Final Report

New Jersey Traffic Signal Retiming Project

Church Street/Maple Avenue (CR 607)
State Route 38 to Locust Avenue

and

Greentree Road (CR 674)
NJ Route 73 to Church Road (CR 616)/Hainesport-Mount Laurel Road

Prepared for:
Delaware Valley Regional Planning Commission (DVRPC)

and

Burlington County, NJ

Prepared by:

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STATE OF NEW JERSEY
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EXECUTIVE SUMMARY

Iteris, Inc. was contracted by the Delaware Valley Regional Planning Commission (DVRPC) through the New Jersey Traffic Signal Retiming Project to provide engineering services for the retiming of 17 intersections within Burlington County, New Jersey on Church Street/Maple Avenue (CR 607) and Greentree Road (CR 674). These signals are located within Mount Laurel and Evesham Townships and there are three NJDOT signals included as well. Imperial Traffic & Data Collection was a subconsultant on this project, responsible for data collection and implementation assistance.

Following the NJ Signal Retiming Regional Corridor Prioritization task completed in 2022, this signal system was identified as a high priority corridor for Burlington County. The priority analysis utilized a scoring system developed to rank signal systems throughout the region utilizing a number of variables and input from each DVRPC New Jersey County. The goal of the retiming initiative is to optimize signal timings along critical corridors given current conditions and utilizing existing equipment, with a focus on optimizing signal operations at the study intersections while considering all users of the system. This system was selected for analysis because it has a high number of signals, high signal density, and experienced significant delays during the peak periods. Both roadways on this system, Church Street/Maple Avenue (CR 607) and Greentree Road (CR 674) are significant commuter corridors that have high vehicle volumes during peak periods.

Project Vision

- **Goal:** Optimize traffic operations and timings throughout the system utilizing existing equipment.
- **Goal**: Improve air quality through decreased motor vehicle emissions and fuel consumption.
- **Goal**: Improve reliability and predictability of travel along arterials.
- **Goal**: Improve the safety of motorists, pedestrians, and bicyclists.
- **Goal**: Identify equipment issues, report them to the maintaining agency and recommend improvements.

According to the available timing directives in each traffic cabinet, the signals included in this project had not been retimed within at least the last 14 years and most programming did not match the timings and operations shown on the directives. With the high signal density in this system, the presence of heavy vehicles, pedestrians and buses along with the volume growth that has occurred since the last retiming, coordinated signal timing analysis along this network was clearly appropriate and would provide significant benefits.

The goal of this project was to evaluate signal timing needs given current conditions and existing equipment throughout the network and to reduce traffic signal delay and stops to help improve system performance.

Project Accomplishments

As part of this project, the Iteris team developed and implemented six unique time-of-day patterns through the network. The following are the patterns that were developed and analyzed for this project:

Pattern Number	Time-of-Day	Abbreviation For Figures
16	AM Peak	AM
13	Midday Peak	MD
17	PM Peak	PM
14	PM Off-peak	PO
10	Weekend AM Peak	WA
15	Weekend Midday Peak	WM
10	Weekend PM Peak	WP

Note Pattern 10 runs for both weekend off-peak periods but were modeled and analyzed independently

Through the completion of this project, all clearance intervals for both vehicle and pedestrian movements were brought up to standard utilizing accepted NJDOT and Burlington County methodology for vehicle clearances and the Manual on Uniform Traffic Control (MUTCD) for pedestrian clearance intervals. Pedestrian crosswalks, approach grades and clearance measurements were all manually measured for these calculations and all observed issues were documented and reported to Burlington County. Accurately programming the pedestrian clearance intervals will improve safety throughout the network and ensure each movement has sufficient crossing time. Also, the programming related to programmed pedestrian recalls and other pedestrian related programming were reviewed and updated in this project to reflect Burlington County preferences.

Also, the programming related to programmed pedestrian recalls and other pedestrian related programming were reviewed and updated in this project to reflect Burlington County preferences.

Under existing conditions, the intersection of Greentree Road (CR 674) & Church Road (CR 616), was running in free operation, or non-coordinated, during all times and the intersection of Church Street/Maple Avenue (CR 607) & Greentree Road (CR 674) was running different cycle lengths than the rest of the system during most time periods, resulting in inconsistent and inefficient operations along the network and resulted in additional delays. Another significant issue under existing conditions was that in the AM peak period, the section of signals on Church Street (CR 607) between Pleasant Valley Avenue and Ramblewood Parkway were calling a pattern that had no programmed coordinated data in the controller, so were all running in free operation during the high volume AM Peak period. All of these issues were rectified through this project and significant improvements were observed in the northern area of Church Street (CR 607), with those four signals being put into coordination during the AM peak.

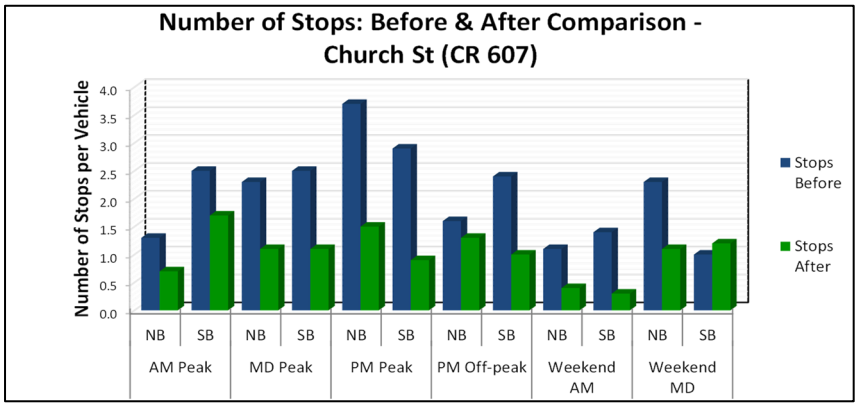
Several operational issues were identified and reported to Burlington County. These issues were generally related to existing programming and operation and were addressed in the project. The remaining noted issues and observations are included within this report and suggested recommendations are also provided.

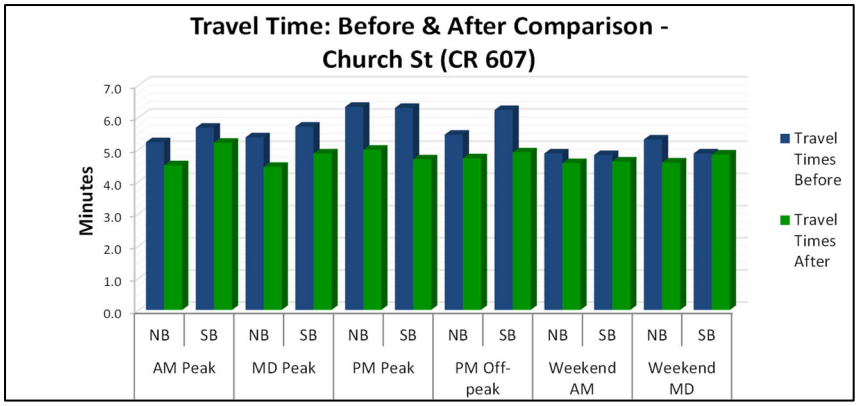
Through this project, the signal timings at the 14 Burlington County signals within this project were optimized to run consistent coordinated cycle lengths throughout the network for both weekday and weekend operations and each signal was programmed with all necessary safety functions properly programmed. The two NJDOT signals were reviewed to ensure clearances were appropriate but continued to operate on their separate adaptive networks. All County signals were online throughout this project on the Burlington County Centracs ATMS platform, so had a consistent time source and controller clocks were regularly updated. Detection was also operational throughout the network, which allowed for optimal distribution of time allotment for each time period.

Traffic Operations Analysis Summary

Field measured travel time runs were conducted on Church Street/Male Avenue (CR 607) between Locust Avenue and Pleasant Valley Avenue. In the northbound direction, weekday travel times decreased by up to 80 seconds (21.1%) and weekend travel times decreased by up to 43 seconds (13.5%). In the southbound direction, weekday travel times decreased by up to 96 seconds (25.5%) and weekend travel times decreased by up to 12 seconds (4.2%).

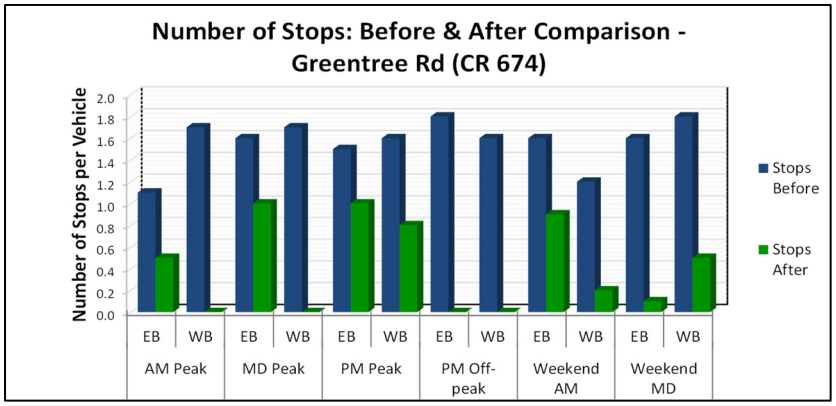
Tru-Traffic Before and After Analysis – Church St (CR 607)

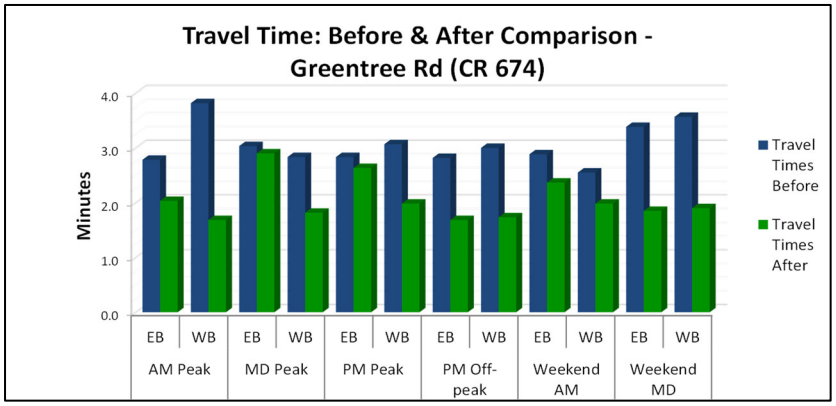




Field measured travel time runs were conducted on Greentree Road (CR 674) between Lincoln Drive and Church Road (CR 616). In the eastbound direction, weekday travel times decreased by up to 68 seconds (40.2%) and weekend travel times decreased by up to 92 seconds (45.3%). In the westbound direction, weekday travel times decreased by up to 128 seconds (55.9%) and weekend travel times decreased by up to 100 seconds (46.7%).

Tru-Traffic Before and After Analysis – Greentree Rd (CR 674)

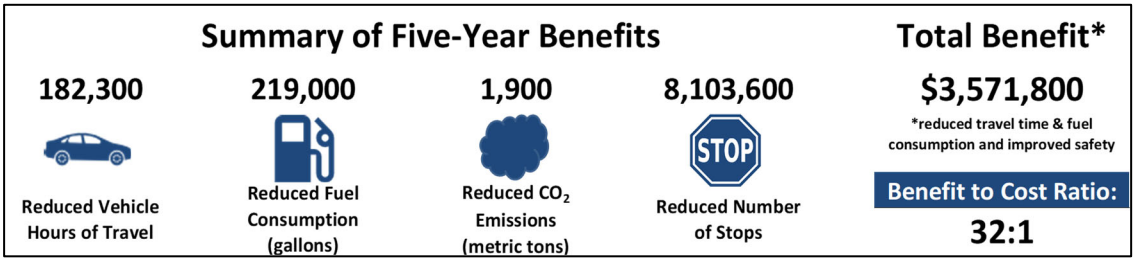




Before and After Analysis – Church Street (CR 607) and Greentree Road (CR 674)

Though there are many benefits to traffic signal retiming projects and for this report, two general benefit types were focused on to quantify the improvements experienced through this project. The first is user benefits, which are enjoyed directly by travelers and are determined by a reduction in travel time and operating costs. Crash costs are generally improved through signal retiming projects but require a comparison of crash data over at least three years, so could be considered and measured in the future. These costs measures are explained in more detail in the body of this report, but travel time and number of stops comparisons were measured using Synchro and operating costs are estimated using a combination of vehicle occupancy, heavy vehicle percentages, the average cost of fuel within the region according to the US Energy Information Administration (EIA) and the current Consumer Price Index. The second type of benefit used in this report is non-user benefits, which include environmental impacts, air quality, and reduced motorist frustration. The emissions estimate shown is calculated using an equation provided by the US Environmental Protection Agency (EPA).

The various values and assumed benefit lifetime utilized are all conservative, so actual improvements are likely much higher than estimated in this report. The figure below summarizes the numerous benefits measured for this project.



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1.0 INTRODUCTION

1.1 Purpose

Iteris, Inc. was contracted by the Delaware Valley Regional Planning Commission (DVRPC) to provide engineering services for the signal timing analysis of 17 intersections located in Burlington County, New Jersey on Church Street/Maple Avenue (CR 607) and Greentree Road (CR 674). The included signals are located within Mount Laurel Township and Evesham Township, New Jersey and three signals are owned and maintained by the New Jersey Department of Transportation (NJDOT). The goal of the project was to optimize signal timings given current conditions, utilizing existing equipment, with a focus on optimizing signal operations at the study intersections while considering all users of the system.

The tasks involved in this analysis were:

- Collected existing geometric, volume, and traffic signal timing data and existing timing directives.
- Conducted field visits to develop understanding of intersection and corridor issues.
- Conducted travel time runs to benchmark existing conditions.
- Updated and developed existing traffic operations models to benchmark existing capacity analysis.
- Updated basic timing parameters for both vehicle and pedestrian movements.
- Developed six unique timing patterns for weekday and weekend operations.
- Modified day plan schedules and implemented new signal timing plans.
- Performed post-implementation observation and fine-tuning of timing and conducted travel time runs.
- Developed implemented operations models to compare and measure improvements.
- Updated timing directives to reflect new timings and placed final copy in each traffic cabinet.
- Documented all work performed and summarized findings in this technical report.
- Updated project website to include all deliverables and project material.

1.2 Traffic Signal Locations

The traffic signals included in this project are:

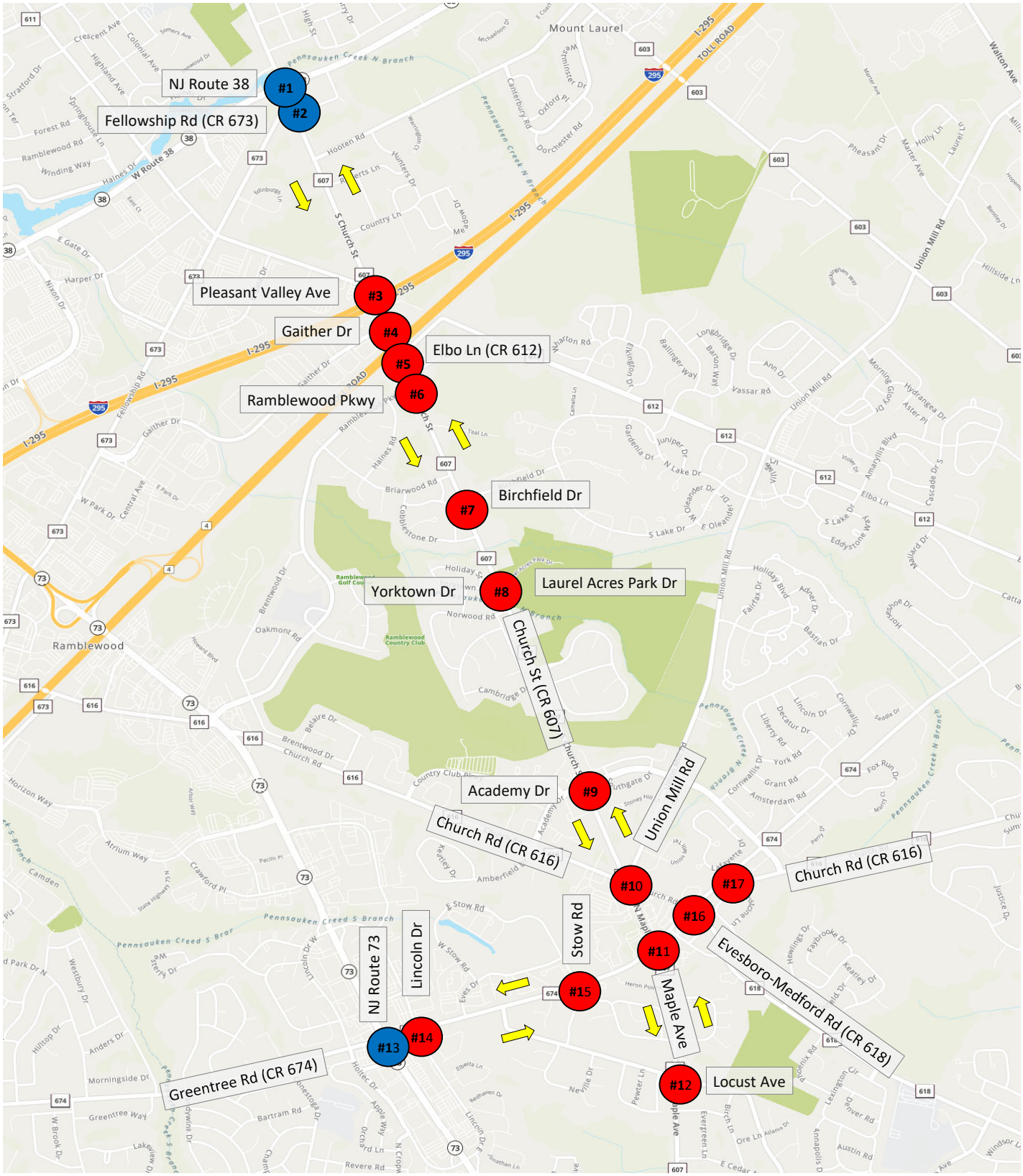
No.	Intersection
1	Church St (CR 607) & NJ Route 38 *(NJDOT)*
2	Church St (CR 607) & Fellowship Rd (CR 673) *(NJDOT)*
3	Church St (CR 607) & Pleasant Valley Ave
4	Church St (CR 607) & Gaither Dr
5	Church St (CR 607) & Elbo Lane (CR 612)
6	Church St (CR 607) & Ramblewood Pkwy
7	Church St (CR 607) & Birchfield Dr
8	Church St (CR 607) & Yorktown Dr/Laurel Acres Park Dr
9	Church St (CR 607) & Academy Dr
10	Church St (CR 607) & Church Rd/Union Mill Rd (CR 616)
11	North Maple Ave (CR 607) & Greentree Rd (CR 674)
12	North Maple Ave (CR 607) & Locust Ave
13	Greentree Rd (CR 674) & NJ Route 73 *(NJDOT)*
14	Greentree Rd (CR 674) & Lincoln Dr
15	Greentree Rd (CR 674) & Stow Rd
16	Greentree Rd (CR 674) & Church Rd (CR 616)/Evesboro-Medford Rd (CR 618)
17	Greentree Rd (CR 674)/Hainesport Mt Laurel Rd (CR 674) & Church Rd (CR 616)

Note that throughout this report, Church Street (CR 607) is considered north-south in directionality, and Greentree Road (CR 674) is considered east-west in directionality. The models, timing sheets and timing directives developed for this project will also reflect this assumption consistently.

Church Street/Maple Avenue (CR 607) is a four-lane undivided roadway that spans approximately 3.5 miles within the limits of this project. The posted speed limit for both directions on Church St (CR 607) is 40 mph between NJ Route 38 and Locust Ave. Greentree Road (CR 674) between Stow Road and Church Road (CR 616) is a two-lane

undivided roadway. Generally between NJ Route 73 and Stow Road, Greentree Road (CR 673) is a two-lane undivided roadway that spans approximately 1.2 miles within the limits of this project. The posted speed limit for eastbound Greentree Road (CR 674) is 45 mph between Stow Road and Church Road (CR 616). For westbound Greentree Road (CR 674), the speed limit is 45 mph between Church Road (CR 616) and Eves Drive and is otherwise 40 mph in both directions. There are no schools in the immediate vicinity of this system but moderate pedestrian activity was observed in several areas within this system.

Figure 1 on page 3 illustrates the locations of the signals included in this report.



Burlington County Study Intersection:

NJDOT Maintained Study Intersection:

7-day, 24-hr Count Location (Directional):

Figure 1

Traffic Signal Locations

Church St (CR 607) & Greentree Rd (CR 674)

2.0 DATA COLLECTION

2.1 7-Day, 24-Hour Volumes

7-day, 24-hour segment counts were conducted by Imperial Traffic & Data Collection (ITDC) during March of 2023. Counts were collected at four locations on Church St (CR 607) and one location on Greentree Rd (674), and these counts were collected to illustrate the various traffic patterns that occur during a typical day on the various roadways at the count locations.

The Average Daily Traffic (ADT) volume on Church St (CR 607) from the locations counted was as high as 20,900 on weekdays and 15,200 on weekends. The ADT volume Greentree Rd (CR 674) was as high as 17,200 on weekdays and 11,700 on weekends.

Figure 2 through Figure 7 on pages 6 – 11 illustrate the average weekday, Saturday and daily hourly volume data for the counts collected for this project.

2.2 Turning Movement Counts

Turning movement counts (TMCs) were collected by ITDC at all 17 locations throughout the project limits in March of 2023.

TMCs for all signals in the network were collected from 7:00 am – 9:30 am, 12:00 pm – 2:00 pm, 3:30 pm – 6:00 pm, and 6:15 pm – 7:15 pm on weekdays, and from 9:00 am – 4:00 pm, and 5:30 pm – 6:30 pm on weekends. So eight (8) hours of data were processed for both weekday and weekend operations.

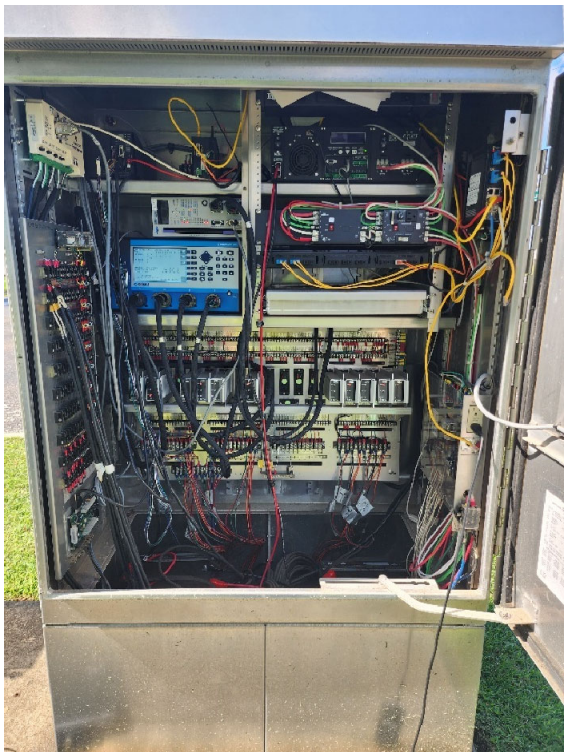
These volumes were then increased by a growth factor to account for fluctuations in daily traffic volumes and to factor in some future volume growth. TMC diagrams illustrating hourly volumes for each developed timing pattern can be found on Figure 18 through Figure 53 on pages 36 – 71. Raw TMC data can be found on the project website.

2.3 Traffic Signal Timing and Phasing Data

All the traffic signal cabinets on this corridor utilize Econolite controllers. Existing data files were uploaded via Aries Zone Manager, an Econolite direct connect software, directly from each local controller.

2.4 Field Notes

Field notes were collected by Iteris, Inc. staff in October 2023 at each intersection on various signal and traffic characteristics to assist in model development and signal optimization. The field notes contain information on various intersections, signal, and traffic characteristics. Diagrams within the field notes contain lane geometry at the stop bar, measured lane storage lengths, number of signal heads, and cabinet locations. Posted speed limits, left turn types (protected only, protected/permissive, or permissive only), turn restrictions, and the presence of roadway lighting and signal back plates were noted.



