previously, the City of Woodstock is considering redesign options at the Towne Lake Parkway / Mill Street intersection, including the possibility of a roundabout. However, no funding had been established for this project and so, according to GRTA standards, it was not included in this analysis.

For informational purposes, the project data sheets for the programmed improvements in Table 14, are located in Appendix I.

PEDESTRIAN AND BICYCLE ACCESS

Woodstock West is being developed with a grid of streets, with sidewalks on both sides of all streets, as feasible (there are a few locations where existing buildings are very close to the street). New sidewalks will connect to existing sidewalks, where they exist. No specific bicycle lanes are being built. However, it is recommended that bicycle racks be provided near retail and civic buildings.

Sidewalks will be provided on both side of all streets throughout the residential portions of the Breezy Hill development. Walking paths will be provided around and through greenspaces. Sidewalks will also be provided along the retail and office frontages. No bicycle lanes are planned for the Breezy Hill streets. It is recommended that bicycle racks be provided in front of the retail portions of the development.

INTERNAL CIRCULATION

The following is a brief description of vehicular circulation within each DRI.

Woodstock West

Woodstock West is being built as an extension of the existing grid pattern of streets in downtown Woodstock. This grid is well-suited to this type of development and will provide many route alternatives through the site and to the various components of the development. Parking facilities are distributed through the project, so that there will not be a concentration of entering or exiting trips at any particular point. Two new north / south streets are being constructed, with the easternmost, Street B, connecting from Towne Lake Parkway to Dupree Road. A second connection to Dupree Road, via Street D, is also a possibility. In addition to providing good circulation for the project, this connection will enhance Woodstock's street network and improve mobility for the motoring public. As noted previously, it is recommended that the access to Deck 1 on Noonday Street be relocated to the west, or to Street B, so as to minimize conflict with the intersection of Main Street at Noonday Street. This recommendation applies to the Deck 1 access on Oak Street as well. Where feasible, accesses and roadways that face across streets should align, for example at Buildings c and i.

Breezy Hill

Breezy Hill will have a central basic grid of streets, with separate sub-developments connecting to the grid. This represents a blend of traditional urban design, with components of suburban design. The blend of the two seems to fit well in this environment. The potential exists for connections, via Road C, to adjacent properties, and ultimately Dupree Road, to the north, other properties, and ultimately SR 92, to the south. The direct connection between the residential to the west and the retail to the east by means of Road B will facilitate mobility and interaction between the compatible land uses.

COMPLIANCE WITH GRTA CRITERIA

The following sections address the compliance of Woodstock West DRI #1245 and Breezy Hill DRI #1271 with the eight criteria presented in Section 3-103 of *Procedures and Principles for GRTA Development of Regional Impact Review*.

1. The proposed DRI is likely to promote improved regional mobility in terms of the quality, character, convenience, and flexibility of transportation options;

The construction of new streets in Woodstock West will enhance mobility in downtown Woodstock. Any improvements to mobility on Main Street and Towne Lake Parkway has regional mobility implications since these are major commuter routes. A similar result will be achieved should the anticipated connections be made through Breezy Hill to the north and south.

2. The proposed DRI is likely to promote improved regional mobility by reducing vehicle miles of travel;

The mix of uses in both DRIs will result in interaction between the uses, which will reduce vehicle miles when compared with similar levels of development built separately. Also, some residents of the surrounding areas may be employed at each site, which could reduce existing trips from this general area to other employment centers.

3. The proposed DRI is likely to promote improved regional mobility because it is located in an urban core, town center, an activity center previously designated by an RDC, a rail/transit station development, or is a part of a publicly sponsored redevelopment or infill initiative;

Woodstock West is located at the heart of a town center. Breezy Hill is located in close proximity to downtown Woodstock and, with anticipated connections to the north, will enhance connectivity to and from this town center.

4. The proposed DRI is located sufficiently close to existing or planned transit facilities to indicate a likelihood of significant use of transit by residents, employees, and visitors of the proposed DRI;

The site is not located in close proximity to any transit services.

5. The proposed DRI is located within an established Transportation Management Area which creates a likelihood that the proposed DRI is reasonably anticipated to result in improved regional mobility as a result of the Transportation Management Area;

These DRIs are not located in an established Transportation Management Area.