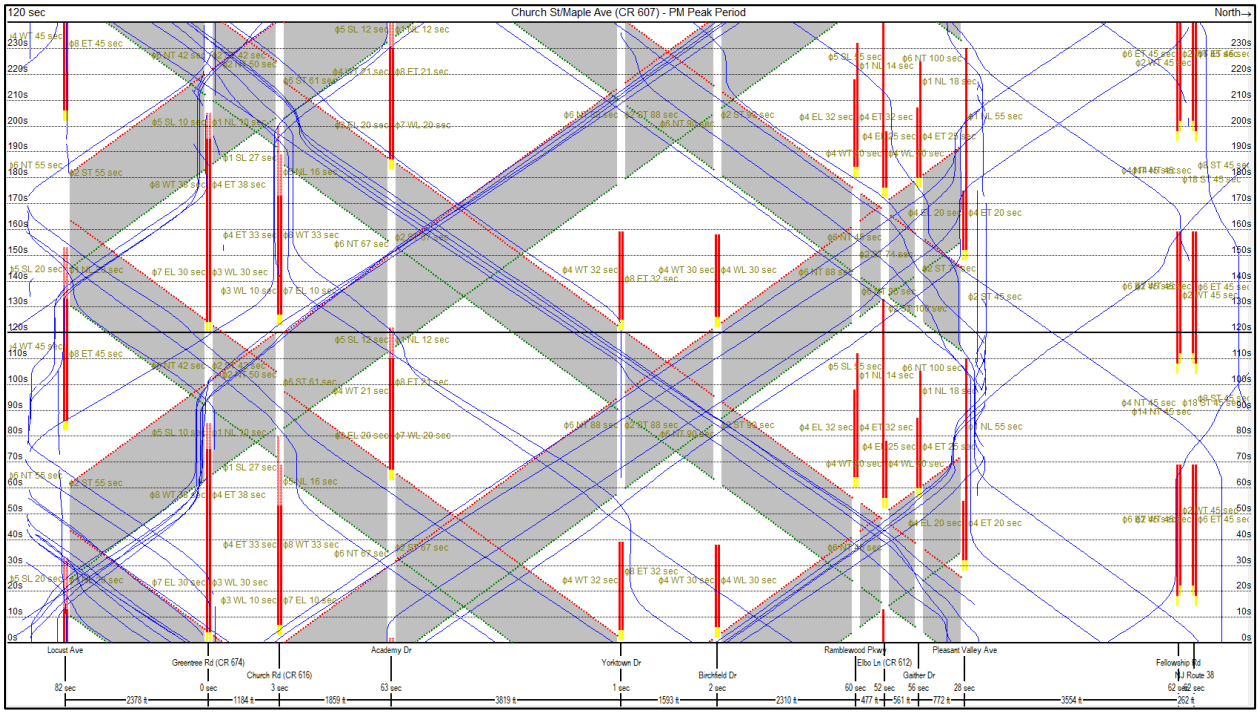
For each approach, vehicle and pedestrian clearance distances along with median widths were measured. Vehicle detection and pedestrian pushbuttons, where present, were reviewed and tested for proper operation. Other unusual or unique characteristics were also recorded. The summary of findings can be found in the Field Notes folder on the project website. The Appendix of this report contains the status of those observations at the end of the project, since some of the observations had changed since the field reviews. The final table will be accurate as of June 29, 2024, when detection was last reviewed for this project.

Photographs were taken within every traffic cabinet and approach photos were also collected for all intersections. The photographs are a record of the current geometrics and other intersection, signal, and roadside characteristics. Field notes and intersection photographs can be found on the project website.

2.5 Travel Time Runs

Travel time runs were conducted under both existing and implemented signal timings on Church St (CR 607) and Greentree Rd (CR 674). These data were collected to both fine-tune implemented signal timing as well as provide a field-measured metric by which existing and implemented signal timing can be compared using floating car studies. Travel time data is presented and analyzed in Section 6.4 of this report.

Video was collected during both the existing and implemented conditions travel time runs in the AM and PM peak periods to be used in developing comparison videos. Complete travel time data can be found in the Tru-Traffic folder on the project website. Comparison videos showing side by side video of the before and after conditions are provided on the project website.

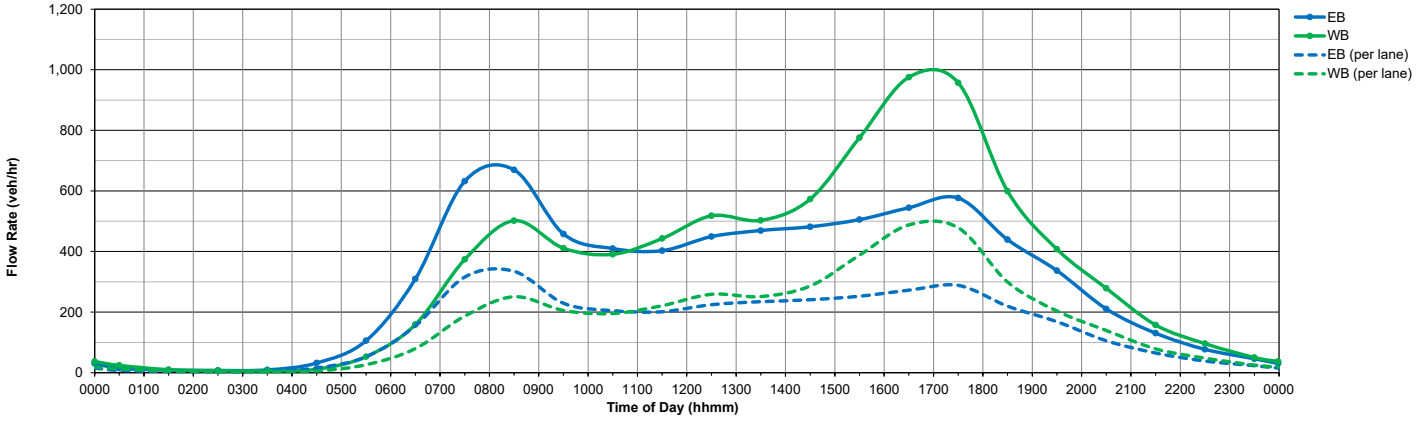


Sample Time-Space Diagram from Tru-Traffic Software – Church St/Maple Ave (CR 607) - PM Peak Period

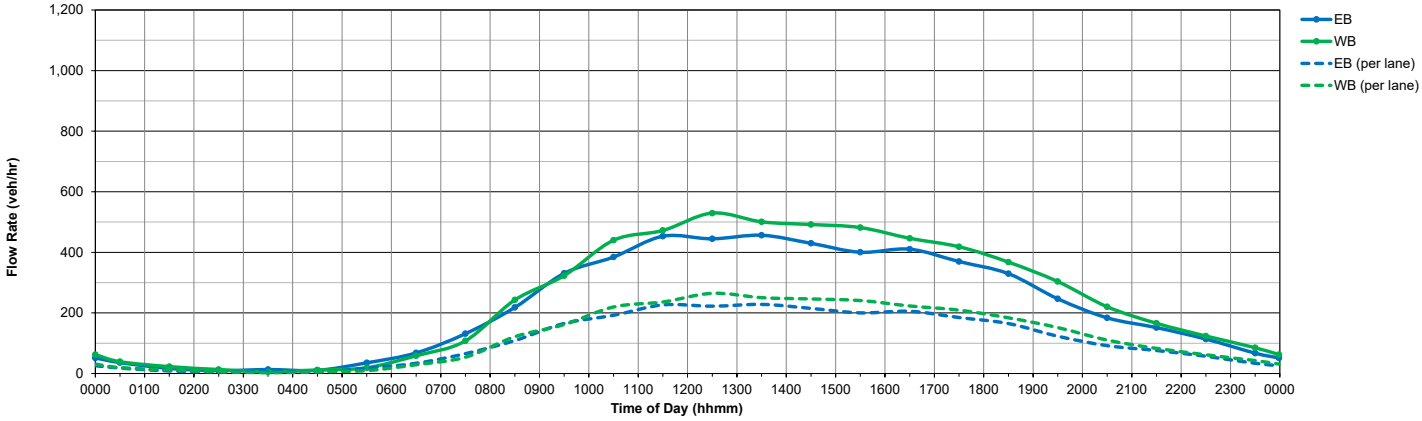
Hourly Volumes - Average for Count Locations on Church St (CR 607) between Fellowship Rd (CR 673) and North Locust Ave

		02/27/23 Monday		02/28/23 Tuesday		03/01/23 Wednesday		03/02/23 Thursday		03/03/23 Friday		03/04/23 Saturday		02/26/23 Sunday		Avg. Weekday		Avg. Weekend	
From	To	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	13	21	11	23	19	26	15	26	17	24	36	39	40	53	15	24	38	46
0100	0200	9	9	7	10	9	11	11	8	8	15	17	23	16	28	9	10	16	25
0200	0300	7	5	8	8	7	10	9	6	8	6	10	13	12	13	8	7	11	13
0300	0400	10	6	8	7	9	6	11	9	9	6	13	6	11	11	9	7	12	8
0400	0500	34	9	34	13	34	13	31	13	27	11	11	12	10	9	32	12	10	10
0500	0600	103	49	118	55	102	53	116	56	91	53	36	19	23	14	106	53	29	16
0600	0700	308	157	311	162	329	166	305	163	293	148	68	59	44	42	309	159	56	50
0700	0800	621	359	670	366	674	387	642	396	554	362	132	108	99	97	632	374	115	103
0800	0900	633	476	707	504	731	519	690	519	587	493	218	243	171	182	670	502	195	212
0900	1000	434	375	475	413	492	441	475	421	414	407	331	323	306	290	458	411	318	306
1000	1100	385	364	393	385	412	395	397	388	462	422	385	440	392	408	410	391	388	424
1100	1200	407	437	403	462	397	419	395	433	414	464	453	472	455	496	403	443	454	484
1200	1300	459	479	483	564	405	504	441	534	459	511	445	530	517	561	449	518	481	545
1300	1400	431	514	515	525	479	475	485	494	437	507	457	501	506	566	469	503	481	533
1400	1500	476	562	484	586	494	589	458	527	497	601	430	492	532	543	482	573	481	518
1500	1600	487	757	533	828	500	775	499	763	509	757	401	482	470	566	505	776	435	524
1600	1700	531	962	557	1,078	549	1,021	543	935	544	883	411	446	443	550	545	976	427	498
1700	1800	557	967	574	1,082	614	996	570	914	568	827	370	419	439	453	577	957	404	436
1800	1900	440	608	479	617	423	602	407	613	449	558	330	368	343	369	439	599	336	368
1900	2000	333	369	360	423	333	422	326	393	336	432	247	304	280	300	337	408	263	302
2000	2100	200	266	204	277	221	289	217	283	213	281	184	221	194	195	211	279	189	208
2100	2200	117	132	138	156	130	151	120	168	149	182	152	166	103	108	131	158	127	137
2200	2300	53	69	65	85	70	94	81	107	119	126	114	124	56	70	77	96	85	97
2300	0000	35	42	43	48	33	44	41	44	80	74	67	85	39	34	46	50	53	59
	Sub-total	7,079	7,992	7,576	8,673	7,462	8,404	7,283	8,209	7,243	8,149	5,311	5,891	5,498	5,953	7,329	8,285	5,404	5,922
	Total	15,070		16,249		15,866		15,492		15,392		11,202		11,450		15,614		11,326	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

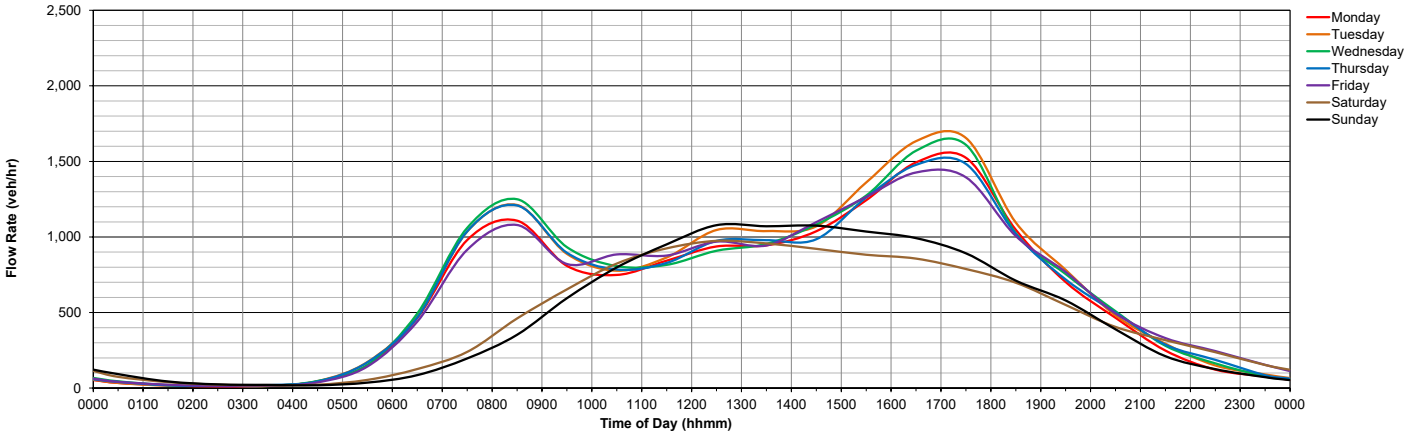
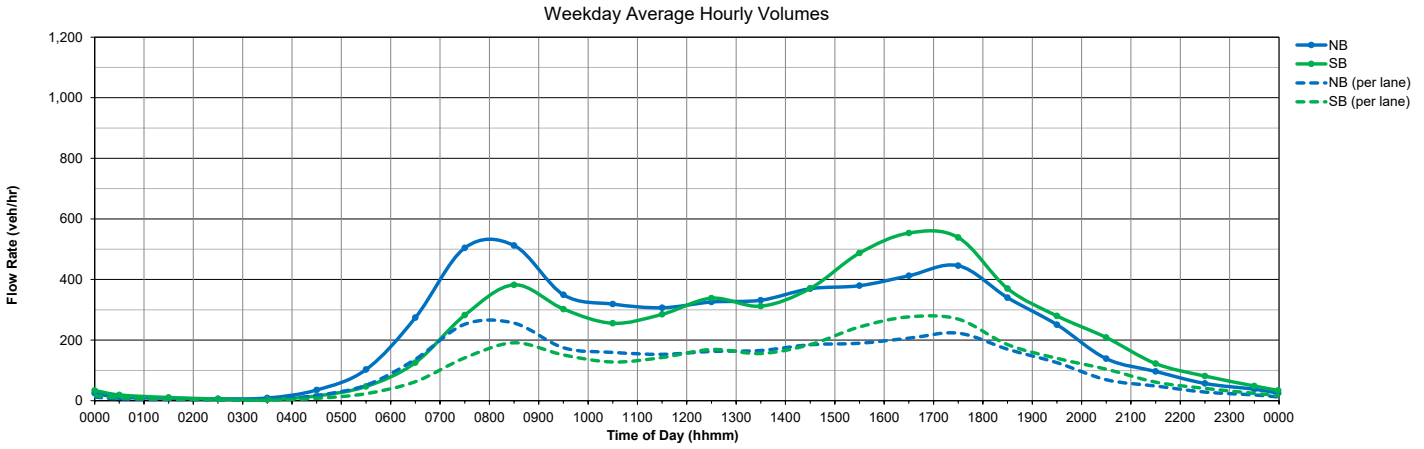
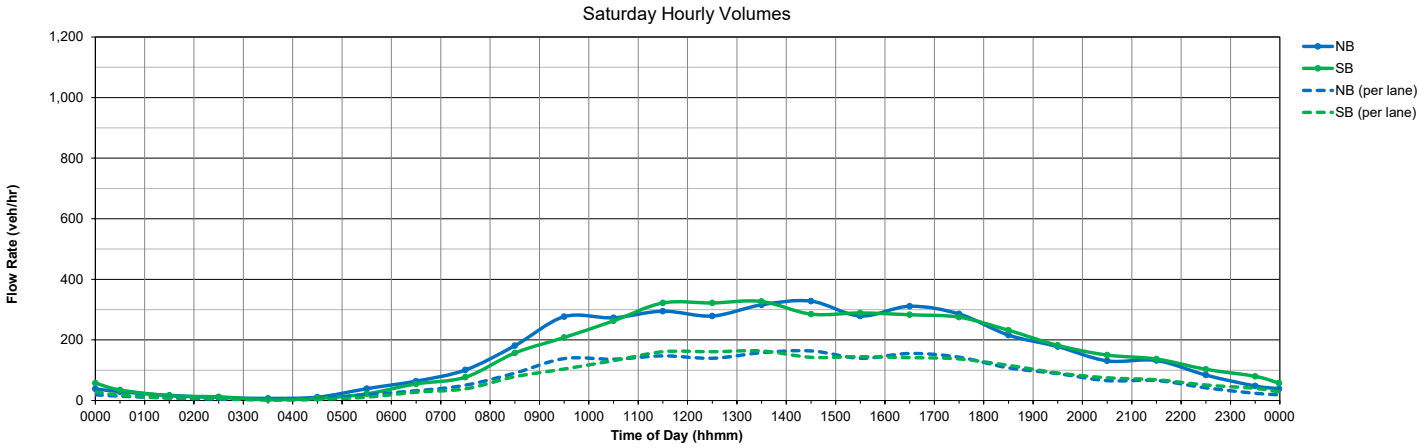


Figure 2
7-Day, 24-Hour Volumes
Average for Count Locations on Church St (CR 607) between Fellowship Rd (CR 673) and North Locust Ave

Hourly Volumes - Church St (CR 607) between Fellowship Rd (CR 673) and Pleasant Valley Ave

From	To	03/20/23 Monday		03/21/23 Tuesday		03/22/23 Wednesday		03/23/23 Thursday		03/24/23 Friday		03/25/23 Saturday		03/26/23 Sunday		Avg. Weekday		Avg. Weekend	
		NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
0000	0100	7	17	6	17	20	21	9	20	15	21	29	35	29	50	11	19	29	43
0100	0200	7	13	6	6	11	11	10	7	8	16	17	16	13	23	8	11	15	20
0200	0300	5	3	8	6	6	9	7	3	6	8	10	12	6	9	6	6	8	11
0300	0400	9	3	7	2	11	3	10	7	8	2	7	3	12	8	9	3	10	6
0400	0500	42	15	35	14	36	18	35	18	29	15	11	7	9	7	35	16	10	7
0500	0600	104	47	111	41	103	50	109	51	87	45	39	22	25	12	103	47	32	17
0600	0700	268	129	267	115	308	132	262	136	265	117	64	55	44	35	274	126	54	45
0700	0800	501	260	543	289	546	292	507	299	426	274	101	77	103	61	505	283	102	69
0800	0900	504	364	519	364	556	387	517	404	466	394	181	157	117	131	512	383	149	144
0900	1000	332	262	330	278	410	328	357	323	319	321	277	208	280	210	350	302	279	209
1000	1100	313	232	322	257	311	236	323	264	325	290	273	263	288	250	319	256	281	257
1100	1200	299	280	319	306	340	263	295	277	281	300	295	322	314	335	307	285	305	329
1200	1300	336	319	337	339	311	351	328	374	317	309	279	322	338	390	326	338	309	356
1300	1400	321	317	381	313	298	281	350	342	308	307	316	327	357	350	332	312	337	339
1400	1500	355	356	372	341	370	395	365	344	386	417	328	285	389	349	370	371	359	317
1500	1600	341	439	422	528	383	525	361	475	391	470	279	289	353	394	380	487	316	342
1600	1700	387	500	423	563	424	616	425	545	404	543	311	283	344	367	413	553	328	325
1700	1800	456	511	455	567	487	582	420	551	412	483	286	275	362	303	446	539	324	289
1800	1900	337	363	377	359	326	369	308	392	354	369	216	232	256	269	340	370	236	251
1900	2000	233	220	284	253	263	308	229	290	246	328	178	182	228	199	251	280	203	191
2000	2100	114	172	131	226	144	218	159	232	146	195	131	150	145	170	139	209	138	160
2100	2200	80	85	107	129	91	130	86	133	120	135	132	137	79	92	97	122	106	115
2200	2300	32	64	51	75	52	82	62	85	88	101	84	103	52	64	57	81	68	84
2300	0000	28	39	35	47	22	48	35	43	71	67	48	80	26	28	38	49	37	54
Sub-total		5,411	5,010	5,848	5,435	5,829	5,655	5,569	5,615	5,478	5,527	3,892	3,842	4,169	4,106	5,627	5,448	4,031	3,974
Total		10,421		11,283		11,484		11,184		11,005		7,734		8,275		11,075		8,005	





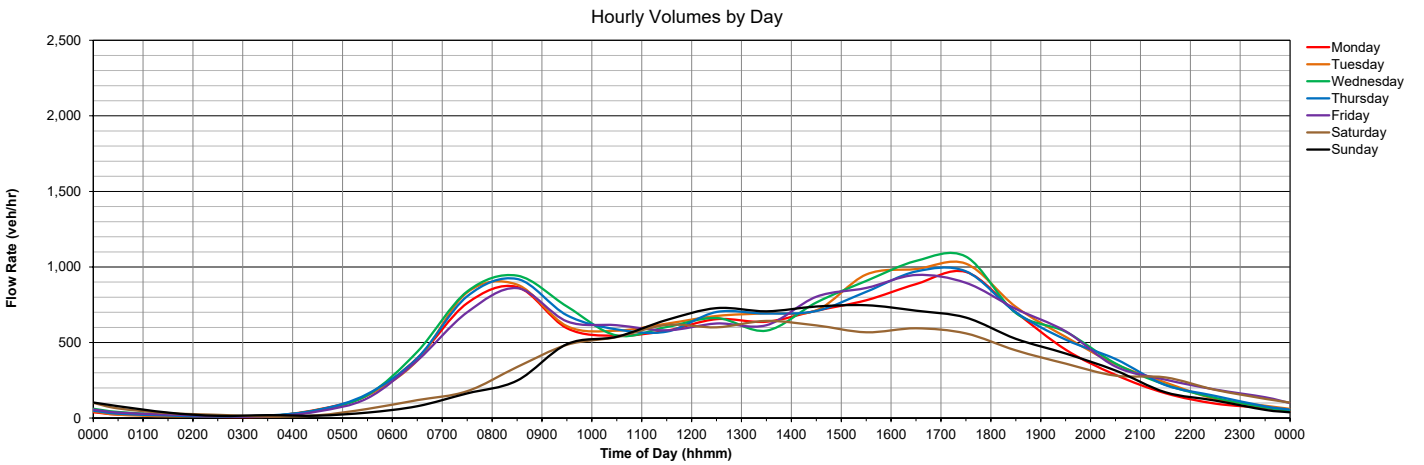
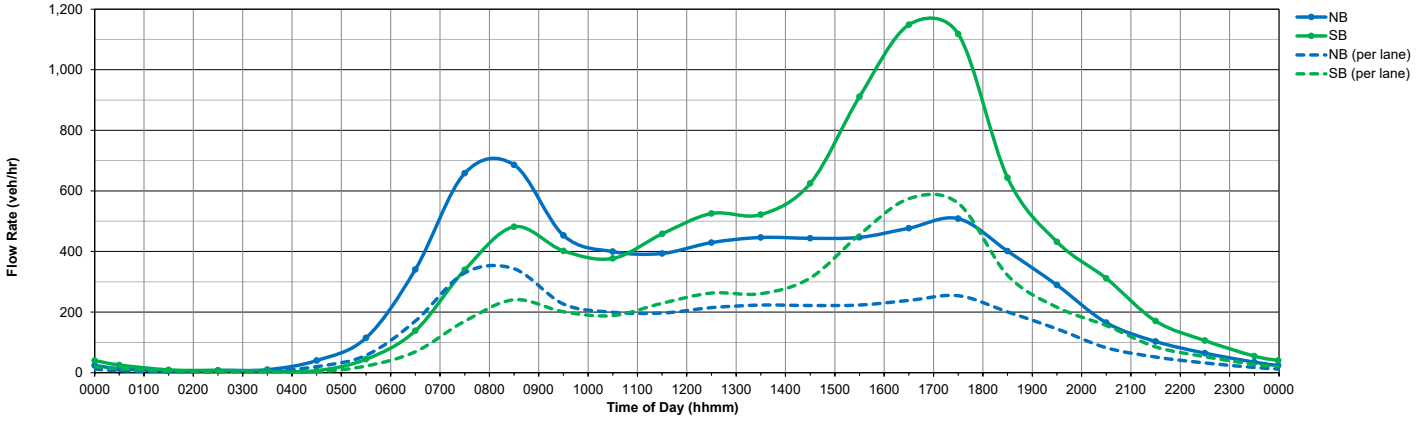


Figure 3
7-Day, 24-Hour Volumes
Church St (CR 607) between Fellowship Rd (CR 673) and Pleasant Valley Ave

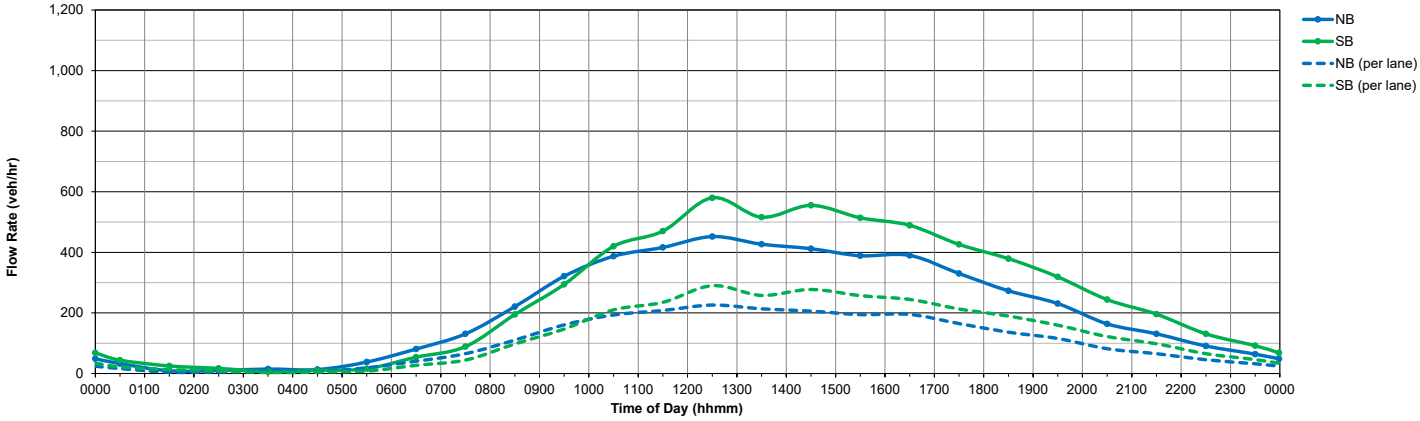
Hourly Volumes - Church St (CR 607) between Ramblewood Pkwy and Birchfield Dr

From	To	03/20/23 Monday NB	03/20/23 Monday SB	03/21/23 Tuesday NB	03/21/23 Tuesday SB	03/22/23 Wednesday NB	03/22/23 Wednesday SB	03/23/23 Thursday NB	03/23/23 Thursday SB	03/24/23 Friday NB	03/24/23 Friday SB	03/25/23 Saturday NB	03/25/23 Saturday SB	03/26/23 Sunday NB	03/26/23 Sunday SB	Avg. Weekday NB	Avg. Weekday SB	Avg. Weekend NB	Avg. Weekend SB
0000	0100	12	24	5	19	22	32	14	29	13	24	33	44	39	69	13	26	36	57
0100	0200	5	7	3	6	3	9	11	9	8	17	9	25	15	34	6	10	12	30
0200	0300	5	5	9	9	9	10	8	6	8	7	10	17	8	16	8	7	9	17
0300	0400	12	6	8	5	9	4	15	9	7	7	15	6	12	14	10	6	14	10
0400	0500	39	5	43	7	41	8	40	9	39	5	13	10	13	11	40	7	13	11
0500	0600	115	40	124	52	103	45	130	48	103	38	38	16	25	14	115	45	32	15
0600	0700	329	145	340	136	384	149	334	139	317	124	81	54	46	42	341	139	64	48
0700	0800	609	327	701	342	686	346	718	369	580	315	131	89	102	70	659	340	117	80
0800	0900	653	464	712	491	759	516	713	479	594	458	221	195	164	154	686	482	193	175
0900	1000	443	373	460	417	474	438	496	398	392	385	321	294	323	290	453	402	322	292
1000	1100	376	365	366	367	413	383	389	368	454	403	387	420	381	422	400	377	384	421
1100	1200	402	433	403	483	390	473	375	432	398	472	416	470	481	477	394	459	449	474
1200	1300	435	487	459	621	353	431	461	557	440	532	452	580	530	611	430	526	491	596
1300	1400	394	530	504	539	467	501	446	518	421	522	427	516	500	623	446	522	464	570
1400	1500	455	604	468	640	463	651	427	580	406	650	412	555	551	624	444	625	482	590
1500	1600	420	883	483	972	459	897	426	909	446	895	389	514	491	624	447	911	440	569
1600	1700	434	1,129	506	1,258	512	1,212	458	1,126	475	1,020	390	489	470	657	477	1,149	430	573
1700	1800	463	1,162	495	1,260	554	1,179	526	1,034	505	956	330	426	485	520	509	1,118	408	473
1800	1900	375	665	445	639	410	650	374	680	404	584	273	379	332	421	402	644	303	400
1900	2000	279	385	326	471	272	446	283	413	287	445	231	319	281	301	289	432	256	310
2000	2100	152	301	157	321	190	323	172	331	155	282	164	244	165	219	165	312	165	232
2100	2200	100	161	119	175	89	157	86	168	122	191	131	196	79	118	103	170	105	157
2200	2300	42	80	59	94	53	89	71	126	98	141	91	131	51	76	65	106	71	104
2300	0000	27	47	34	52	23	46	34	50	56	79	64	92	23	33	35	55	44	63
Sub-total		6,576	8,628	7,229	9,376	7,138	8,995	7,007	8,787	6,728	8,552	5,029	6,081	5,567	6,440	6,936	8,868	5,298	6,261
Total		15,204		16,605		16,133		15,794		15,280		11,110		12,007		15,803		11,559	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

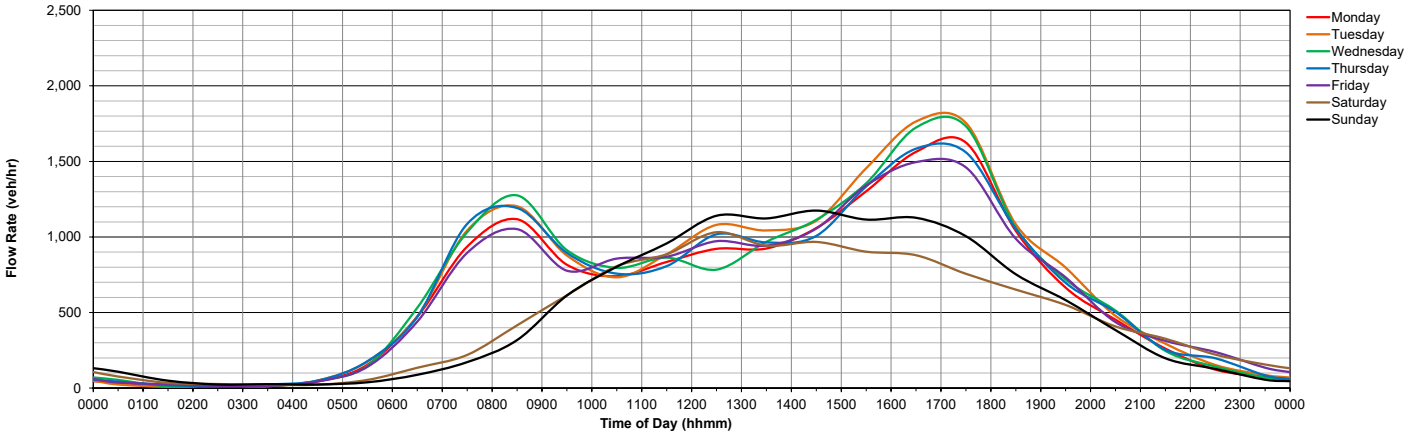
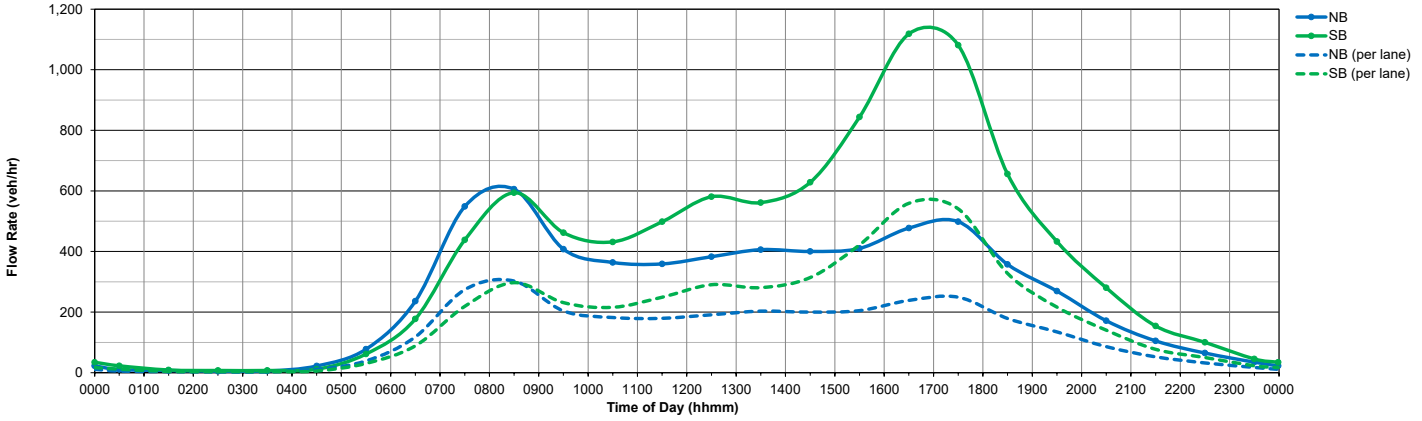


Figure 4
7-Day, 24-Hour Volumes
Church St (CR 607) between Ramblewood Pkwy and Birchfield Dr

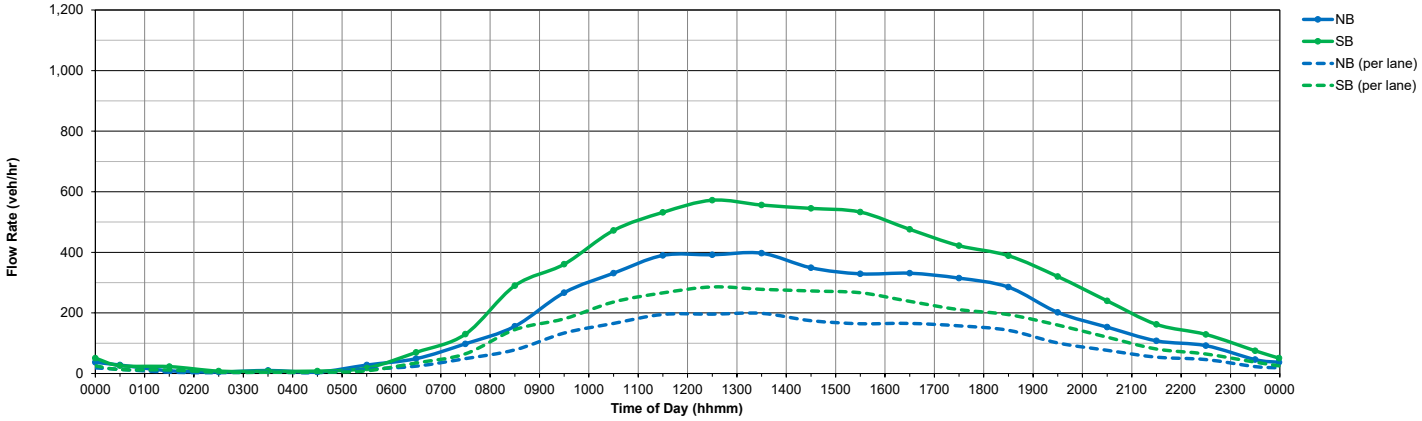
Hourly Volumes - Church St (CR 607) between Academy Dr and Union Mill Rd

		03/20/23 Monday		03/21/23 Tuesday		03/22/23 Wednesday		03/23/23 Thursday		03/24/23 Friday		03/25/23 Saturday		03/19/23 Sunday		Avg. Weekday		Avg. Weekend	
From	To	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
0000	0100	10	19	9	26	9	20	11	23	13	26	28	26	34	42	10	23	31	34
0100	0200	7	7	8	11	6	9	10	7	5	11	9	23	8	21	7	9	9	22
0200	0300	5	7	5	9	5	10	5	5	5	5	5	8	10	10	5	7	8	9
0300	0400	8	6	5	7	6	7	5	11	5	6	10	8	3	10	6	7	7	9
0400	0500	24	11	25	8	22	12	24	16	16	11	5	8	5	9	22	12	5	9
0500	0600	78	61	91	61	70	55	82	72	68	60	28	18	16	13	78	62	22	16
0600	0700	245	166	243	184	237	183	221	180	235	175	49	70	30	44	236	178	40	57
0700	0800	558	415	572	400	634	458	533	471	446	448	98	130	70	115	549	438	84	123
0800	0900	553	522	651	604	674	620	636	640	515	586	156	290	110	197	606	594	133	244
0900	1000	398	404	447	462	433	517	404	485	358	444	267	361	218	300	408	462	243	331
1000	1100	335	383	335	426	373	459	360	427	417	464	331	472	325	459	364	432	328	466
1100	1200	366	491	364	494	379	469	322	515	365	525	390	532	359	508	359	499	375	520
1200	1300	390	523	438	617	296	584	383	586	407	595	392	572	422	578	383	581	407	575
1300	1400	386	554	456	609	419	538	413	533	358	574	397	556	421	583	406	562	409	570
1400	1500	391	599	388	641	412	670	378	560	432	672	349	545	457	595	400	628	403	570
1500	1600	381	824	434	885	375	848	431	839	430	823	329	533	359	631	410	844	344	582
1600	1700	453	1,098	494	1,245	468	1,183	478	1,095	494	973	331	476	364	605	477	1,119	348	541
1700	1800	448	1,069	516	1,284	528	1,126	509	1,014	493	914	315	422	341	484	499	1,081	328	453
1800	1900	357	664	401	665	333	671	323	682	375	597	285	389	257	363	358	656	271	376
1900	2000	252	397	307	471	267	442	247	410	275	445	202	320	192	327	270	433	197	324
2000	2100	177	263	174	268	176	292	175	281	157	299	153	240	152	183	172	281	153	212
2100	2200	90	130	121	143	108	145	93	163	113	190	108	162	73	100	105	154	91	131
2200	2300	43	67	48	84	54	95	78	119	102	136	92	129	40	60	65	100	66	95
2300	0000	26	38	37	39	23	38	33	43	55	70	46	75	29	33	35	46	38	54
	Sub-total	5,981	8,718	6,569	9,643	6,307	9,451	6,154	9,177	6,139	9,049	4,375	6,365	4,295	6,270	6,230	9,208	4,335	6,318
	Total	14,699		16,212		15,758		15,331		15,188		10,740		10,565		15,438		10,653	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

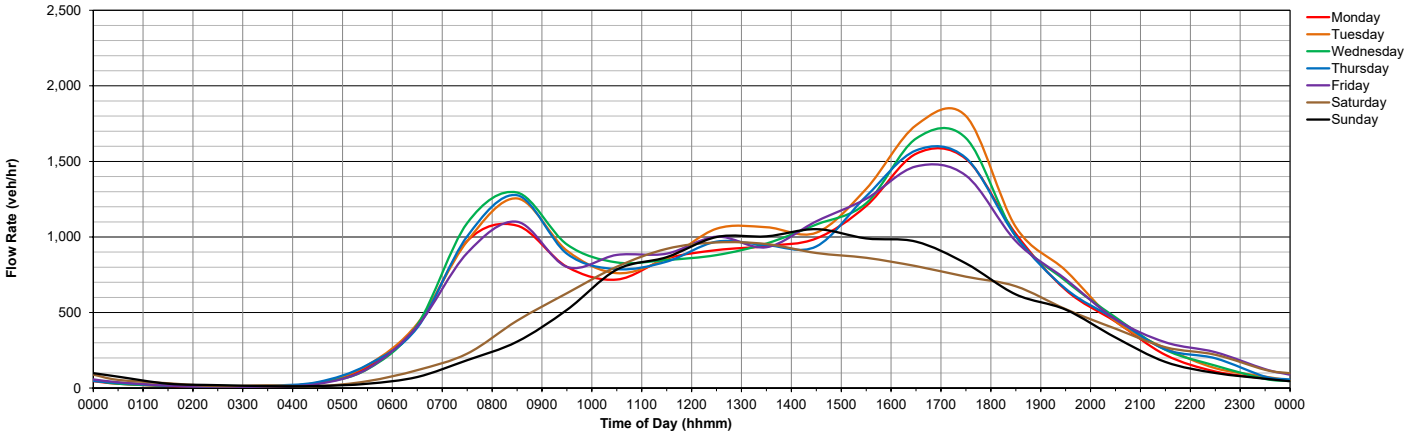
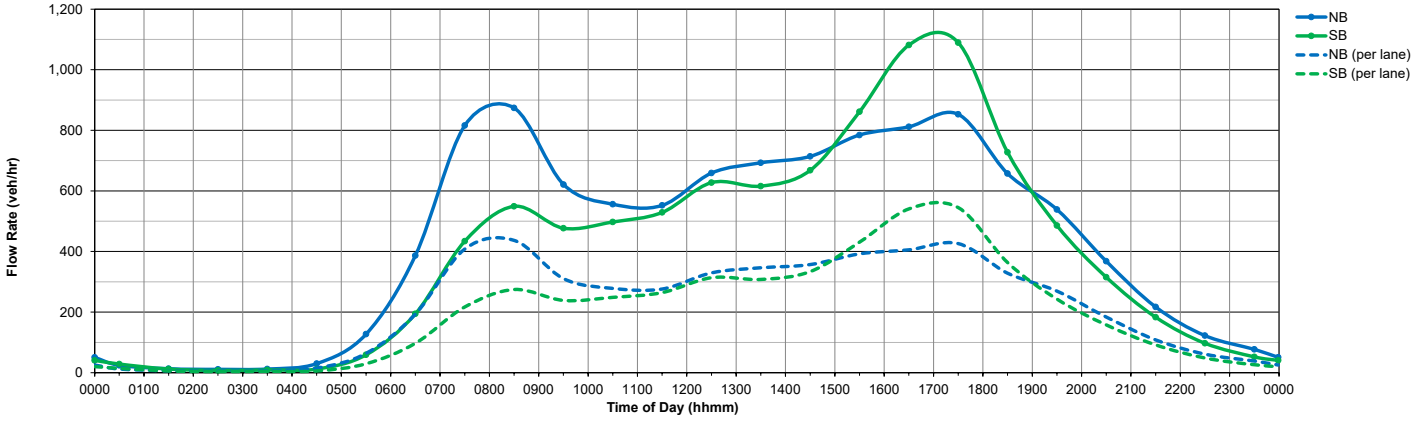


Figure 5
7-Day, 24-Hour Volumes
Church St (CR 607) between Academy Dr and Union Mill Rd

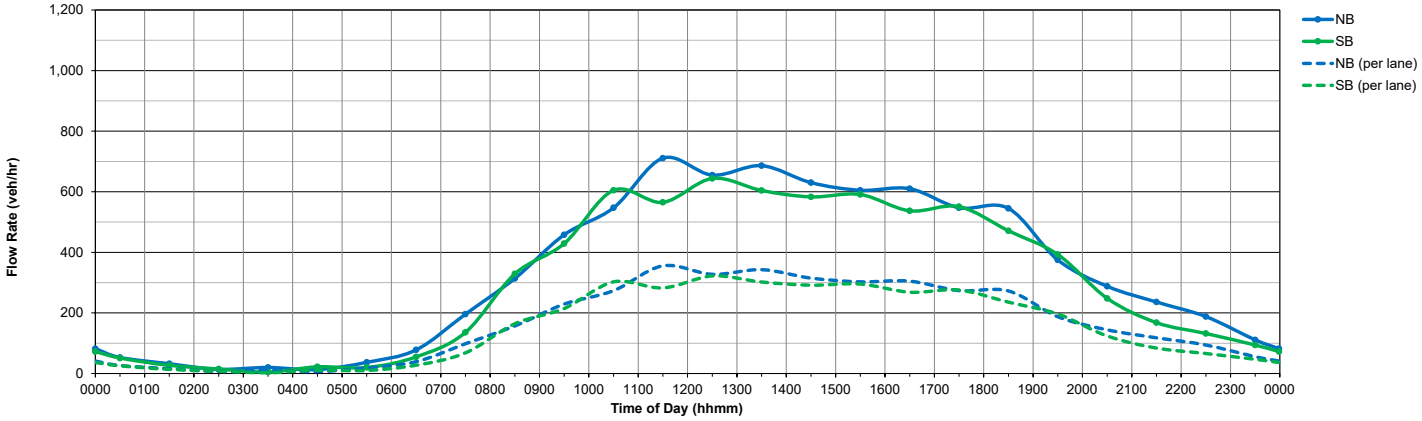
Hourly Volumes - Maple Ave (CR 607) between Greentree Rd (CR 674) and North Locust Ave

From	To	03/20/23 Monday		03/21/23 Tuesday		03/22/23 Wednesday		03/23/23 Thursday		03/24/23 Friday		03/25/23 Saturday		03/26/23 Sunday		Avg. Weekday		Avg. Weekend	
		NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB	NB	SB
0000	0100	23	25	23	31	23	31	25	32	28	25	53	51	58	49	24	29	56	50
0100	0200	17	9	9	16	16	14	13	7	10	14	32	27	28	32	13	12	30	30
0200	0300	11	4	10	9	8	10	14	9	12	5	14	15	22	17	11	7	18	16
0300	0400	12	7	10	12	10	9	15	8	15	10	20	5	15	11	12	9	18	8
0400	0500	32	6	32	21	38	12	25	9	24	13	13	22	14	8	30	12	14	15
0500	0600	115	47	145	67	131	60	141	52	105	69	37	20	24	15	127	59	31	18
0600	0700	390	187	395	213	388	198	403	198	356	176	78	55	56	46	386	194	67	51
0700	0800	815	434	863	432	831	450	810	443	762	412	196	136	122	142	816	434	159	139
0800	0900	820	552	947	558	934	553	895	551	774	532	314	329	294	245	874	549	304	287
0900	1000	564	459	663	494	651	479	643	476	586	477	458	429	403	358	621	477	431	394
1000	1100	514	476	547	488	552	501	516	492	653	532	547	605	572	499	556	498	560	552
1100	1200	559	545	526	563	477	471	589	509	611	558	711	565	664	665	552	529	688	615
1200	1300	673	585	697	679	661	650	592	617	672	607	655	644	779	665	659	628	717	655
1300	1400	622	654	718	637	731	581	732	582	661	626	686	604	744	706	693	616	715	655
1400	1500	703	688	709	723	732	639	661	625	765	665	630	583	730	605	714	668	680	594
1500	1600	804	883	791	928	781	830	777	829	770	838	605	591	676	614	785	862	641	603
1600	1700	851	1,122	803	1,244	792	1,074	810	973	803	995	610	537	592	571	812	1,082	601	554
1700	1800	861	1,127	830	1,216	885	1,096	825	1,055	863	955	547	551	568	505	853	1,090	558	528
1800	1900	690	738	692	805	622	716	623	699	661	680	545	471	526	421	658	728	536	446
1900	2000	566	474	521	496	528	492	543	457	537	510	375	393	420	371	539	486	398	382
2000	2100	355	327	355	294	372	321	363	287	395	348	288	248	314	208	368	315	301	228
2100	2200	197	151	205	175	230	170	214	208	239	213	236	168	181	122	217	183	209	145
2200	2300	94	66	102	85	119	111	111	97	187	127	188	132	81	79	123	97	135	106
2300	0000	58	45	64	52	62	45	63	41	138	79	111	94	76	40	77	52	94	67
Sub-total		10,346	9,611	10,657	10,238	10,574	9,513	10,403	9,256	10,627	9,466	7,949	7,275	7,959	6,994	10,521	9,617	7,954	7,135
Total		19,957		20,895		20,087		19,659		20,093		15,224		14,953		20,138		15,089	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