6. Offsite trip generation from the proposed DRI is reduced by at least fifteen percent (15%), or, in the event that a proposed DRI is unable to satisfy the trip reduction standard established in this subsection because of other conditions which are beyond the control of the developer or the affected local

government, the proposed DRI implements all available trip reduction techniques which are reasonably practical.

Table 8 in this report summarizes the reductions that will occur in trip generation due to the multi-use nature of these projects. Over a 24-hour period, Woodstock West will experience a 16.6% reduction in new vehicle trips due to the multi-use nature of the project. Breezy Hill will have a 13.9% reduction due to multiple uses within the development. It is noted that, in addition to these reductions, the two DRIs will have some synergy with one another. In assigning trips for each DRI, a small percentage was assigned to the other DRI. Therefore, while these trips are counted as new external trips, they will be intercepted by the other DRI and will, therefore, only represent new trips on a short segment of Main Street. Should the Breezy Hill connection to the north be made, these trips may occur almost entirely off the existing street network. The trips between the two sites, over a 24-hour period, represents approximately 196 trips shared between the sites. This is about 2% of Woodstock West's daily trips and almost 3% of Breezy Hill's daily trips. Therefore, the total reduction in new trips that will occur by the multi-use character of each DRI coupled with the interaction between the two projects, will be about 18.5% for Woodstock West and 16.5% for Breezy Hill.

7. The proposed DRI:

a. Contains a mix of uses which are reasonably anticipated to contribute to a balancing of land uses such that it would be affordable for at least ten percent (10%) of the persons who are reasonably anticipated to be employed in the proposed DRI, to be reasonably anticipated to have an opportunity to reside within the DRI; or

b. Is located in an Area of Influence where the proposed DRI is reasonably anticipated to contribute to a balancing of land uses within the Area of Influence such that twenty-five percent (25%) of the persons who are reasonably anticipated to be employed in the proposed DRI have the opportunity to live within the Area of Influence; or

c. Is located in an Area of Influence with employment opportunities which are such that at least twenty-five percent (25%) of the persons who are reasonably anticipated to live in the proposed DRI and are reasonably expected to be employed will have an opportunity to find employment appropriate to such persons' qualifications and experience within the Area of Influence.

Answer provided by Tunnell-Spangler-Walsh & Associates: Because the DRIs add more than 200 jobs to the AOI and because the analysis estimates that 45.1% of the total households working in the DRI can afford to live in the DRI, the project satisfies the requirements of a., and requires no further analysis.

8. The proposed DRI is not located in any area where the existing level of development and availability of infrastructure within the Area of Influence of the proposed DRI is such that the proposed DRI is reasonably anticipated to result in unplanned and poorly served development which would not otherwise occur until well-planned growth and development and adequate public facilities are available.

Answer provided by Tunnell-Spangler-Walsh & Associates: In 2002 the City of Woodstock embarked on an ambitious effort to thoughtfully plan for its downtown area over the next 25 years. In this year the 2002 *Woodstock Livable Centers Initiative* (LCI) was prepared via a community-based planning effort that sought to concentrate new development within the city's historic core and surrounding marginal lands. Shortly thereafter, in 2004, the city developed a plan to further refine the recommendations of the LCI study and codify them via the *Downtown Woodstock Master Plan* planning and zoning effort. The outcome of this plan was a detailed strategy for accommodating community-desire redevelopment through balanced land use and transportation planning. The 2004 effort achieved this by creating a new zoning district that: permitted mixed-use development; required pedestrian building orientation; supported shared parking; mandated the creation of an interconnected multi-use trail system; and required wide, tree-lined sidewalks with redevelopment. Most significant, however, was its establishment of maximum block size and street connectivity requirements (for projects greater than five acres) which would ensure the creation of an interconnected street and pedestrian system as marginal properties were redeveloped into community-supported densities.