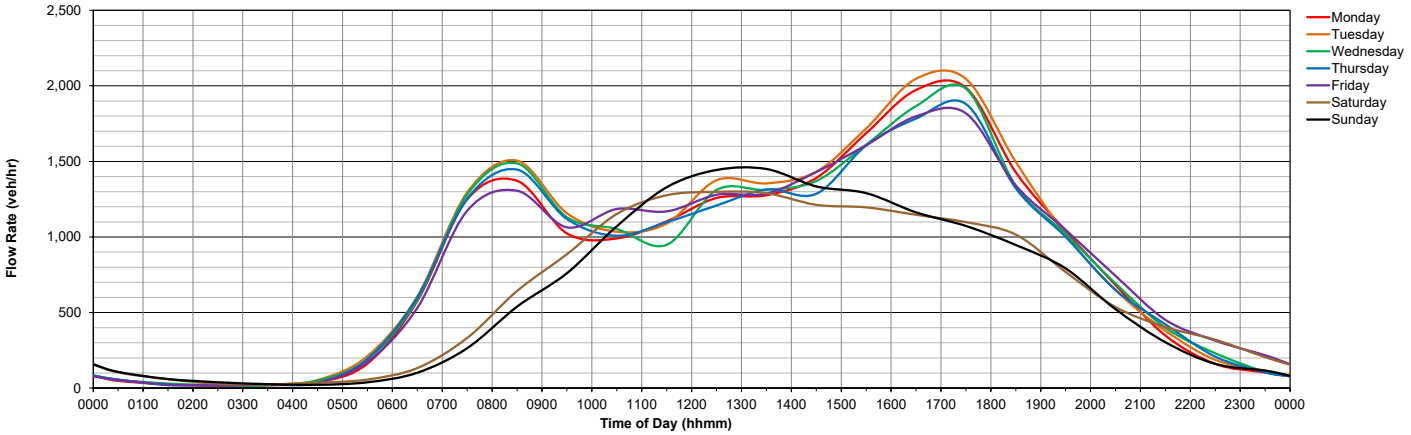
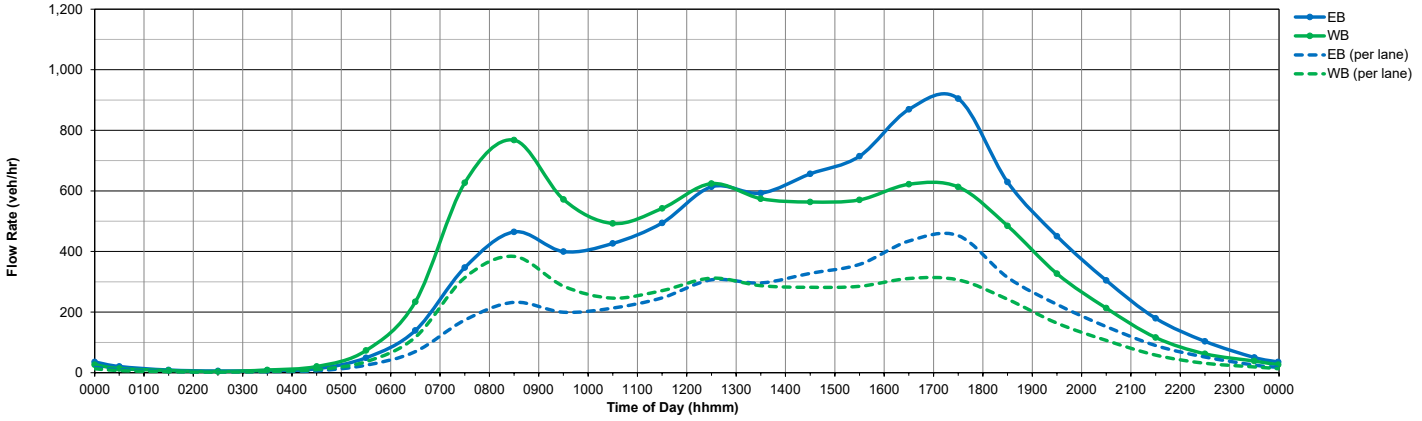


Figure 6
7-Day, 24-Hour Volumes
Maple Ave (CR 607) between Greentree Rd (CR 674) and North Locust Ave

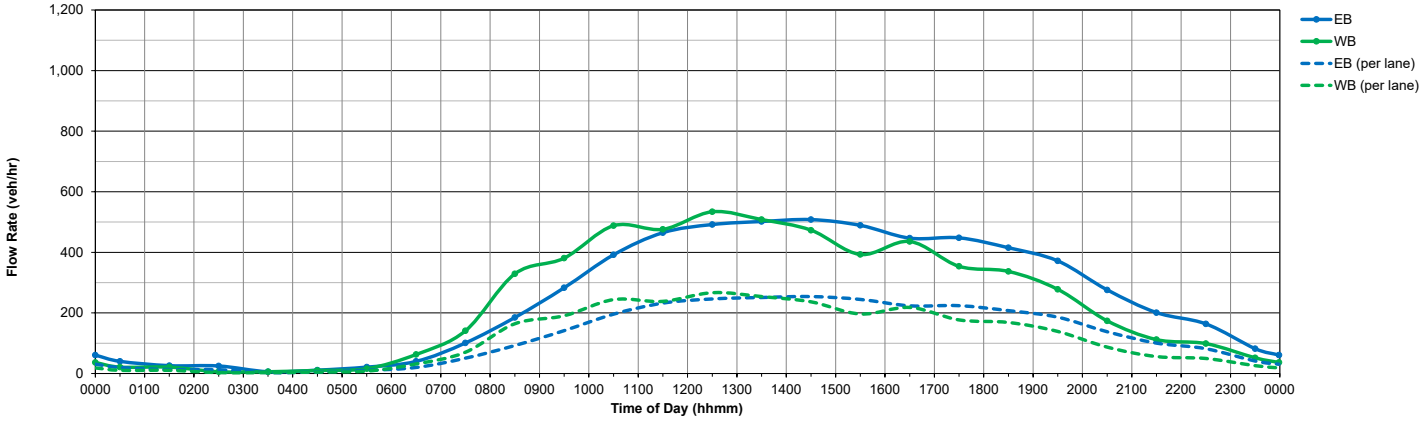
Hourly Volumes - Greentree Rd (CR 674) between Lincoln Dr and Stow Rd

From	To	03/27/23 Monday		03/28/23 Tuesday		03/29/23 Wednesday		03/30/23 Thursday		03/24/23 Friday		03/25/23 Saturday		03/26/23 Sunday		Avg. Weekday		Avg. Weekend	
		EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
0000	0100	14	10	19	17	18	14	28	16	23	13	40	21	60	30	20	14	50	26
0100	0200	4	10	5	9	9	7	9	5	17	5	26	21	30	14	9	7	28	18
0200	0300	5	3	6	3	3	6	6	5	8	3	25	6	10	6	6	4	18	6
0300	0400	5	2	10	11	6	11	11	17	5	4	6	6	11	12	7	9	9	9
0400	0500	12	21	12	19	9	21	18	22	14	20	11	10	3	7	13	21	7	9
0500	0600	48	76	58	77	55	78	45	72	41	63	21	16	16	17	49	73	19	17
0600	0700	138	228	149	250	126	240	146	246	139	207	40	63	28	32	140	234	34	48
0700	0800	329	632	329	675	362	633	396	625	320	571	101	141	67	94	347	627	84	118
0800	0900	452	759	472	784	465	840	496	794	439	662	185	329	164	194	465	768	175	262
0900	1000	403	542	414	576	376	603	433	615	372	524	283	381	255	364	400	572	269	373
1000	1100	401	474	402	512	426	477	471	485	435	515	392	488	325	468	427	493	359	478
1100	1200	481	491	533	514	495	545	477	560	487	602	465	476	436	438	495	542	451	457
1200	1300	593	588	603	634	620	642	570	611	682	647	492	534	439	445	614	624	466	490
1300	1400	574	552	567	551	609	587	632	595	582	587	502	508	513	513	593	574	508	511
1400	1500	653	540	635	538	649	594	631	566	714	580	508	473	549	468	656	564	529	471
1500	1600	708	502	705	566	701	594	757	609	703	582	489	393	508	450	715	571	499	422
1600	1700	811	561	872	627	971	644	885	668	808	610	447	436	451	362	869	622	449	399
1700	1800	845	596	900	601	1,012	675	913	610	854	584	448	354	424	297	905	613	436	326
1800	1900	590	436	628	501	687	483	628	474	614	530	415	337	384	260	629	485	400	299
1900	2000	383	259	418	301	499	377	469	351	485	347	372	278	334	214	451	327	353	246
2000	2100	232	145	330	243	325	217	342	220	294	241	276	174	223	159	305	213	250	167
2100	2200	129	76	177	98	183	112	198	138	211	156	201	112	109	86	180	116	155	99
2200	2300	78	47	76	54	87	61	103	64	174	87	164	99	75	48	104	63	120	74
2300	0000	35	33	39	30	50	40	45	32	83	57	82	52	35	26	50	38	59	39
Sub-total		7,923	7,583	8,359	8,191	8,743	8,501	8,709	8,400	8,504	8,197	5,991	5,708	5,449	5,004	8,448	8,174	5,720	5,356
Total		15,506		16,550		17,244		17,109		16,701		11,699		10,453		16,622		11,076	

Weekday Average Hourly Volumes



Saturday Hourly Volumes



Hourly Volumes by Day

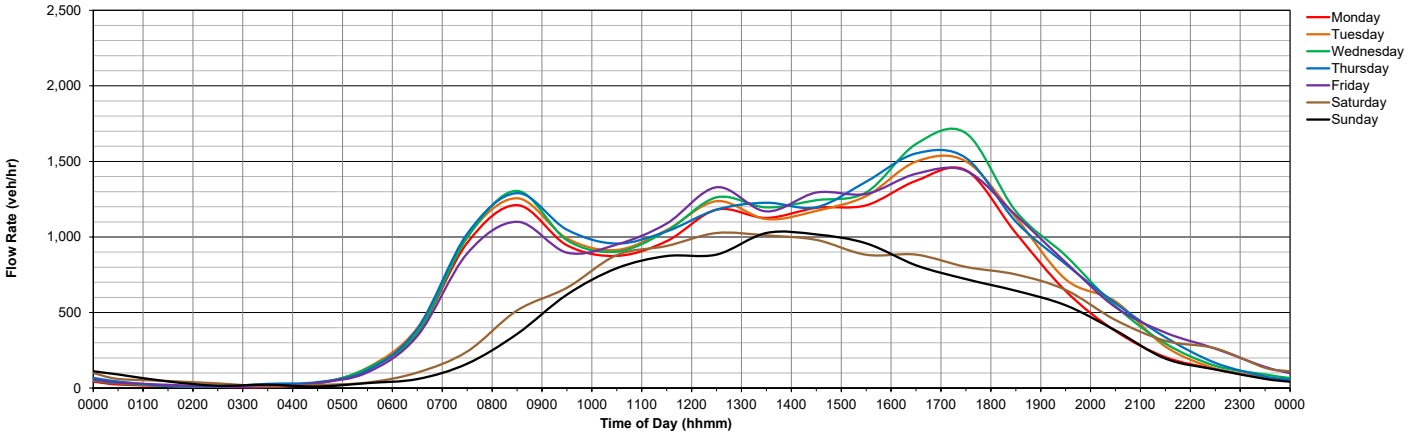


Figure 7
7-Day, 24-Hour Volumes
Greentree Rd (CR 674) between Lincoln Dr and Stow Rd

3.0 SITE SURVEY

Prior to conducting any analysis, a site survey was performed to observe the signal equipment in the cabinet and operation of the traffic signal as well as the geometric, traffic, and signal timing characteristics of each intersection.

3.1 Intersection Observation

A general observation of the interaction between traffic, the signal, and intersection design was also made during the site survey. The purpose of these observations was to note any characteristics (such as low lane utilization) that may not be inferred from any other available data sources but could significantly affect the performance of the new signal timings. Any potential safety hazards observed during the site survey, such as missing, damaged, or obstructed signs, signals, or pavement markings were also noted. All vehicle and pedestrian detectors were observed and tested for proper operation. A summary of those detection issues is included in this report on Figure 13 on page 31. An observation of all signals was conducted during daytime operation under normal weather conditions.

3.2 Summary of Field Observations

The following observations were noted during the site survey:

General Observations

- Several observations were noted during the field notes and a summary is included in Figure 13 on page 31. These include existing pedestrian pushbutton notes, pedestrian signal heads but no crosswalk, poor visibility of pedestrian signal head, faded crosswalk striping, a pushbutton not placing a call, and other operational notes that were considered in this project.
- Volumes were directionally unbalanced by time of day along both roadways on this network. Church Street/Maple Avenue (CR 607) has much heavier northbound volumes during the AM period and heavier southbound volumes during the PM period. On Greentree Road (CR 674), westbound volumes were significantly higher than eastbound during the AM period and eastbound volumes were higher during the PM period.
- The section of signals on Church Street (CR 607) between Pleasant Valley Avenue and Ramblewood Parkway was running in free operation during the AM peak period during both weekday and weekend operations. From Centracs, pattern 22 was being called at these controllers and there was no programming available for these patterns, so the signals defaulted to free operation.

Church Street (CR 607) & NJ Route 38

- During the PM period, westbound and southbound queues did not clear, so experienced cycle failures. Southbound issues were generally caused by the lane configuration for that movement, where vehicles could not get around southbound left-turning vehicles.
- Westbound left-turning vehicles often were metered by the storage on Fellowship Road between Church Street (CR 607) and NJ Route 38. This operation signified that the cycle must be fairly short at this signal as a longer cycle would only result in more vehicles not being able to service due to this short spacing.

Church Street (CR 607) & Fellowship Road (CR 673)

- The inside northbound through lane turns to a left-turn only lane at NJ Route 38 and it was noted on multiple occasions that vehicles did not plan for that and ended up aggressively moving the outside lane to continue straight on CR 607.

Church Street (CR 607) & Pleasant Valley Avenue

- During the AM period, northbound and northbound left-turning vehicles experienced cycle failures during peak times. Due to this signal running in free operation during the AM period, there was poor coordination and interaction between this signal and those to the south. During the PM period, the signals were running

coordination but still experienced occasional cycle failures. Since the inside lane services both the northbound left-turn and northbound through-movement, when even one vehicle was queued to make the left-turn, the northbound through was only effectively operating from one lane, which resulted in reduced capacity.

- The existing timing directive instructed for the controller programming to have the eastbound right-turn lane to call the northbound left-turn phase but this was not set up under existing conditions. Through this project however, this operation was implemented and improved operations. The intent was to allow the heavy volume eastbound right-turn to continue to extend the overlap movement, which is a protected eastbound right-turn arrow that services with the non-conflicting northbound left-turn.
- During the PM period, eastbound queues extended up to approximately 750 feet and took several cycles to clear, especially with the noted issue with the eastbound right-turn did not extend the northbound left-turn phase, so could only service effectively during the eastbound movement and making right turns on red.
- During the AM period, there are heavy NB left-turn volumes, with no left-turn lane to service the vehicles.

Church Street (CR 607) & Gaither Drive

- Similar to the note at Pleasant Valley Avenue, the existing timing directive instructed for the eastbound right turn detector to extend the northbound left-turn phase. Under existing conditions, this was not programmed but was implemented through this project. During the PM period, eastbound right-turn queues extended up to approximately 350 feet and experienced cycle failures.
- The inside northbound lane services both the northbound left-turn and northbound through traffic, so capacity would be significantly reduced when a northbound left-turn vehicle would be waiting to make a permissive left-turn at this signal. This resulted in periodic cycle failures during the PM period.

Church Street (CR 607) & Elbo Lane (CR 612)

- The southbound inside lane services both southbound left-turn and southbound through traffic. The southbound left-turn has heavy volumes during peak periods, especially the PM period, so when there was permissive queues for the southbound left-turn, there was a lot of maneuvers to either enter the left-turn queue or to get around it, resulting in a lot of friction and ultimately, cycle failures.

Church Street (CR 607) & Church Road (CR 616)

- During the AM and PM periods, westbound queues extended up to 550 feet and resulted in cycle failures.
- During the PM period, southbound left-turn queues extended up to 300 feet, which is beyond the left-turn storage bay and blocked the southbound inside through lane.

Church Street (CR 607) & Greentree Road (CR 674)

- During all time periods expect the AM period, the existing timings at this intersection had a different cycle length programmed than the rest of the system. This resulted in inconsistent arrivals and departures and added delays and stops on the network. The signal timings programmed did not match those on the timing directive for existing conditions.
- During the AM period, westbound queues extended to the previous intersection at Church Road (CR 616), resulting in consistent cycle failures.
- During the PM period, eastbound queues extended up to approximately 600 feet and resulted in cycle failures.
- Poor lane utilization was noted for the eastbound and westbound movements. This looked to be caused by the transition either from or to the two-lane section to the west of this signal and that vehicles were positioning to be able to make turns onto Evesboro-Medford Road (CR 618) or Church Road (CR 616), which are the two signals to the east.

Greentree Road (CR 674) & Church Road (CR 616)

- Poor lane utilization was noted for both the eastbound and westbound movements at this intersection. The eastbound outside lane drops to a right-turn only shortly beyond the signal. For westbound traffic, vehicles significantly favored the inside lane.
- This signal was operating in free operation at all times under existing conditions due to the existing programming in the controller. This resulted in inconsistent interactions with the surrounding signals.

Greentree Road (CR 674) & Stow Road

- During the PM period, there was a significant queue southbound at this intersection, with a high percentage of heavy vehicles. This was a short-term issue and looked to be a release shortly after typical business hours, so was caused by vehicles leaving the business park.
- Poor lane utilization was observed for the westbound movement at this intersection. This was the result of the westbound dropping from two lanes down to one approximately 300 feet west of Stow Road.

Greentree Road (CR 674) & East Lincoln Drive

- Poor lane utilization was observed for the eastbound movement since the eastbound lanes drop from two lanes down to one lane approximately 400 feet east of this intersection.
- During peak periods, especially the weekend midday peak period, westbound left-turn queues extended up to 250 feet and resulted in cycle failures.
- Eastbound queues extended up to 500 feet, which is close to the intersection at NJ Route 73. Blocking of that intersection was not observed but it was within 100 feet of doing so.

Greentree Road (CR 674) & NJ Route 73

- Volumes at this intersection are clearly higher along NJ Route 73 instead of Greentree Road (CR 673) and the priority must be placed on moving traffic along the state route. The cycle length and characteristics are significantly different than those on Greentree Road (CR 673) as well, so it would not be logical to try to coordinate the Burlington County signals with this intersection.
- This signal runs in adaptive signal control with signals both the north and south on NJ Route 73.

4.0 SIGNAL TIMING IMPLEMENTATION

4.1 Model Development

The basic link-node structure of the roadway network was built in Synchro on a coordinate-specific, Bing Maps image of roads provided within Synchro. This type of reference ensures precise intersection placement as well as proper link curvature and length. Node numbers (intersection IDs) were based on the numbering system from Burlington County's Centracs system.

Once all existing geometric, volume, and signal timing data were coded into the models and general field observations were completed, new signal timings were developed.

4.2 Basic Signal Timing Parameters

The basic timing parameters, such as minimum green, yellow change, red clearance, vehicle extension, recall mode, walk time, and pedestrian clearance (flashing don't walk), were reviewed and updated as necessary for each traffic signal phase. These parameters are discussed in greater detail below. All clearance intervals were calculated for all intersections.

Minimum Green

Minimum values were reviewed and updated, as necessary. In general, minimum greens were maintained with their existing values but were updated for several locations due to detection layout and consistency along the network. Each minimum green was reviewed to ensure its appropriateness.

Yellow Change and Red Clearance Intervals

The yellow change and red clearance intervals were calculated from equations provided by the NJDOT Traffic Engineering Division as follows:

$$\text{Total Clearance (TC)} = t + \frac{V}{2a} + \frac{w+L}{V}$$

t = perception-reaction time (s)
V = approach speed (ft/sec)
a = deceleration rate (ft/sec^2)
w = width of intersection (stop bar to furthest conflict point)
L = length of vehicle

Yellow time for each movement is calculated based on the approach posted speed limit, with one second per 10 mph and rounded up to the nearest whole number. If speeds vary on the concurrent approaches, the higher value is utilized, and the concurrent phases have matching yellow and red intervals. The red interval is then calculated by subtracting the yellow interval from the Total Clearance equation shown above and rounded up the nearest whole number. The recommended value was also backchecked utilizing the ITE standards. If there were significant differences, adjustments were made.

Walk Time

A value of seven seconds was used for all pedestrian movements on this system. This was based on 2009 MUTCD requirements and each movement was reviewed to ensure the value utilized was appropriate.

Pedestrian Clearance (Flashing Don't Walk)

The length of this interval is a function of the crosswalk length, pedestrian push button distance from the curb, and a standard pedestrian walking speed of 3.5 ft/s. MUTCD guidelines were utilized in calculating appropriate flashing don't walk times.

For specific information, the existing and implemented timing directives and summary timing sheets can be found on the project website. All clearance measurements and calculations for both vehicle and pedestrian movements are provided on the project website.

4.3 Phasing

During the optimization process, it may be determined that the basic phasing structure of an intersection should be changed or further evaluated to improve the operation and/or safety of the intersection or corridor. No such recommendations are being presented for this system.

4.4 Day Plan Schedules

The process of determining the day plan schedule is primarily based on the 7-day, 24-hour traffic volume counts and engineering judgment. Figure 8 through Figure 10 on pages 17 – 19 illustrates the existing and implemented day plan schedules.

EXISTING SCHEDULES
Church St (CR 607)
Weekday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1	NJ Route 38	[NJDOT Adaptive System]																								
2	Fellowship Rd	[NJDOT Adaptive System]																								
143	Pleasant Valley Rd	254 [Free]								22 [FREE][B]			10 [105]					13 [115]				10 [105]				254 [Free]
103	Gaither Dr	254 [Free]								22 [FREE][B]			10 [105]					13 [115]				10 [105]				254 [Free]
210	Elbo Ln	254 [Free]								22 [FREE][B]			10 [105]					13 [115]				10 [105]				254 [Free]
115	Ramblewood Pkwy	254 [Free]								22 [FREE][B]			10 [105]					13 [115]				10 [105]				254 [Free]
142	Birchfield Dr	254 [Free]								16 [120]			10 [105]					13 [115]				10 [105]				254 [Free]
198	Yorktown Dr/Laurel Acres Park Dr	254 [Free]								16 [120]			10 [105]					13 [115]				10 [105]				254 [Free]
113	Academy Dr	254 [Free]								16 [120]			10 [105]					13 [115]				10 [105]				254 [Free]
67	Church Rd/Union Mill Rd	254 [Free]								16 [120]			10 [105]					13 [115]				10 [105]				254 [Free]
101	Greentree Rd (CR 674)	254 [Free]								16 [120]			10 [100][A]					13 [110][A]				10 [100][A]				254 [Free]
17	Locust Ave	254 [Free]								16 [120]			10 [105]					13 [115]				10 [105]				254 [Free]

Notes:
A - Note that #101 cycle is not consistent with surrounding signals
B - Note that Zone 101 had Centracs scheduler calling Pattern 22, which was not defined in local controllers, so all four signals were running in free operation during this time period

IMPLEMENTED SCHEDULES
Church St (CR 607)
Weekday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1	NJ Route 38	[NJDOT Adaptive System]																								
2	Fellowship Rd	[NJDOT Adaptive System]																								
143	Pleasant Valley Rd	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
103	Gaither Dr	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
210	Elbo Ln	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
115	Ramblewood Pkwy	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
142	Birchfield Dr	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
198	Yorktown Dr/Laurel Acres Park Dr	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
113	Academy Dr	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
67	Church Rd/Union Mill Rd	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
101	Greentree Rd (CR 674)	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
17	Locust Ave	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]

Notes:

EXISTING SCHEDULES
Greentree Rd (CR 674)
Weekday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
13	NJ Route 73	[NJDOT Adaptive System]																								
180	Lincoln Dr	254 [Free]								16 [120]			10 [105]					13 [115]				10 [105]				254 [Free]
202	Stow Rd	254 [Free]								16 [120]			10 [105]					13 [115]				10 [105]				254 [Free]
101	Maple Ave (CR 607)	254 [Free]								16 [120]			10 [100][A]					13 [110][A]				10 [100][A]				254 [Free]
160	Evesboro-Medford Rd (CR 618)	254 [Free]								16 [120]			10 [105]					13 [115]				10 [105]				254 [Free]
171	Church Rd (CR 616)	254 [Free][B]																								

Notes:
A - Note that #101 cycle is not consistent with surrounding signals
B - Programmed to run coordinated signal timings but runs in free since day plan not defined in database scheduler
C - Note that Zone 101 had Centracs scheduler calling Pattern 22, which was not defined in local controllers, so all four signals were running in free operation during this time period

IMPLEMENTED SCHEDULES
Greentree Rd (CR 674)
Weekday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
13	NJ Route 73	[NJDOT Adaptive System]																								
180	Lincoln Dr	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
202	Stow Rd	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
101	Maple Ave (CR 607)	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
160	Evesboro-Medford Rd (CR 618)	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]
171	Church Rd (CR 616)	254 [Free]								16 [120]			13 [110]					17 [120]				14 [110]				254 [FREE]

Notes:

LEGEND
A white box indicates FREE operation, a shaded box indicates coordinated operation.
The first number specifies the pattern, the second number [in brackets] is the cycle length (s).
Darker shades represent a longer cycle length.

Figure 8
Weekday Day Plan Schedules
Church St (CR 607) & Greentree Rd (CR 674)

EXISTING SCHEDULES
Church St (CR 607)
Saturday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1	NJ Route 38	[NJDOT Adaptive System]																								
2	Fellowship Rd	[NJDOT Adaptive System]																								
143	Pleasant Valley Rd	254 [Free]								22 [FREE][B]				10 [105]					13 [115]			10 [105]				254 [Free]
103	Gaither Dr	254 [Free]								22 [FREE][B]				10 [105]					13 [115]			10 [105]				254 [Free]
210	Elbo Ln	254 [Free]								22 [FREE][B]				10 [105]					13 [115]			10 [105]				254 [Free]
115	Ramblewood Pkwy	254 [Free]								22 [FREE][B]				10 [105]					13 [115]			10 [105]				254 [Free]
142	Birchfield Dr	254 [Free]								16 [120]				10 [105]					13 [115]			10 [105]				254 [Free]
198	Yorktown Dr/Laurel Acres Park Dr	254 [Free]								16 [120]				10 [105]					13 [115]			10 [105]				254 [Free]
113	Academy Dr	254 [Free]								16 [120]				10 [105]					13 [115]			10 [105]				254 [Free]
67	Church Rd/Union Mill Rd	254 [Free]								16 [120]				10 [105]					13 [115]			10 [105]				254 [Free]
101	Greentree Rd (CR 674)	254 [Free]								16 [120]				10 [100][A]					13 [110][A]			10 [100][A]				254 [Free]
17	Locust Ave	254 [Free]																								

Notes:
A - Note that #101 cycle is not consistent with surrounding signals
B - Note that Zone 101 had Centracs scheduler calling Pattern 22, which was not defined in local controllers, so all four signals were running in free operation during this time period

IMPLEMENTED SCHEDULES
Church St (CR 607)
Saturday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1	NJ Route 38	[NJDOT Adaptive System]																								
2	Fellowship Rd	[NJDOT Adaptive System]																								
143	Pleasant Valley Rd	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
103	Gaither Dr	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
210	Elbo Ln	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
115	Ramblewood Pkwy	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
142	Birchfield Dr	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
198	Yorktown Dr/Laurel Acres Park Dr	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
113	Academy Dr	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
67	Church Rd/Union Mill Rd	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
101	Greentree Rd (CR 674)	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
17	Locust Ave	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]

Notes:

EXISTING SCHEDULES
Greentree Rd (CR 674)
Saturday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
13	NJ Route 73	[NJDOT Adaptive System]																								
180	Lincoln Dr	254 [Free]																								
202	Stow Rd	254 [Free]								16 [120]				10 [105]					13 [115]			10 [105]				254 [Free]
101	Maple Ave (CR 607)	254 [Free]								16 [120]				10 [100][A]					13 [110][A]			10 [100][A]				254 [Free]
160	Evesboro-Medford Rd (CR 618)	254 [Free]								16 [120]				10 [105]					13 [115]			10 [105]				254 [Free]
171	Church Rd (CR 616)	254 [Free][B]																								

Notes:
A - Note that #101 cycle is not consistent with surrounding signals
B - Programmed to run coordinated signal timings but runs in free since day plan not defined in database scheduler

IMPLEMENTED SCHEDULES
Greentree Rd (CR 674)
Saturday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
13	NJ Route 73	[NJDOT Adaptive System]																								
180	Lincoln Dr	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
202	Stow Rd	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
101	Maple Ave (CR 607)	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
160	Evesboro-Medford Rd (CR 618)	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]
171	Church Rd (CR 616)	254 [Free]									10 [100]				15 [110]						10 [100]					254 [Free]

Notes:

LEGEND
A white box indicates FREE operation, a shaded box indicates coordinated operation.
The first number specifies the pattern, the second number [in brackets] is the cycle length (s).
Darker shades represent a longer cycle length.

Figure 9
Saturday Day Plan Schedules
Church St (CR 607) & Greentree Rd (CR 674)

EXISTING SCHEDULES
Church St (CR 607)
Sunday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1	NJ Route 38	[NJDOT Adaptive System]																								
2	Fellowship Rd	[NJDOT Adaptive System]																								
143	Pleasant Valley Rd	254 [Free]								22 [FREE][B]				10 [105]				13 [115]			10 [105]					254 [Free]
103	Gaither Dr	254 [Free]								22 [FREE][B]				10 [105]				13 [115]			10 [105]					254 [Free]
210	Elbo Ln	254 [Free]								22 [FREE][B]				10 [105]				13 [115]			10 [105]					254 [Free]
115	Ramblewood Pkwy	254 [Free]								22 [FREE][B]				10 [105]				13 [115]			10 [105]					254 [Free]
142	Birchfield Dr	254 [Free]								16 [120]				10 [105]				13 [115]			10 [105]					254 [Free]
198	Yorktown Dr/Laurel Acres Park Dr	254 [Free]								16 [120]				10 [105]				13 [115]			10 [105]					254 [Free]
113	Academy Dr	254 [Free]								16 [120]				10 [105]				13 [115]			10 [105]					254 [Free]
67	Church Rd/Union Mill Rd	254 [Free]								16 [120]				10 [105]				13 [115]			10 [105]					254 [Free]
101	Greentree Rd (CR 674)	254 [Free]								16 [120]				10 [100][A]				13 [110][A]			10 [100][A]					254 [Free]
17	Locust Ave	254 [Free]																								

Notes:
A - Note that #101 cycle is not consistent with surrounding signals
B - Note that Zone 101 had Centracs scheduler calling Pattern 22, which was not defined in local controllers, so all four signals were running in free operation during this time period

IMPLEMENTED SCHEDULES
Church St (CR 607)
Sunday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
1	NJ Route 38	[NJDOT Adaptive System]																								
2	Fellowship Rd	[NJDOT Adaptive System]																								
143	Pleasant Valley Rd	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
103	Gaither Dr	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
210	Elbo Ln	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
115	Ramblewood Pkwy	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
142	Birchfield Dr	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
198	Yorktown Dr/Laurel Acres Park Dr	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
113	Academy Dr	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
67	Church Rd/Union Mill Rd	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
101	Greentree Rd (CR 674)	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
17	Locust Ave	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]

Notes:

EXISTING SCHEDULES
Greentree Rd (CR 674)
Sunday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
13	NJ Route 73	[NJDOT Adaptive System]																								
180	Lincoln Dr	254 [Free]																								
202	Stow Rd	254 [Free]								16 [120]				10 [105]				13 [115]			10 [105]					254 [Free]
101	Maple Ave (CR 607)	254 [Free]								16 [120]				10 [100][A]				13 [110][A]			10 [100][A]					254 [Free]
160	Evesboro-Medford Rd (CR 618)	254 [Free]								16 [120]				10 [105]				13 [115]			10 [105]					254 [Free]
171	Church Rd (CR 616)	254 [Free][B]																								

Notes:
A - Note that #101 cycle is not consistent with surrounding signals
B - Programmed to run coordinated signal timings but runs in free since day plan not defined in database scheduler

IMPLEMENTED SCHEDULES
Greentree Rd (CR 674)
Sunday

		12 am	1 am	2 am	3 am	4 am	5 am	6 am	7 am	8 am	9 am	10 am	11 am	12 pm	1 pm	2 pm	3 pm	4 pm	5 pm	6 pm	7 pm	8 pm	9 pm	10 pm	11 pm	12 am
13	NJ Route 73	[NJDOT Adaptive System]																								
180	Lincoln Dr	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
202	Stow Rd	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
101	Maple Ave (CR 607)	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
160	Evesboro-Medford Rd (CR 618)	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]
171	Church Rd (CR 616)	254 [Free]										10 [100]				15 [110]					10 [100]					254 [Free]

Notes:

LEGEND
A white box indicates FREE operation, a shaded box indicates coordinated operation.
The first number specifies the pattern, the second number [in brackets] is the cycle length (s).
Darker shades represent a longer cycle length.

Figure 10
Sunday Day Plan Schedules
Church St (CR 607) & Greentree Rd (CR 674)

4.5 Pattern Optimization

The list below summarizes each time period that was modeled and analyzed for this system and the overall peak hour that was determined from the volumes collected for this project. Within the network, however, each signal was optimized using volumes from its own individual peak hour within the period for which the pattern was designed to operate instead of the overall peak hour.

Time-of-Day	Abbreviation	Pattern No.	Network Peak Hour
Weekday AM Peak	AM	16	7:45 am – 8:45 am
Weekday Midday Peak	MD	13	12:15 pm – 1:15 pm
Weekday PM Peak	PM	17	4:30 pm – 5:30 pm
Weekday PM Off-peak	PO	14	6:15 pm – 7:15 pm
Weekend AM Peak	WA	10	9:30 am – 10:30 am
Weekend Midday Peak	WM	15	11:30 am – 12:30 pm
Weekend PM Peak	WP	10	5:30 pm – 6:30 pm

Cycle lengths were developed in an effort to balance optimal progression along both Church Street (CR 607) and Greentree Road (CR 674) and to limit the delay experienced by pedestrians and side street traffic. Under existing conditions, several intersections were running in free operation. Greentree Road (CR 674) & Church Road (CR 616) was running free under existing conditions during all time periods while Church Street (CR 607) & Locust Avenue was running free during the identified weekend time periods. Also, the four signals on Church Street (CR 607) between Pleasant Valley Avenue and Ramblewood Parkway were running in free operation during the AM and weekend AM (WA) time periods. At these intersections, cycle lengths were selected in an effort to make the adjustment to coordinated timings as unnoticeable as possible to typical drivers on the network.

The existing cycle lengths for the coordinated signals along both Church St (CR 670) and Greentree Rd (CR 674) were generally slightly increased across the weekday time periods, while they were generally decreased across weekend time periods.

4.6 Phase Sequences

Phase sequence diagrams illustrate the phasing at each intersection as well as the sequences that are used with existing and implemented timing patterns. Phase sequence diagrams are shown in Figure 14 through Figure 17 on pages 32 – 35. For this project, there were no changes in phase sequence from existing to implemented conditions.

4.7 Pre-Implementation Memorandum

Once all timings were developed, the proposed timings were summarized in a series of figures and sent to Burlington County representatives for review. Initial timing directives were created reflecting the proposed timings and simple summary timing sheets were also developed to match the programming style and terminology in each controller. The provided Pre-Implementation Memorandum is included in the Report folder on the project website. An implementation plan was proposed to Burlington County and the consultant team then gained approval for implementation by Burlington County. This was to be done while schools were still in full session to ensure the traffic volumes would not be lower than normal for implementation.

5.0 SIGNAL TIMING IMPLEMENTATION

5.1 Controller Programming

After the basic timing parameters were updated, optimized signal timings were developed, and an updated day plan schedule was created, this information was coded into database files and tested with coordination diagnostic tools and test controllers where possible. The Burlington County Centracs ATMS platform was used to download the timing parameters to the Econolite Cobalt controllers that are utilized on this network. Once each database was tested successfully, each database was downloaded to the local controllers on Wednesday, June 7, 2024. Following the initial downloads, the signals were observed for proper operation and each controller was observed to address any issues that could have occurred during the data transfer. During the download process, Iteris placed a temporary timing sheet and timing directive in each cabinet. This was done to alert any maintenance providers that there was an active retiming project underway and noted that the files would be replaced with final timing directives at the project conclusion.

5.2 Fine-Tuning of Signal Timings

Each new timing plan was observed at each intersection at some point during its respective peak hour to ensure each phase split was appropriate for the traffic conditions present. At some intersections, fine-tuning may consist of simply increasing or decreasing a split for one or more phases. If a movement or intersection is over capacity, split adjustments may be required to manage queue spillback and blockage.

In addition to fine-tuning splits, offset adjustments often have a larger effect on the performance of the network. Offset adjustments at coordinated intersections were determined by conducting travel time runs along the corridor. Travel time runs were conducted using Tru-Traffic (v 10.0). Tru-Traffic, in conjunction with a direct connect GPS unit, tracks the location of the test vehicle within the traffic signal system. Because the software uses the actual traffic signal timing settings and an actual vehicle in the traffic stream, this fine-tuning tool can be powerful. This also provides the user dynamic information about the performance of the traffic signal system such as travel time and delay. Results of the travel time runs under existing signal timings (the “before” runs) and implemented signal timings (the “after” runs) are discussed in Section 6.4 of this report.

The fine-tuning process for this project took place over the course of a week and all signals were observed for proper and optimal operation during each time period, including the off-peak pattern on both Saturdays and Sundays. All changes to the proposed timings presented in the Pre-Implementation Memorandum were documented and updated in each model, timing sheet and timing directive. Once fine-tuning was completed and timings were finalized, timing directives were thoroughly reviewed for accuracy to match the controller programming and were placed in each local cabinet for reference during any maintenance visit that may occur in the future. The changes made during fine-tuning for this project were minor and included offset and phase allocation adjustments to balance optimal progression and side street operations.

Following the completion of fine-tuning, final timing directives and summary timing sheets were updated to reflect the new timings in each controller and on Centracs. Those files were placed in each physical cabinet and old directives were marked to denote that they are now outdated. For this project, Iteris also worked with Burlington County to rectify Centracs to ensure the final timings are stored on their ATMS platform

6.0 TRAFFIC OPERATIONS ANALYSIS

Operations analysis was conducted, using the traffic models, on each of the periods with existing signal timings. This analysis established a benchmark by which traffic operations with implemented signal timings are compared. In addition to the models, travel time runs were conducted in the field to specifically measure the change in travel time and delay on the primary corridors of Church St (CR 607) and Greentree Rd (CR 674).

6.1 Intersection Performance Measures

Synchro (v11) was used to determine the delay (in seconds per vehicle) for each lane group as well as the delay and level of service (LOS) for the intersection. SimTraffic was used to determine the delay for each movement and the intersection by averaging five, one-hour simulations. The intersection capacity utilization (ICU) was also determined for each intersection. The delay, LOS, and ICU for each intersection can be found in Figure 18 through Figure 53 on pages 36 – 71.

The figures illustrate traffic operations at the same intersection for the various periods and scenarios analyzed. The top row illustrates each period with existing hourly volumes. The second row illustrates each period with existing signal timings. The third row illustrates each period with implemented signal timings. The bottom row, if present, summarizes traffic operations for each period if recommended capacity improvements are made at the intersection. These recommended improvements are described in Section 8.2 of this report. This arrangement allows easy comparison of operations across all periods and scenarios.

In general, intersections may experience an increase in overall intersection delay when 1) the cycle length is significantly adjusted from its optimal cycle length to provide coordination, 2) green times are allocated with the objective of providing maximum progression on the major street or 3) green times are allocated to prevent queue spillback and blockage. Table 1, below, summarizes the number of intersections that experienced an increase or decrease in overall intersection delay during each period.

Table 1 – Summary of Changes in Intersection Delay

Number of intersections where:	AM	MD	PM	PO	WA	WM	WP
delay decreased	13	14	14	15	14	14	15
delay increased ≤ 5 sec/veh	3	4	3	3	4	3	3
delay increased > 5 sec/veh	2	0	1	0	0	1	0

Table 2 – Intersection(s) where Delay Increased Greater than Five Seconds per Vehicle

Intersection	Period	Existing Delay (s/veh) - LOS	Implemented Delay (s/veh) - LOS
Maple Ave/Church St (CR 607) & Church Rd (CR 616) & Union Mill Rd	AM	31 - C	37 - D
Church St (CR 607) & Birchfield Dr	PM	8 - A	14 - B
Greentree Rd (CR 674)/Hainesport-Mt Laurel Rd (CR 674) & Church Rd (CR 616)	AM	15 - B	22 - C
	WM	13 - B	20 - C

While delay largely decreased across all periods, there are three intersections where delay increased more than five seconds per vehicle during at least one peak period. These are addressed individually below but clearances were generally increased, which results in added delay but improves safety on the network. Maple Avenue/Church Street (CR 607) & Church Road (CR 674) & Union Mill Road show a delay increase in the AM period. Priority was given to coordination along Maple Avenue/Church Street (CR 607) during this time period, which caused added delay for the CR 616 movements, increasing the overall intersection delay. At the intersection of Church Street (CR 607) & Birchfield Drive, an increase in delay occurred during the PM period. During this time period, the cycle length was increased from the existing condition, which can increase delay. The delay at Greentree Road (CR 674)/Hainesport-Mt Laurel Road (CR 674) & Church Road (CR 616) increased during both the AM and weekend midday periods. During both of these time periods, the increase in delay was due to switching from free operation to coordinated operation. Coordinated operation can increase delay at a single intersection which decreasing delay for the whole corridor. The locations where delay increased slightly generally is caused by several factors, including increased clearance intervals, and converting a signal from free operation to coordinated operation. Free operation may result in reduced delay at single intersection but when coordinated across a network, delay is decreased for the overall system.

6.2 Network Performance Measures

While the figures in Section 6.1 summarize performance of each individual intersection by delay, LOS, and ICU, the tables in this section combine and summarize four performance measures for all intersections in the network: total delay, total stops, total travel time, and total fuel consumption. The tables also summarize the percent reduction of each measure, which illustrates the overall improvement to the network with the implemented signal timings. The performance measures were calculated (not field-measured) by two separate models, Synchro and SimTraffic. The models summarize data for all vehicles in the network. Network performance measures developed by Synchro and SimTraffic can be found below.

Table 3 – Church St (CR 607) & Greentree Rd (CR 674) Synchro Network Performance Measures

	AM Peak			MD Peak			PM Peak			PM Off-peak		
	Existing	Implemented	Difference	Existing	Implemented	Difference	Existing	Implemented	Difference	Existing	Implemented	Difference
Total Delay (hr)	320	271	-15.3%	182	175	-3.8%	495	428	-13.5%	162	151	-6.8%
Total Stops	22,969	21,372	-7.0%	18,524	17,603	-5.0%	31,252	29,537	-5.5%	16,578	15,193	-8.4%
Total Travel Time (hr)	639	590	-7.7%	462	455	-1.5%	888	821	-7.5%	413	402	-2.7%
Fuel Consumed (gal)	967	914	-5.5%	735	720	-2.0%	1,271	1,202	-5.4%	664	642	-3.3%
	Weekend AM Peak			Weekend MD Peak			Weekend PM Peak					
	Existing	Implemented	Difference	Existing	Implemented	Difference	Existing	Implemented	Difference			
Total Delay (hr)	123	116	-5.7%	184	175	-4.9%	130	115	-11.5%			
Total Stops	12,545	12,360	-1.5%	18,514	17,283	-6.6%	13,557	12,693	-6.4%			
Total Travel Time (hr)	337	330	-2.1%	463	454	-1.9%	352	337	-4.3%			
Fuel Consumed (gal)	537	530	-1.3%	744	725	-2.6%	569	550	-3.3%			

Table 4 – Church St (CR 607) & Greentree Rd (CR 674) SimTraffic Network Performance Measures

	AM Peak			MD Peak			PM Peak			PM Off-peak		
	Existing	Implemented	Difference	Existing	Implemented	Difference	Existing	Implemented	Difference	Existing	Implemented	Difference
Total Delay (hr)	325	302	-7.1%	178	172	-3.4%	600	533	-11.3%	149	142	-4.5%
Total Stops	20,021	18,887	-5.7%	15,158	14,104	-7.0%	28,505	27,108	-4.9%	13,167	12,302	-6.6%
Total Travel Time (hr)	810	788	-2.7%	603	588	-2.6%	1,179	1,137	-3.6%	532	521	-2.2%
Fuel Consumed (gal)	666	658	-1.1%	553	539	-2.6%	838	838	0.0%	498	489	-1.7%
	Weekend AM Peak			Weekend MD Peak			Weekend PM Peak					
	Existing	Implemented	Difference	Existing	Implemented	Difference	Existing	Implemented	Difference			
Total Delay (hr)	118	117	-1.2%	180	177	-1.9%	127	119	-6.0%			
Total Stops	10,671	10,307	-3.4%	15,140	14,356	-5.2%	11,019	10,570	-4.1%			
Total Travel Time (hr)	446	443	-0.5%	609	604	-0.9%	472	464	-1.9%			
Fuel Consumed (gal)	424	420	-1.0%	563	557	-1.1%	452	447	-1.1%			

The overall network performance measures improved during all time periods in both Synchro and SimTraffic. The most significant benefits are realized during the AM and PM peak periods, which have the highest volumes.

Over the expected five-year life of the project and based upon calculated values, the implemented signal timing is estimated to reduce delay by 182,300 hours (11.0%), stops by over 8 million (6.1%), and fuel consumption by 219,000 gallons (4.0%). Based on the fuel savings above, the implemented signal timing is estimated to reduce carbon dioxide emissions by 1,900 metric tons over the life of the project. That estimate is calculated utilizing an equation developed by the US Environmental Protection Agency and factors in a number of the measures from Synchro.

6.3 Time-Space Diagrams

Time-space diagrams can be used as a tool for fine-tuning splits and offsets and maximizing corridor bandwidth and progression. Time-space diagrams for each of the implemented patterns for each roadway are included on the project website. These diagrams show the designed progression for each roadway and the relationship between intersections across the network.

6.4 Travel Time Runs

As stated in Section 2.5, travel time runs were conducted as a fine-tuning tool. In addition to fine-tuning, travel time runs also provide the analyst field-measured metrics such as delay and travel time reductions. While only travel time and delay are summarized here, information on other measures such as the number of stops, stopped delay, and average speed can be found on the project website.

Travel time runs for both directions on both Church Street (CR 607) and Greentree Road (CR 674) were conducted before and after the new signal timings were implemented. The average of the "existing" runs was compared to the average of the "implemented" runs to determine travel time savings on the corridor. These performance data are field-measured and apply only to vehicles on the main corridor. Figure 11 through Figure 12 on page 25 - 26 illustrate the average cumulative travel time on each corridor for each direction with existing and implemented signal timings. The tables at the top of these figures summarize the average travel time and delays with existing and implemented signal timings and the percent change in those measurements.

Along Church Street (CR 607), travel time runs were completed between NJ Route 38 and Locust Avenue. In the northbound direction, weekday travel times decreased by up to 80 seconds (21.1%) and weekend travel times decreased by up to 43 seconds (13.5%). In the southbound direction, weekday travel times decreased by up to 96 seconds (25.5%) and weekend travel times decreased by up to 12 seconds (4.2%).