In light of this planning framework, and the community-expressed desire for concentrating new development in Woodstock's historic core that it represents, both Woodstock West and Breezy Hills' locations within their greater Areas of Influence are consistent with principles of locating well-planned new development in areas with adequate public facilities. Both are located in areas with existing infrastructure (including roadways, water, sewer, schools, and public services) and both will include enhancements to said facilities, as expressed through the LCI's vision and required by local zoning. By concentrating new development in an existing center; enhancing infrastructure facilities therein; and establishing land use patterns that support non-motorized transportation and a balance of housing with jobs, both projects will satisfy the above-referenced requirements and conform to Regional Development Policies discouraging sprawling land use patterns.

APPENDIX A
TRAFFIC ANALYSIS METHODOLOGIES

TRAFFIC ANALYSIS METHODOLOGIES AND ASSUMPTIONS

This text was originally included as a chapter in the body of the traffic report. However, since this section provides background information and does not contain findings of the analysis, it has been moved to the appendix to serve as a reference, while simplifying the presentation of findings in the body of the report. The following sections provide information on the analysis methodologies employed in this study.

GROWTH RATE

Georgia Department of Transportation historic daily traffic volumes were researched in the study area. The data was collected for five years from 2001 to 2005 (inclusive). This data is presented in Table A. Based on discussions with GRTA, and annual growth rate of 1% was applied to all routes except SR 92, to which an annual rate of 2.5% was applied.

Table A – Georgia DOT Historic AADT Data

Location	TC #	2001	2002	%	2003	%	2004	%	2005	%	average %
Main St. south of Dupree Rd.	0007	18,698	19,046	1.86%	17,760	-6.75%	17,855	0.53%	18,030	0.98%	-0.91%
Towne Lake Pkwy. west of I-575	0297	40,412	41,800	3.43%	42,824	2.45%	40,036	-6.51%	na	na	-0.31%
Arnold Mill Rd. east of Main St.	0156	13,732	14,068	2.45%	13,143	-6.58%	16,894	28.54%	14,140	-16.30%	0.73%
Canton Hwy. south of Ridgewalk Pkwy.	0010	13,782	14,120	2.45%	13,414	-5.00%	14,403	7.37%	14,000	-2.80%	0.39%
SR 92 east of I-575	0080	na	na	na	52,746	na	59,613	13.02%	60,210	1.00%	1.00%
SR 92 east of Canton Hwy.	0082	34,629	35,685	3.05%	39,056	9.45%	33,612	-13.94%	33,950	1.01%	-0.49%
Canton Hwy. south of SR 92	0004	17,889	18,327	2.45%	24,538	33.89%	24,466	-0.29%	24,700	0.96%	8.40%

TRAFFIC DATA COLLECTION

Traffic counts used in the analyses in this study were collected during the weekday a.m. and p.m. peak periods. The morning counts were collected from 7:00 a.m. to 9:00 a.m., the evening counts were performed from 4:00 p.m. to 6:00 p.m., and the Saturday counts were collected from 11:00 a.m. to 1:00 p.m. From the count data, the highest four consecutive 15-minute interval volumes in each time period were determined. These volumes make up the typical peak hour traffic volumes at each intersection for each time period. All counts were performed by a data collection subconsultant and reviewed by Marc R. Acampora, PE, LLC. Specific details concerning the count times, dates, and locations are presented in the appropriate section of this report.

DETAILED INTERSECTION ANALYSIS

The methodology used for evaluating traffic operations at intersections is presented in the Transportation Research Board's Highway Capacity Manual, 2000 edition (HCM 2000). Synchro software, version 6, which emulates the HCM 2000 methodology, was used for the analysis. The following is an overview of the methodology employed for the analysis of stop-sign controlled (unsignalized) and signalized intersections.

Unsignalized Intersections

The operations at an unsignalized intersection are defined in terms of levels of service. Level of service (LOS) is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. Level of service for an unsignalized intersection is defined in terms of control delay per vehicle. Control delay is that portion of delay attributable to the control device and includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The delays at unsignalized intersections are based on gap acceptance theory, factoring in availability of gaps, usefulness of the gaps, and the priority of right-of-way given to each traffic stream.