Along Greentree Road (CR 674), travel time runs were completed between NJ Route 73 and Church Road (CR 616). In the eastbound direction, weekday travel times decreased by up to 68 seconds (40.2%) and weekend travel times decreased by up to 92 seconds (45.3%). In the westbound direction, weekday travel times decreased by up to 128 seconds (55.9%) and weekend travel times decreased by up to 100 seconds (46.7%).

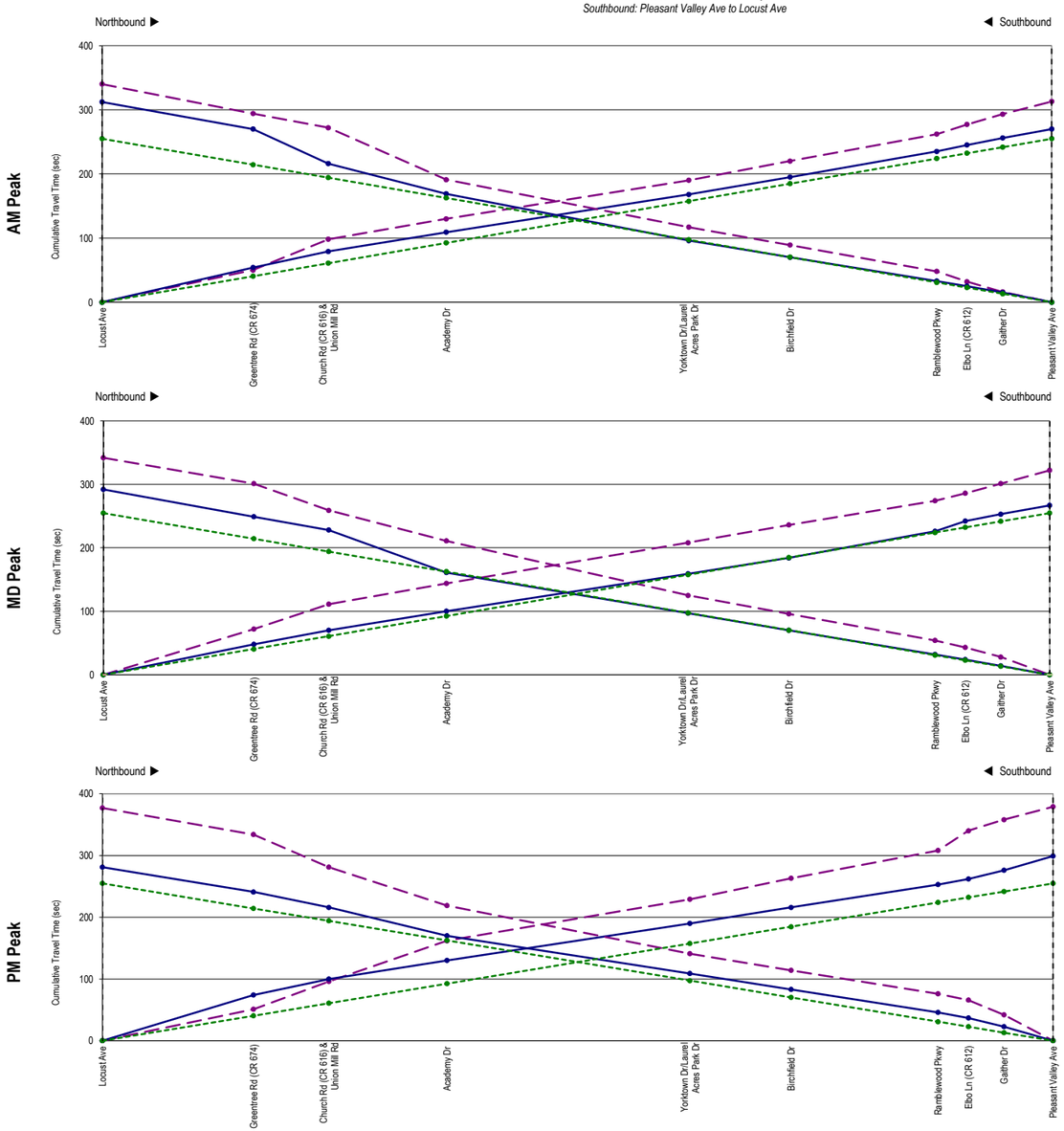
During the travel time runs under both existing and implemented conditions, dash cam video was collected. Those videos were then processed into several comparison videos detailing the improvements across the network. Those videos are available on the project website and were developed for both the northbound and southbound directions of the AM and PM peak periods on Church St (CR 607). They were also developed for the eastbound and westbound directions of the AM and PM peak periods of Greentree Rd (CR 674).

Average Total Travel Time & Delay

Maple Ave: 2.8 miles

		AM Peak		MD Peak		PM Peak		PM Off-peak		Weekend AM Peak		Weekend MD Peak	
		Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)
Northbound	Existing	313	58	322	67	379	124	327	72	292	37	318	63
	Implemented	270	15	267	12	299	45	283	28	274	20	275	20
	Difference	-43		-55		-80		-44		-18		-43	
	% Difference	-13.7%	-74.1%	-17.1%	-82.1%	-21.1%	-64.5%	-13.5%	-61.1%	-6.2%	-48.6%	-13.5%	-68.3%
Southbound	Existing	340	86	342	87	377	122	373	118	289	34	292	37
	Implemented	312	57	292	37	281	26	294	39	277	22	290	35
	Difference	-28		-50		-96		-79		-12		-2	
	% Difference	-8.2%	-32.6%	-14.6%	-57.5%	-25.5%	-78.7%	-21.2%	-66.9%	-4.2%	-35.3%	-0.7%	-5.4%

Northbound: Locust Ave to Pleasant Valley Ave
Southbound: Pleasant Valley Ave to Locust Ave

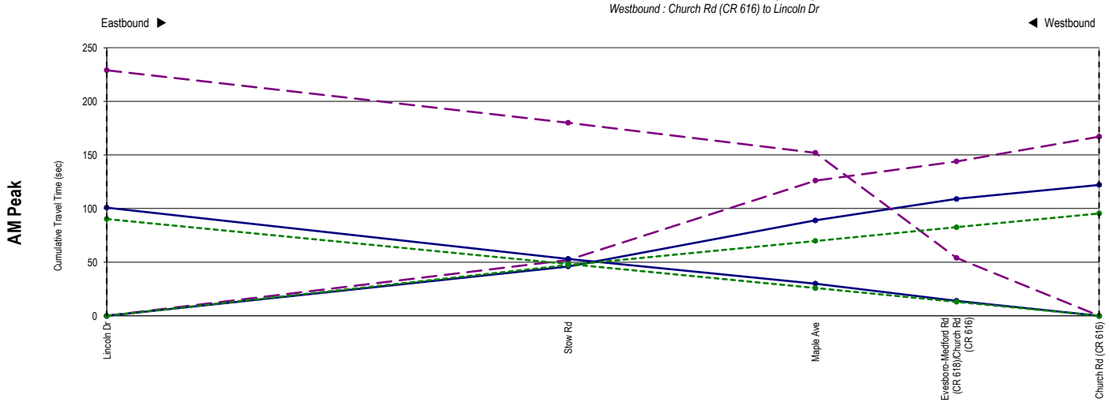


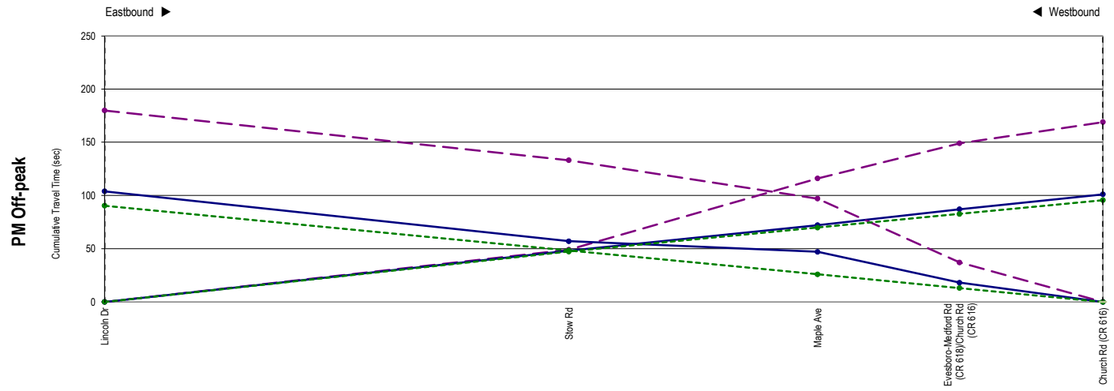
Average Total Travel Time & Delay

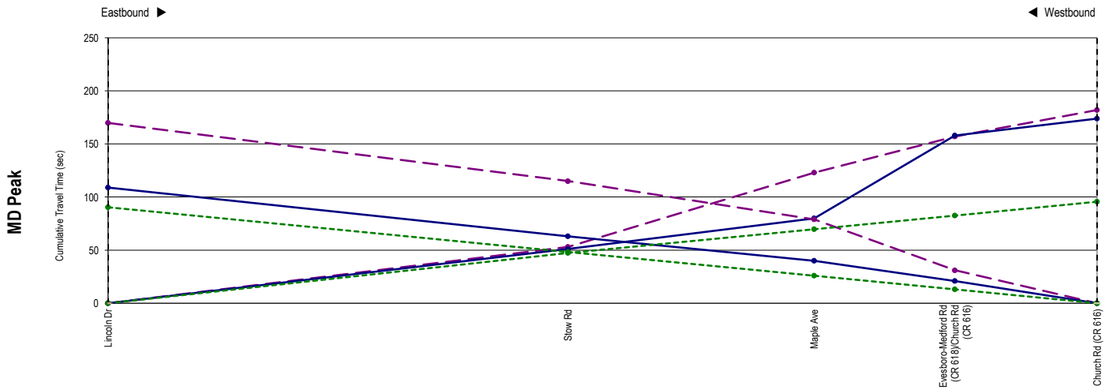
Greentree Rd (CR 674): 1.1 miles

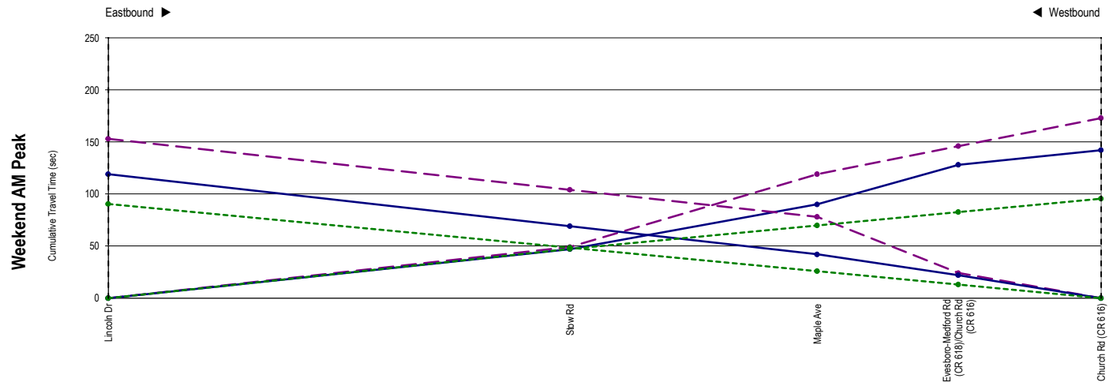
		AM Peak		MD Peak		PM Peak		PM Off-peak		Weekend AM Peak		Weekend MD Peak	
		Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)	Travel Time (s)	Delay (s)
Eastbound	Existing	167	71	182	87	170	74	169	74	173	78	203	107
	Implemented	122	26	174	78	158	63	101	5	142	47	111	15
	Difference	-45		-8		-12		-68		-31		-92	
	% Difference	-26.9%	-63.4%	-4.4%	-9.2%	-7.1%	-16.2%	-40.2%	-91.9%	-17.9%	-39.7%	-45.3%	-86.0%
Westbound	Existing	229	139	170	79	184	94	180	89	153	63	214	124
	Implemented	101	11	109	18	119	28	104	13	119	29	114	24
	Difference	-128		-61		-65		-76		-34		-100	
	% Difference	-55.9%	-92.1%	-35.9%	-77.2%	-35.3%	-69.1%	-42.2%	-85.4%	-22.2%	-54.0%	-46.7%	-80.6%

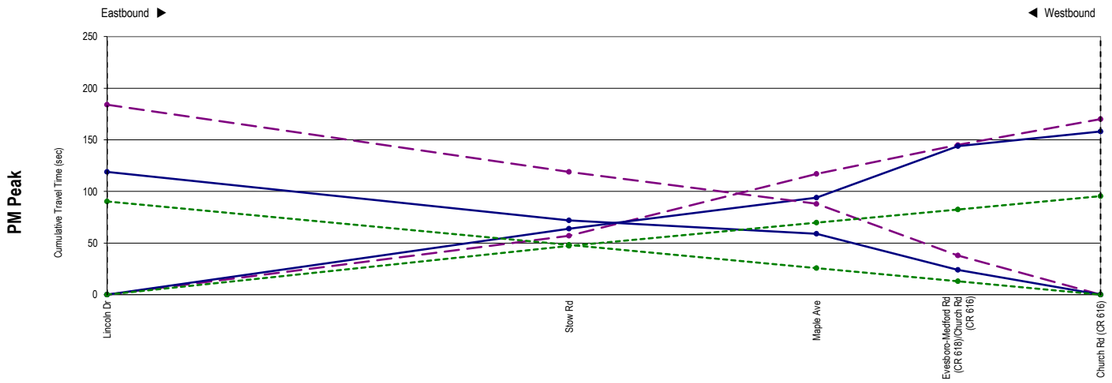
Eastbound : Lincoln Dr to Church Rd (CR 616)
Westbound : Church Rd (CR 616) to Lincoln Dr

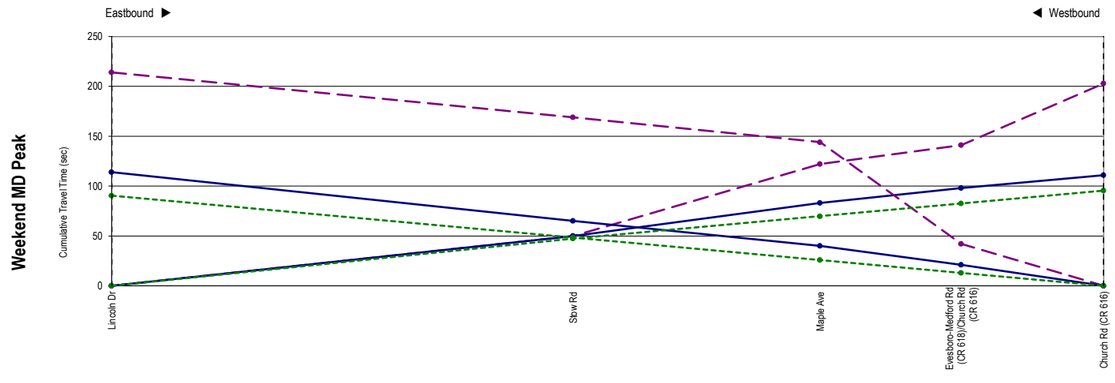












Existing
Implemented
Free Flow

Figure 12
Average Travel Time & Delay
Greentree Rd (CR 674)

7.0 TRAFFIC SIGNAL RETIMING BENEFIT-COST ANALYSIS

The purpose of this analysis is to establish a project's merit by economically quantifying the benefits and costs associated with the project over its lifetime. According to the ITE, "signal retiming is a beneficial method for maintaining efficient traffic signal operations" and "is the most cost-effective technique to reduce congestion, improve air quality, and potentially reduce accidents." The following discusses the methodology used to determine the benefits and costs of implementing new signal timings at the intersections within the scope of this project.

There are two types of benefits as they relate to transportation improvements. User benefits, or direct benefits, are enjoyed directly by travelers and are determined by a reduction in three distinct travel costs: travel time costs, operating costs, and crash costs. The second type of benefit is non-user benefits, or indirect benefits. These benefits include environmental impacts, air quality, and reduced motorist frustration.

While improved signal timing reduces certain types of crashes, it is difficult to determine the actual reduction without collecting several years of data. Therefore, this analysis assumes the number of crashes will remain constant throughout the life of the project. However, it should be noted that the implemented signal timing and updated clearance intervals may reduce the frequency of some types of crashes at all intersections. Studies reported by the Federal Highway Administration have shown that total crashes are reduced by an average of 15% through retiming; and right-angle crashes reduced by an average of 25% to 32%.

7.1 Travel Time & Operations Benefit-Cost Analysis

Travel time benefits were calculated by modeling delay with existing and implemented signal timings during each hour modeled within Synchro. Each pattern modeled analyzes only the single peak hour for each time period, so benefits were also estimated for non-peak hours during which implemented timings are in coordinated operation. The total delay was multiplied by a value-of-time and auto occupancy to determine the total weekly benefit as a result of reduction in travel time as shown in Table 5 below. The value of time is determined from the Consumer Price Index while the heavy vehicle percentage of two percent on this system was estimated based on the turning movement count data collected in this project, which includes volume counts by classification.

Table 5 – Weekly Benefit for Change in Travel Time Costs – Church St (CR 607) & Greentree Rd (CR 674)

Delay (h)	AM	MD	PM	PO	WA	WM	WP
Existing Timings	320	182	495	162	123	184	130
Implemented Timings	271	175	428	151	116	175	115
Change	-49	-7	-67	-11	-7	-9	-15
Estimated Change during other hours				-81			-16
Total Daily Change				-215			-47
Total Weekly Change in Delay				-1,075			-93

	Auto	Truck
Vehicle Type	98%	2%
Value-of-Time ($/hr) [1] [2]	$11.48	$118.75
Auto Occupancy [1]	1.25	1.00
Total	$16,435	$2,775
Weekly Benefit for Change in Travel Time Costs		**$19,210**

[1] *Taken from* Urban Mobility Report, *Texas Transportation Institute, 2012 and adjusted based on Consumer Price Index for May 2024*

[2] *Adjusted for trip type per AASHTO* User Benefit Analysis for Highways, *2003*

Benefits for the reduction in operating costs were calculated by modeling fuel consumption within Synchro with existing and implemented signal timings during each peak hour and estimating fuel consumption during non-peak hours. The total change in fuel consumption was multiplied by the twelve-month average fuel cost from the US Energy Information Administration (EIA) for the Central Atlantic Region where this corridor is located. The weekly benefit for change in operating costs is shown in Table 6 on page 28.

Table 6 – Weekly Benefit for Change in Operating Costs – Church St (CR 607) & Greentree Rd (CR 674)

Fuel Consumption (gal)	AM	MD	PM	PO	WA	WM	WP
Existing Timings	967	735	1,271	664	537	744	569
Implemented Timings	914	720	1,202	642	530	725	550
Change	-53	-15	-69	-22	-7	-19	-19
Estimated Change during other hours				-94			-25
Total Daily Change				-253			-70
Total Weekly Change				-1,265			-139
Fuel Cost [3]							$3.53
Weekly Benefit for Change in Operating Costs							**$4,956**

[3] *52-week average fuel cost, US Energy Information Administration Gasoline Prices for the Central Atlantic Region, June 2024 - www.eia.gov*

Based on the previous tables, the total weekly benefit is $24,166.

In order to calculate the total lifetime benefit present value, it was assumed the life of this project will be five years even though the benefit should long outlive that period. As with most of estimates made in the benefit section, the analysis used conservative values, so actual benefits are likely much higher. A discount rate of 3% was used for this estimate. It was also assumed that 100% of the total daily benefit will be realized in Year 1. However, as traffic volumes change, the benefits will decrease. Therefore, benefits in subsequent years are reduced by 20% each year. Table 7 summarizes the present values of annual benefits.

Table 7 – Present Value of Annual Benefits

Year	Annual Benefit Present Value
Year 1	$1,237,610
Year 2	$961,250
Year 3	$699,940
Year 4	$453,035
Year 5	$219,920

The present value of total lifetime benefits based on the table above is approximately $3,571,800.

Costs

The total cost to conduct all the tasks for the intersections within the scope of this project was $110,245.

Benefit-Cost Ratio

Comparing the anticipated benefits from savings in travel time and operating costs to the overall project costs, the anticipated benefit-cost ratio for this project is 32:1.

8.0 RECOMMENDATIONS

8.1 Recommendations for Safety Improvements

Based on the field observations in Section 2.0, the following improvements are recommended to mitigate potentially hazardous conditions.

General

- Consider reviewing the list of observations provided in this report and reviewing them with a maintenance provider. The notes include faded crosswalks, inconsistent signage and detection observations. The primary improvement would be to provide added consistency to how pedestrians are serviced along the network.

Greentree Road (CR 673) & East Lincoln Drive

- Consider installing modern pedestrian facilities with Walk and Countdown signal heads for the pedestrian movements this intersection. This would improve safety and provide consistency for pedestrians through the network. Currently, there are only push for green buttons and the arrows pointing to the crosswalk are confusing as to which direction they are intended to work for.

8.2 Recommendations for Capacity and Operational Improvements

Beyond optimizing traffic signal timing, other improvements such as additional capacity can further improve the performance of an intersection and roadway network. Additional consideration should be given to improvements required by future traffic growth and costs of right-of-way, design, construction, etc. However, these considerations are not included in the scope of this project.

Church Street (CR 607) & Church Street (CR 616)/Union Mill Road

- Consider extending the marked southbound left-tun storage area. The existing turn bay is painted, so this would only require restriping. Under existing conditions, when the queues extends beyond the turn bay, vehicles tend to extend into the adjacent through lane instead of into the painted median.

General

- As this system continues to develop in the future, consider the impact any changes may have to the signal timings for activities such as replacing controllers, upgrading equipment, new developments, or any roadway adjustments.

9.0 APPENDIX

Included in the Appendix within this report are as follows:

- Field Notes Summary with detailed list of detection and operational issues found during project (Figure 13)
- Phase Sequence Diagrams (Figure 14 – Figure 17)
- Traffic Operations Analysis figures (Figure 18 – Figure 53)

Documents included on the project website:

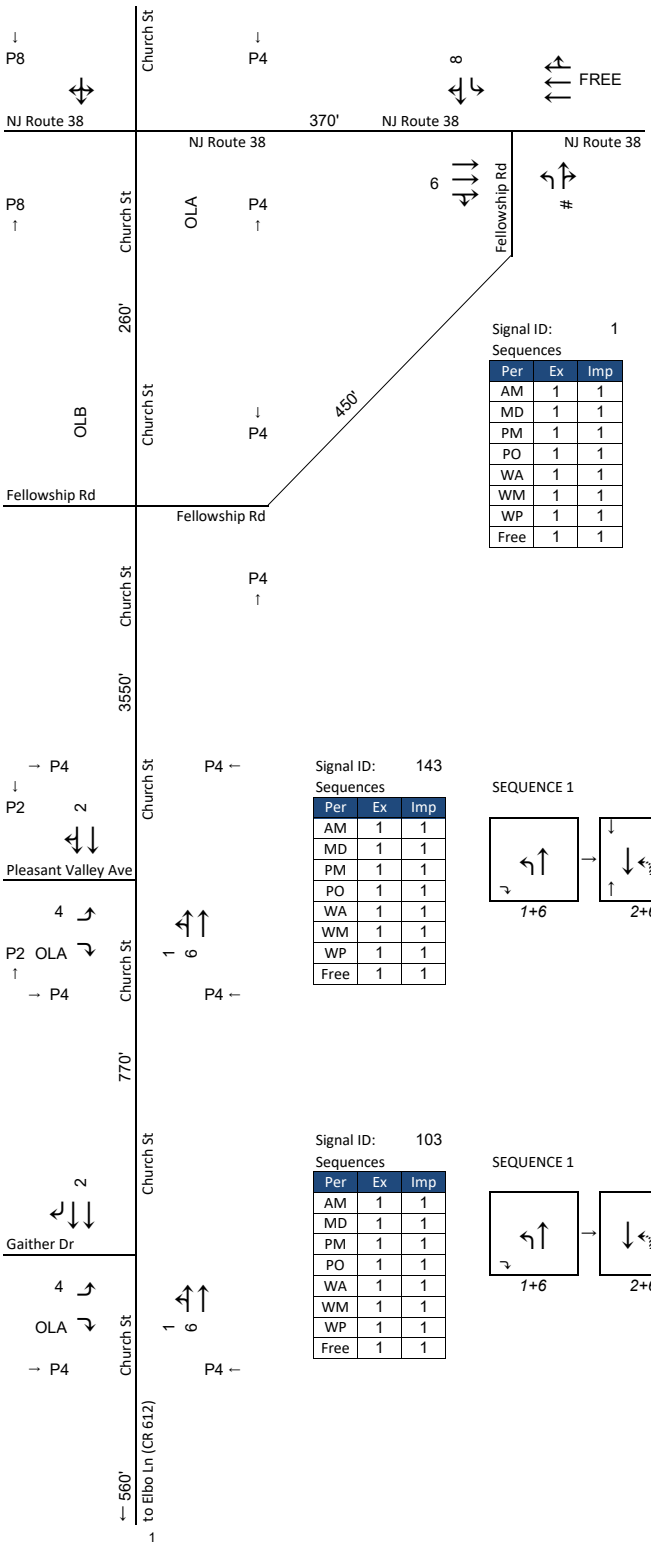
- 7-day, 24-hour directional raw volume counts
- Turning movement counts
- Clearance calculations
- Existing and implemented timing sheets
- Existing and implementing timing directives
- Intersection cabinet, approach, and aerial photographs
- Field notes
- Synchro models with existing and implemented signal timings and report files
- Tru-Traffic files and travel time reports displaying time-space diagrams with implemented signal timings
- Travel time run comparison videos
- Final report

Full NJ Signal Retiming Project URL is as follows:
https://iterisinc1.sharepoint.com/sites/CS-Ext-NJSignalTiming

Individual Project page under Project Page section:
Church St (CR 607) & Greentree Rd (CR 673) – Burlington County

Please note that permissions must be manually added to access SharePoint website, so please direct any requests for access to Brian Jatzke at bjatzke@iteris.com.

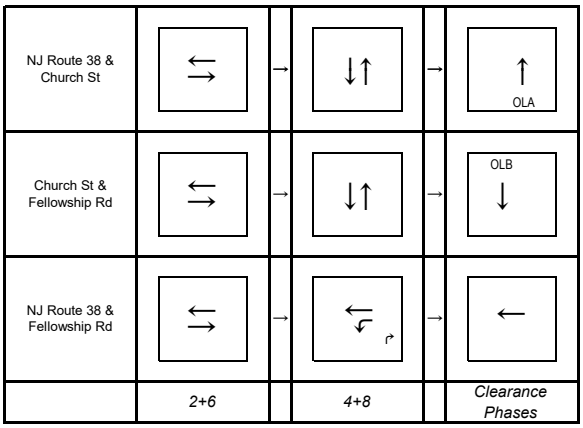
ID	Intersection	Date of Last Observation	Controller Type	Notes and observations from Field Notes *Directionality Notes: CR 607 assumed North-South and CR 674 assumed East-West throughout network*
1	NJ Route 38 & Church St (CR 674)	06/04/2024	Naztec TS2	NJDOT Signal, running adaptive operation. Modeled utilizing base background timings from NJDOT provided timing directive. No main street detection. Note this signal essentially runs three intersections in the model, first the main intersection, while also Fellowship Rd and also the spur intersection to the east on Route 38.
143	Church St (CR 674) & Pleasant Valley Rd	06/29/2024	Econolite Cobalt	Controller status said 'Traffic Responsive Mode' under existing operations. During project, had this change to TOD mode. No crosswalk for eastbound pedestrian movement but there are buttons and facilities supporting that movement. No pedestrian instructions signs for Pedestrian Phase 4 on Northeast corner. Pedestrian phase 2 is in recall and CNA, so no buttons and will service each cycle regardless of demand. Under existing conditions, eastbound right-turn detector only called phase 4. During project, had that detector also start to call phase 1 so it can extend the overlap when appropriate.
103	Church St (CR 674) & Gaither Dr	06/29/2024	Econolite Cobalt	Pedestrian pushbutton did not place call in controller for either eastbound pedestrian buttons. This was addressed in project. Detectors for phases 1 (NBLT), 2 (SB) and 6 (NB) had constant call. Southbound pedestrian crosswalk faded. This was addressed in project. under existing conditions, eastbound right-turn detector only called phase 4. During project, had that detector also start to call phase 1 so it can extend the overlap when appropriate.
210	Church St (CR 674) & Elbo Ln	06/29/2024	Econolite Cobalt	Westbound outside signal head over left turn lane gives impression vehicles can make right turn from both lanes, so leads to some confusion. Under existing conditions, westbound right-turn detector only called phase 4. During project, had that detector also start to call phase 5 so it can extend the overlap when appropriate.
115	Church St (CR 674) & Ramblewood Pkwy	06/29/2024	Econolite Cobalt	All detection OK but cabinet has clearly been hit and is dented significantly. Cabinet can still open and close, just dented on front. No countdown for pedestrian movement on northeast corner but WALK indication is working OK.
142	Church St (CR 674) & Birchfield Dr	06/29/2024	Econolite Cobalt	Pedestrian phase 4 was not servicing at time of observation due to programming in controller. This was addressed within this project.
198	Church St (CR 674) & Yorktown Dr/Laurel Acres Park Dr	06/29/2024	Econolite Cobalt	Pedestrian buttons call both phases 2 and 6 or phases 4 and 8 instead of just one phase. Not necessarily an issue but could result in longer than needed clearance time when pedestrian is actuated. Westbound approach was reconstructed over the course of this project. Was under construction during October 2023 field notes.
113	Church St (CR 674) & Academy Dr	06/29/2024	Econolite Cobalt	Constant call on phases 3 (EBLT) and 8 (EB), looks like it was caused by shadows in the detection zone. Pedestrian clearance times seem short given time given during our field notes. This was addressed within this project.
67	Church St (CR 674) & Church Rd/Union Mill Rd	06/29/2024	Econolite Cobalt	No crosswalk painted for northbound pedestrian movement so took best estimate for measurements. Should review the line of site for pedestrians making the westbound movement for the head on the northwest corner.
101	Church St (CR 674) & Greentree Rd (CR 674)	06/29/2024	Econolite Cobalt	Significant distance between pedestrian pushbuttons and the actual crossing start, so considered in WALK time calculation. No pedestrian pushbuttons for NB+SB pedestrian movements, so serve in recall and serve each cycle regardless of actuation.
17	Church St (CR 674) & Locust Ave	06/29/2024	Econolite Cobalt	At observations, phases 4+8 buttons do not place call in controller. All vehicle detection OK but noted some periods of false calls, either due to wind of shadows in detection zone. Pedestrian phases 2 and 6 come up each cycle regardless of demand. Northbound and southbound pedestrian crosswalks are faded.
180	Greentree Rd (CR 674) & Lincoln Dr	06/29/2024	Econolite Cobalt	No signal plan in cabinet. Only push for green pedestrian buttons and no walk or flashing don't walk signals. Crosswalks are present for EB+WB movements but no pedestrian facilities provided.
202	Greentree Rd (CR 674) & Stow Rd	06/29/2024	Econolite Cobalt	Phase 5 (WBLT) movement picks up calls from the adjacent through lane periodically, so should review detector zone. Ped buttons call either 2 AND 6 or 4 AND 8. Not necessarily a problem, but worth noting as it could result in longer clearance times under certain situations.
160	Greentree Rd (CR 674) & Evesboro-Medford Rd (CR 618)	06/29/2024	Econolite Cobalt	Pedestrian buttons call either phases 2 AND 6 or 4 AND 8. Not necessarily a problem, but worth noting as it could result in longer clearance times under certain situations.
171	Greentree Rd (CR 674) & Church Rd CR 616)	06/29/2024	Econolite Cobalt	Significant distance between pedestrian pushbuttons and the actual crossing start, so considered in WALK time calculation. No pedestrian pushbuttons for NB+SB pedestrian movements, so serve in recall and serve each cycle regardless of actuation.



Signal ID: 1
Sequences

Per	Ex	Imp
AM	1	1
MD	1	1
PM	1	1
PO	1	1
WA	1	1
WM	1	1
WP	1	1
Free	1	1

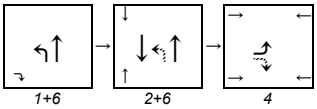
SEQUENCE 1



Signal ID: 143
Sequences

Per	Ex	Imp
AM	1	1
MD	1	1
PM	1	1
PO	1	1
WA	1	1
WM	1	1
WP	1	1
Free	1	1

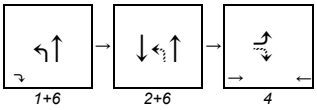
SEQUENCE 1



Signal ID: 103
Sequences

Per	Ex	Imp
AM	1	1
MD	1	1
PM	1	1
PO	1	1
WA	1	1
WM	1	1
WP	1	1
Free	1	1

SEQUENCE 1



Phase Diagrams

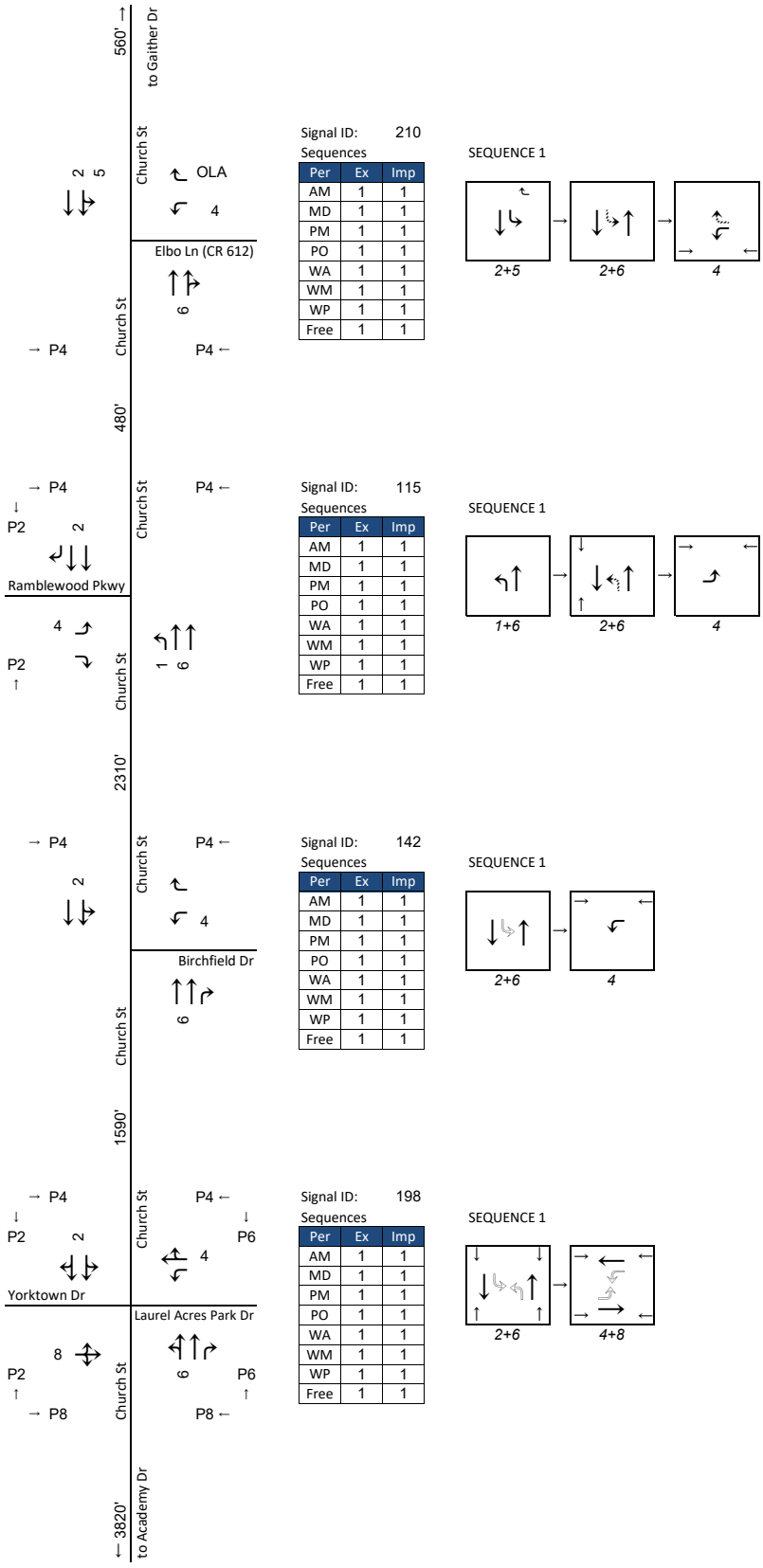
- Permissive Movement
- Protected + Permissive Movement
- Protected-Only Movement

NTS

Figure 14

Phase Sequence Diagrams

Church St (CR 607) - NJ Route 38 to Gaither Dr



Phase Diagrams

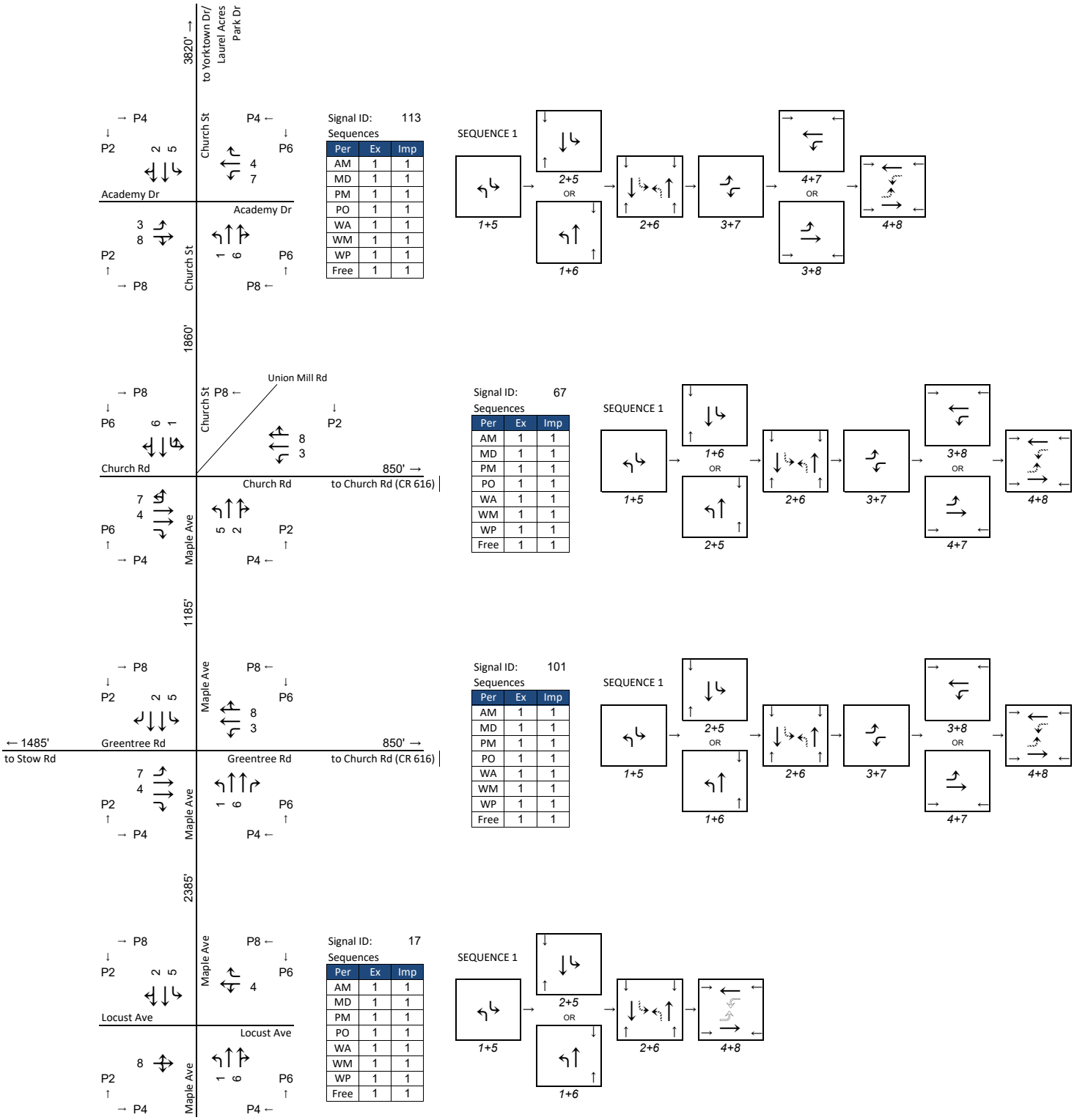
- Permissive Movement
- Protected + Permissive Movement
- Protected-Only Movement

NTS

Figure 15

Phase Sequence Diagrams

Church St (CR 607) - Elbo Ln to Yorktown Dr/Laurel Acres Park Dr



Phase Diagrams

- Permissive Movement
- Protected + Permissive Movement
- Protected-Only Movement

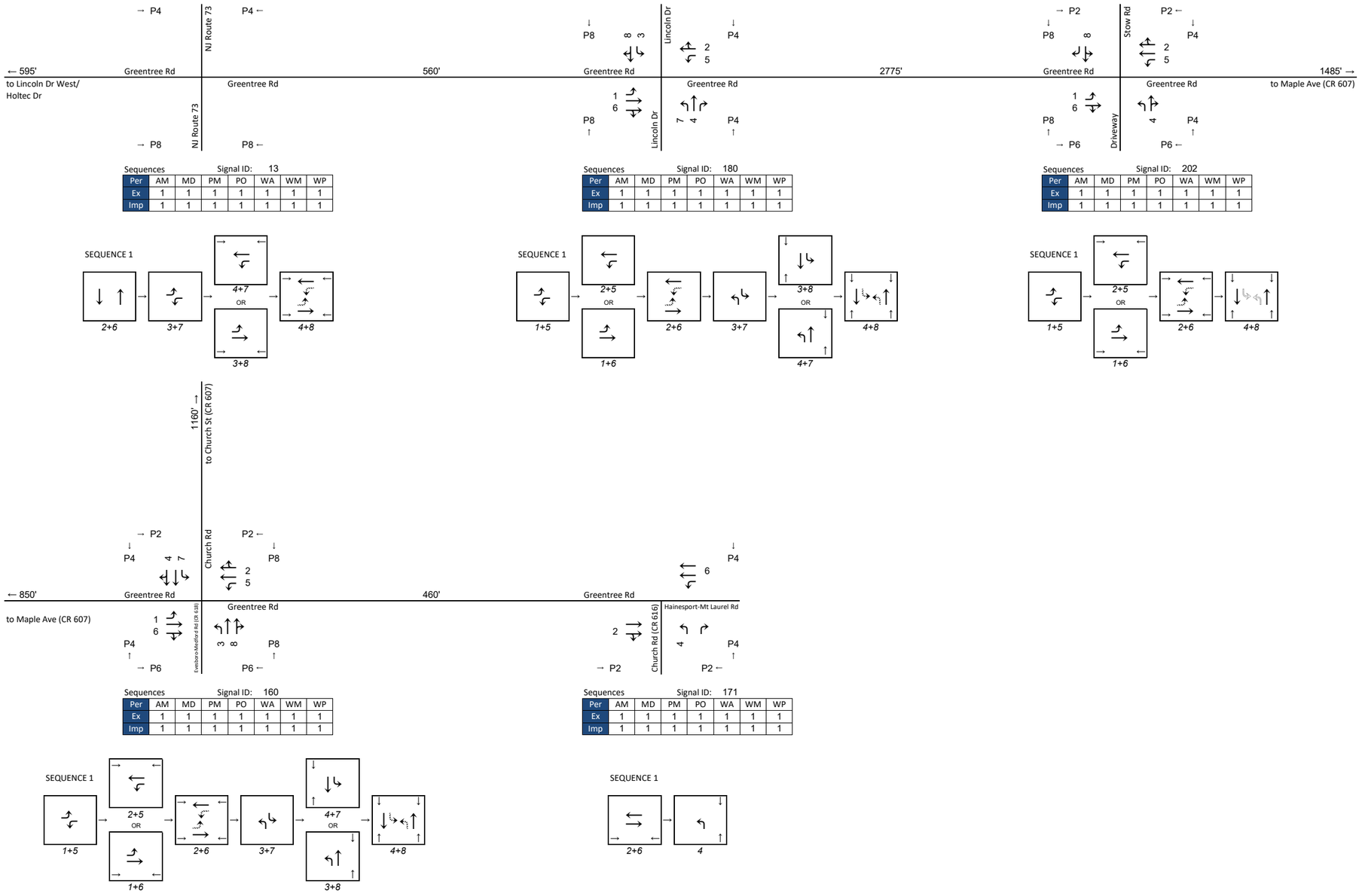
N

NTS

Figure 16

Phase Sequence Diagrams

Church St/Maple Ave (CR 607) - Academy Dr to Locust Ave



Sequences — Signal ID: 13

Per	AM	MD	PM	PO	WA	WM	WP
Ex	1	1	1	1	1	1	1
Imp	1	1	1	1	1	1	1

Sequences — Signal ID: 180

Per	AM	MD	PM	PO	WA	WM	WP
Ex	1	1	1	1	1	1	1
Imp	1	1	1	1	1	1	1

Sequences — Signal ID: 202

Per	AM	MD	PM	PO	WA	WM	WP
Ex	1	1	1	1	1	1	1
Imp	1	1	1	1	1	1	1

Sequences — Signal ID: 160

Per	AM	MD	PM	PO	WA	WM	WP
Ex	1	1	1	1	1	1	1
Imp	1	1	1	1	1	1	1

Sequences — Signal ID: 171

Per	AM	MD	PM	PO	WA	WM	WP
Ex	1	1	1	1	1	1	1
Imp	1	1	1	1	1	1	1

Phase Diagrams

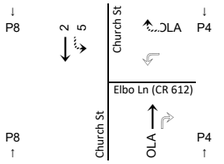
- Permissive Movement
- Protected + Permissive Movement
- Protected-Only Movement

NTS

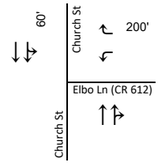
Figure 17

Phase Sequence Diagrams

Greentree Rd (CR 674) - NJ Route 73 to Church Rd (CR 616)/Hainesport-Mt Laurel Rd (CR 674)