Levels of service are assigned letters A through F. LOS A indicates operations with very low control delay while LOS F describes operations with high control delay. LOS F is considered to be unacceptable by most drivers, while LOS E is typically considered to be the limit of acceptable delay. In the HCM 2000 methodology, levels of service are defined for each minor (controlled) movement at a two-way stop-controlled intersection, but not for the intersection as a whole. However, Synchro software includes a method for calculating the overall intersection LOS. This provides a useful indicator of overall intersection sufficiency and is, therefore, reported in this study, along with the movement levels of service. The level of service criteria for unsignalized intersections are given in Table B.

Table B – Level of Service Criteria for Unsignalized Intersections

Level of Service	Control Delay (s/veh)
A	0 - 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

Source: Highway Capacity Manual 2000

Signalized Intersections

The criterion for evaluating signalized intersections according to GRTA standards is level of service (LOS). Level of service for a signalized intersection is defined in terms of control delay per vehicle. For signalized intersections, a composite intersection level of service is determined. The thresholds for each level of service are higher for signalized intersections than for unsignalized intersections. This is attributable to a variety of factors including expectation and acceptance of higher delays at signals, and the fact that drivers can relax when waiting at a signal as opposed to having to remain attentive as they proceed through the unsignalized intersection. The level of service criteria for signalized intersections are shown in the following table.

Table C – Level of Service Criteria for Signalized Intersections

Level of Service	Control Delay (s/veh)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

Source: Highway Capacity Manual 2000

FACILITIES NEEDS ANALYSIS

A facilities needs analysis tests alternative combinations of roadway improvements that allow a facility to achieve the LOS D standard (see Level of Service Standards section of the Study Network Chapter). Facilities needs analyses are performed for the existing, no-build, and build conditions, where necessary. The existing facilities needs analysis identifies existing deficiencies, and the mitigation required to achieve the applicable LOS standard. The future no-build analyses allow for the identification of projects necessary to bring the roadways up to the proscribed LOS standard, after the inclusion of other planned levels of development, but before the introduction of project-generated traffic. The future build analyses identify those additional facilities improvements that will be necessitated by the subject DRIs. Later in the study, programmed transportation improvements are identified, and those improvements are compared with the results of the facilities needs analysis, where appropriate.

TRIP GENERATION

Vehicle trip estimates are determined through a process called trip generation. Rates or equations are applied to size of the proposed land use to estimate the number of entering and exiting trips during specific time intervals. The standard rates and equations were employed from the 7th edition of the

Institute of Transportation Engineers (ITE) *Trip Generation*. The trip generation is summarized in the Project Traffic Characteristics chapter of the report.

Multi-Use Trip Adjustments

Multi-use trip adjustments reflect the benefit that is realized by the sharing of compatible trips between land uses. The sharing of uses can occur in two ways. Trips between immediately adjacent uses which are interconnected will occur by either automobile or by foot or bicycle. These trips remain within the development and never appear in the analysis of intersections or site driveways. Other multi-use trips will occur between non-contiguous uses. These trips are likely to be made by automobile and will enter and exit site driveways and travel through some study intersections. The multi-use adjustments presented in Tables 6 and 7 are based on the *Trip Generation Handbook* and the GRTA methodologies. The internal multi-use worksheets are included on the following pages of this appendix.

Pass By Adjustments

In addition, the retail trip generation was adjusted to account for the effect of pass-by trips. These are trips that are already on the adjacent roadways and will divert into the retail for shopping purposes enroute to their final destination. Pass-by percentages for the proposed amount of retail were calculated using the ITE *Trip Generation Handbook*. For the Woodstock West retail, pass-by percentages of 30%, 40%, 30% and 30% were applied to the a.m., p.m., 24-hour, and Saturday numbers, respectively. For the Breezy Hill retail the following pass-by percentages were applied: 35%, 45%, 35%, 35%.

APPENDIX B
STUDY NETWORK DETERMINATION CALCULATIONS

APPENDIX C
RAW TRAFFIC COUNT DATA

APPENDIX D
TRAFFIC VOLUME WORKSHEETS

APPENDIX E
EXISTING CONDITION ANALYSIS

APPENDIX F
NO-BUILD ANALYSIS

APPENDIX G
BUILD ANALYSIS

APPENDIX H
PROGRAMMED INFRASTRUCTURE IMPROVEMENTS