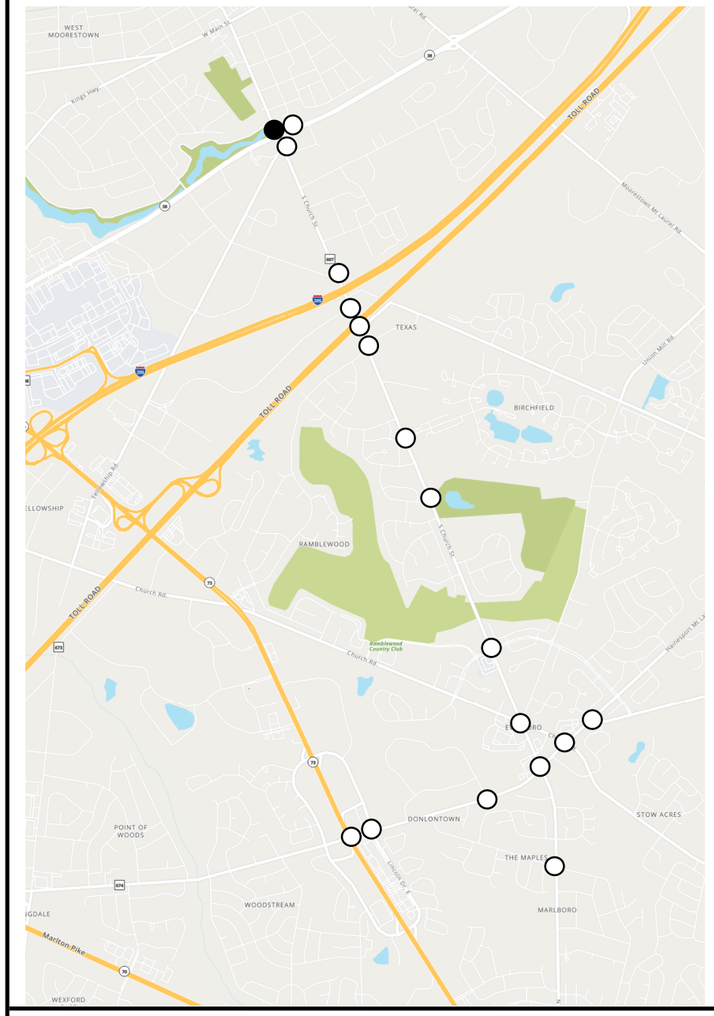


Phasing Diagram



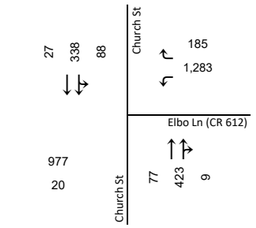
Intersection Geometry

Intersection ID # 1001

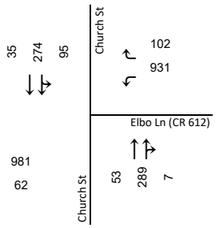


Hourly Volumes

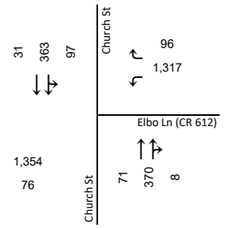
AM Peak Period



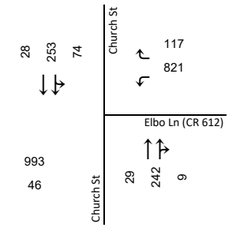
MD Peak Period



PM Peak Period

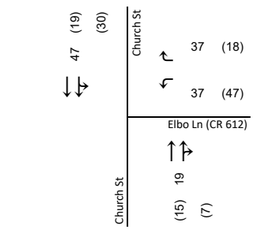


PM Off-peak Period



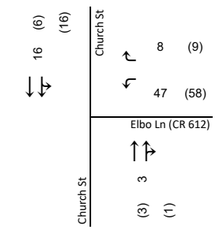
Existing Operations

AM Peak Period



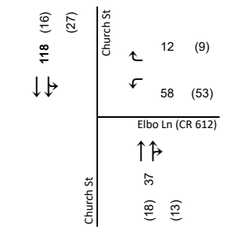
Summary				
Timing Pattern	1	Syn Delay	31	C
Actuated Cycle	120	Sim Delay	(18)	
Max v/C	0.83	ICU	70%	C

MD Peak Period



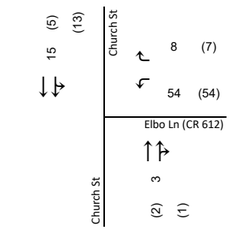
Summary				
Timing Pattern	1	Syn Delay	11	B
Actuated Cycle	105	Sim Delay	(7)	
Max v/C	0.80	ICU	67%	C

PM Peak Period



Summary				
Timing Pattern	1	Syn Delay	86	F
Actuated Cycle	115	Sim Delay	(19)	
Max v/C	1.20	ICU	93%	F

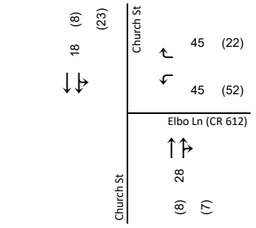
PM Off-peak Period



Summary				
Timing Pattern	1	Syn Delay	12	B
Actuated Cycle	105	Sim Delay	(7)	
Max v/C	0.77	ICU	66%	C

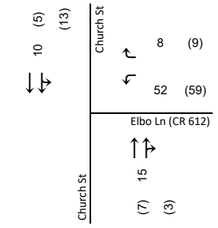
Implemented Operations

AM Peak Period



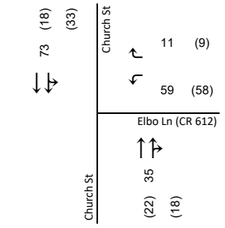
Summary				
Timing Pattern	1	Syn Delay	29	C
Actuated Cycle	120	Sim Delay	(13)	
Max v/C	0.82	ICU	69%	C

MD Peak Period



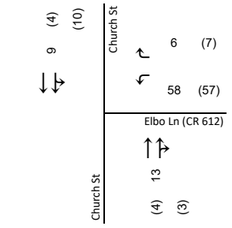
Summary				
Timing Pattern	1	Syn Delay	13	B
Actuated Cycle	110	Sim Delay	(8)	
Max v/C	0.72	ICU	65%	C

PM Peak Period



Summary				
Timing Pattern	1	Syn Delay	57	E
Actuated Cycle	120	Sim Delay	(22)	
Max v/C	1.08	ICU	91%	E

PM Off-peak Period



Summary				
Timing Pattern	1	Syn Delay	11	B
Actuated Cycle	110	Sim Delay	(6)	
Max v/C	0.71	ICU	64%	B

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

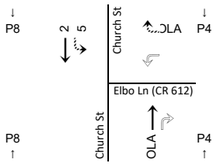
stop bar geometry

turning movement volume

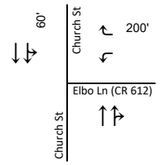
Figure 18

Weekday Traffic Operations Analysis

Church St (CR 607) & Elbo Ln (CR 612)

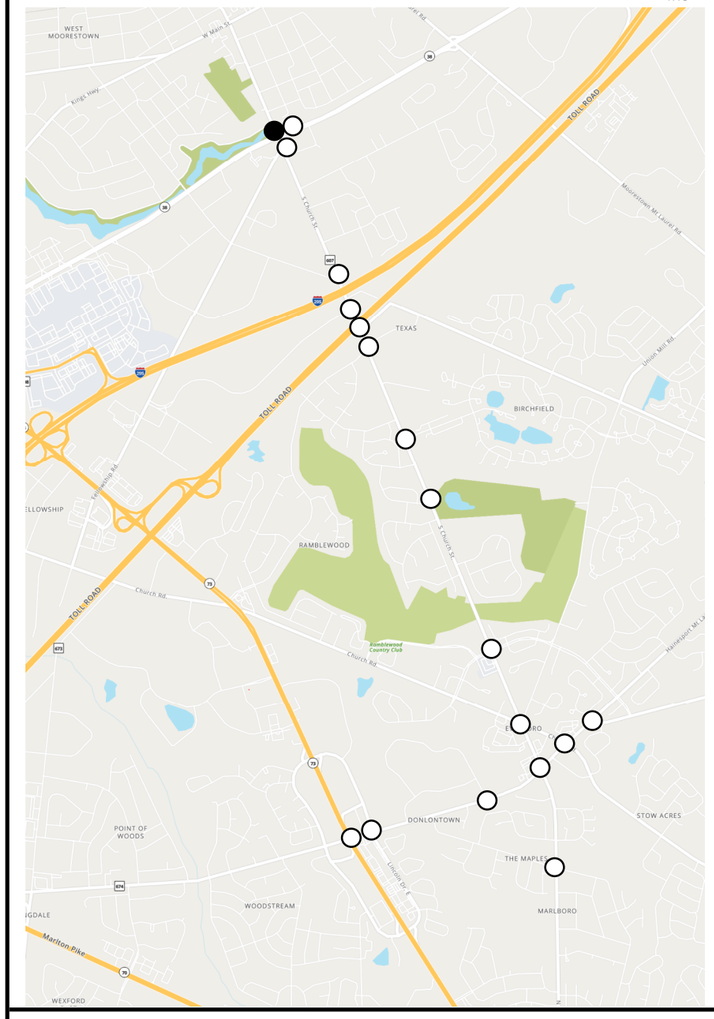


Phasing Diagram



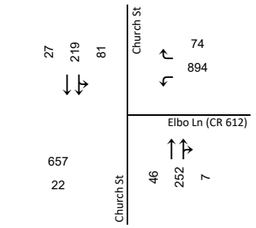
Intersection Geometry

Intersection ID # 1001

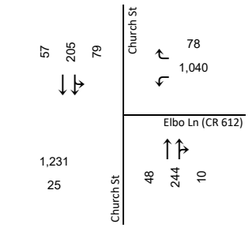


Hourly Volumes

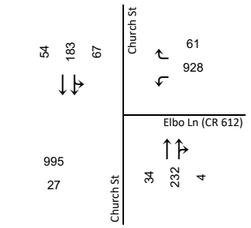
Weekend AM Peak Period



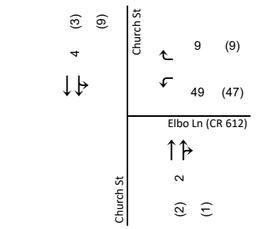
Weekend MD Peak Period



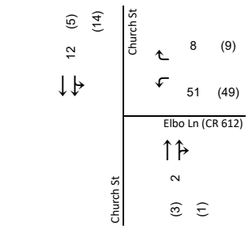
Weekend PM Peak Period



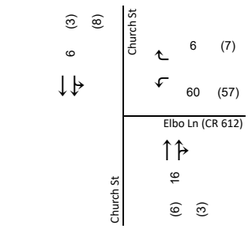
Existing Operations



Summary				
Timing Pattern	1	Syn Delay	5	A
Actuated Cycle	105	Sim Delay	(6)	
Max v/C	0.53	ICU	55%	A

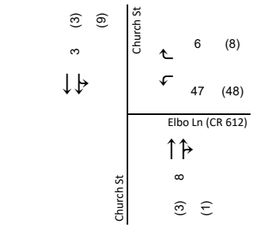


Summary				
Timing Pattern	1	Syn Delay	9	A
Actuated Cycle	105	Sim Delay	(7)	
Max v/C	0.71	ICU	66%	C

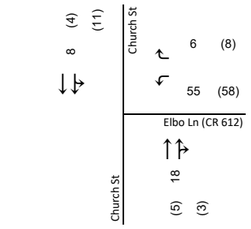


Summary				
Timing Pattern	1	Syn Delay	11	B
Actuated Cycle	115	Sim Delay	(7)	
Max v/C	0.51	ICU	59%	B

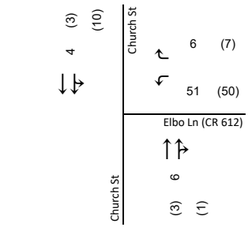
Implemented Operations



Summary				
Timing Pattern	1	Syn Delay	6	A
Actuated Cycle	100	Sim Delay	(5)	
Max v/C	0.46	ICU	53%	A



Summary				
Timing Pattern	1	Syn Delay	12	B
Actuated Cycle	110	Sim Delay	(7)	
Max v/C	0.65	ICU	64%	B



Summary				
Timing Pattern	1	Syn Delay	6	A
Actuated Cycle	100	Sim Delay	(6)	
Max v/C	0.52	ICU	57%	B

Operations with Improvements

No operational improvements recommended at this time.

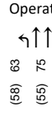
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

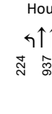


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



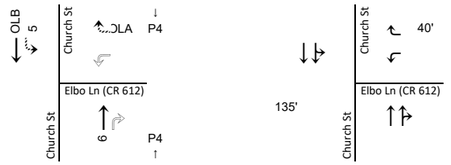
stop bar geometry

turning movement volume

Figure 19

Weekend Traffic Operations Analysis

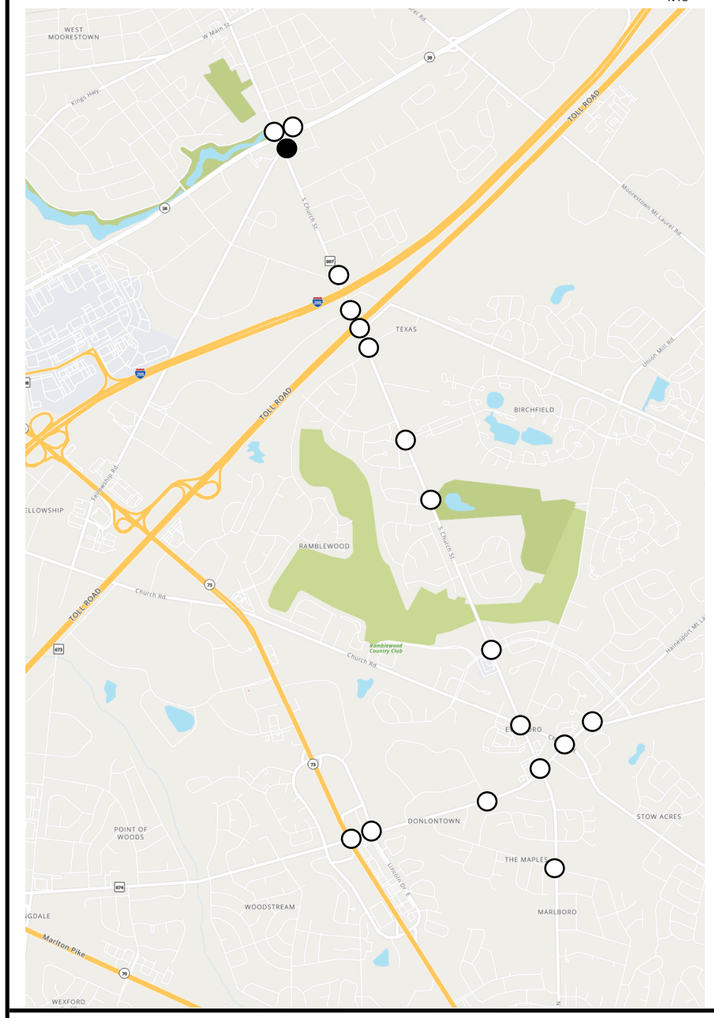
Church St (CR 607) & Elbo Ln (CR 612)



Phasing Diagram

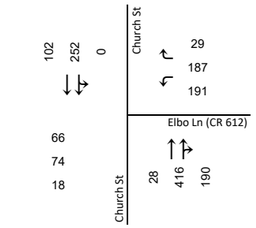
Intersection Geometry

Intersection ID # 1002

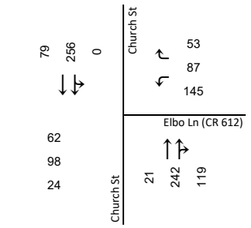


Hourly Volumes

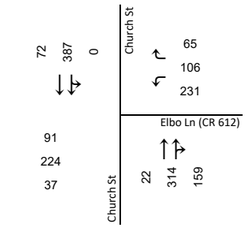
AM Peak Period



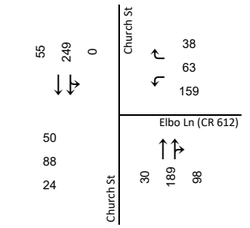
MD Peak Period



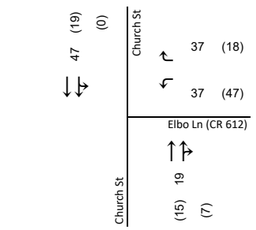
PM Peak Period



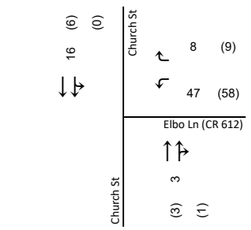
PM Off-peak Period



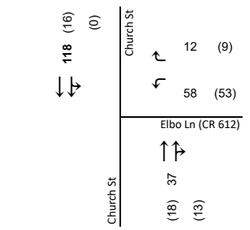
Existing Operations



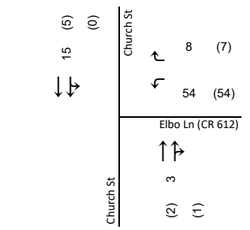
Summary				
Timing Pattern	1	Syn Delay	31	C
Actuated Cycle	120	Sim Delay	(18)	
Max v/C	0.83	ICU	70%	C



Summary				
Timing Pattern	1	Syn Delay	11	B
Actuated Cycle	105	Sim Delay	(7)	
Max v/C	0.80	ICU	67%	C

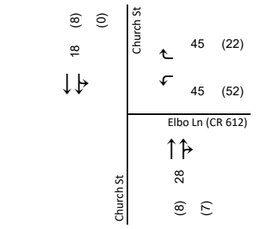


Summary				
Timing Pattern	1	Syn Delay	**86**	F
Actuated Cycle	115	Sim Delay	(19)	
Max v/C	1.20	ICU	**93%**	F

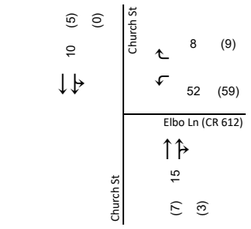


Summary				
Timing Pattern	1	Syn Delay	12	B
Actuated Cycle	105	Sim Delay	(7)	
Max v/C	0.77	ICU	66%	C

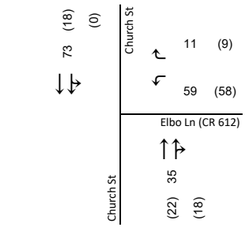
Implemented Operations



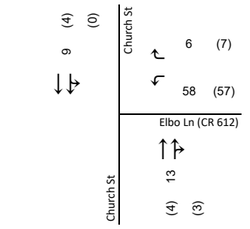
Summary				
Timing Pattern	1	Syn Delay	29	C
Actuated Cycle	120	Sim Delay	(13)	
Max v/C	0.82	ICU	69%	C



Summary				
Timing Pattern	1	Syn Delay	13	B
Actuated Cycle	110	Sim Delay	(8)	
Max v/C	0.72	ICU	65%	C



Summary				
Timing Pattern	1	Syn Delay	57	E
Actuated Cycle	120	Sim Delay	(22)	
Max v/C	1.08	ICU	91%	E



Summary				
Timing Pattern	1	Syn Delay	11	B
Actuated Cycle	110	Sim Delay	(6)	
Max v/C	0.71	ICU	64%	B

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

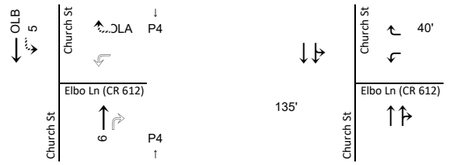
stop bar geometry

turning movement volume

Figure 20

Weekday Traffic Operations Analysis

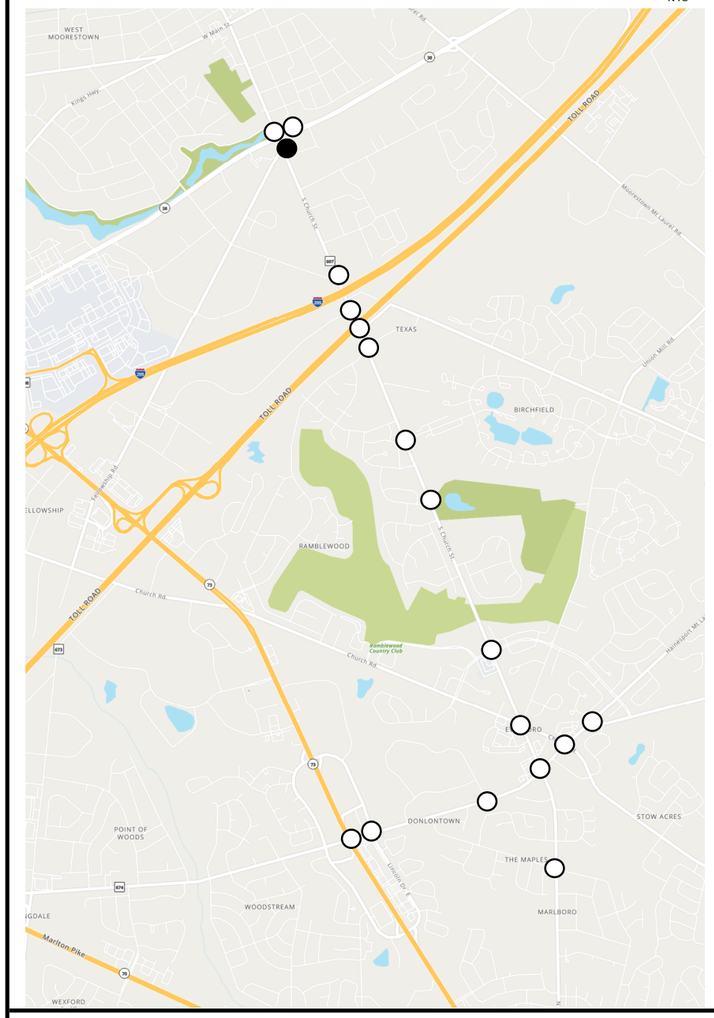
Church St (CR 607) & Elbo Ln (CR 612)



Phasing Diagram

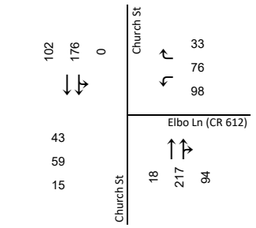
Intersection Geometry

Intersection ID # 1002

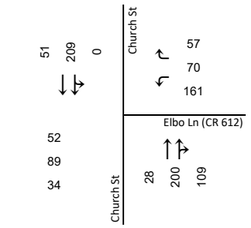


Hourly Volumes

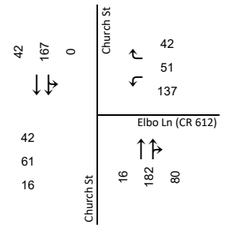
Weekend AM Peak Period



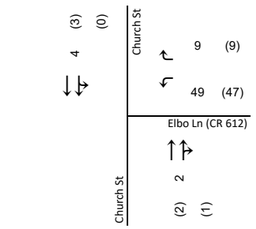
Weekend MD Peak Period



Weekend PM Peak Period

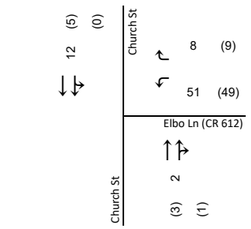


Existing Operations



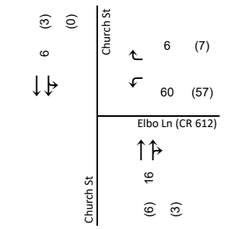
Summary

Timing Pattern	1	*Syn Delay*	5	A
Actuated Cycle	105	*Sim Delay*	(6)	
Max v/C	0.53	*ICU*	55%	A



Summary

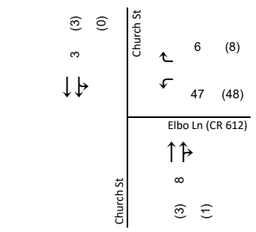
Timing Pattern	1	*Syn Delay*	9	A
Actuated Cycle	105	*Sim Delay*	(7)	
Max v/C	0.71	*ICU*	66%	C



Summary

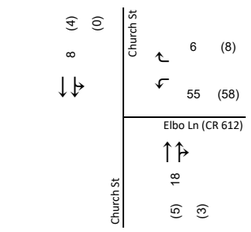
Timing Pattern	1	*Syn Delay*	11	B
Actuated Cycle	115	*Sim Delay*	(7)	
Max v/C	0.51	*ICU*	59%	B

Implemented Operations



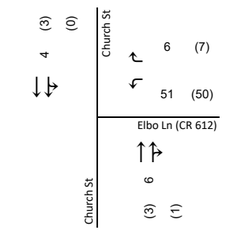
Summary

Timing Pattern	1	*Syn Delay*	6	A
Actuated Cycle	100	*Sim Delay*	(5)	
Max v/C	0.46	*ICU*	53%	A



Summary

Timing Pattern	1	*Syn Delay*	12	B
Actuated Cycle	110	*Sim Delay*	(7)	
Max v/C	0.65	*ICU*	64%	B



Summary

Timing Pattern	1	*Syn Delay*	6	A
Actuated Cycle	100	*Sim Delay*	(6)	
Max v/C	0.52	*ICU*	57%	B

Operations with Improvements

No operational improvements recommended at this time.

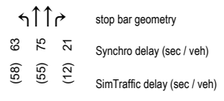
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

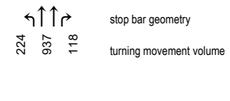


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



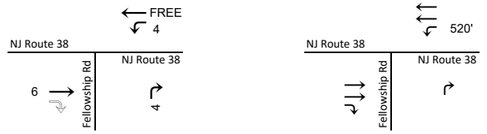
stop bar geometry

turning movement volume

Figure 21

Weekend Traffic Operations Analysis

Church St (CR 607) & Elbo Ln (CR 612)



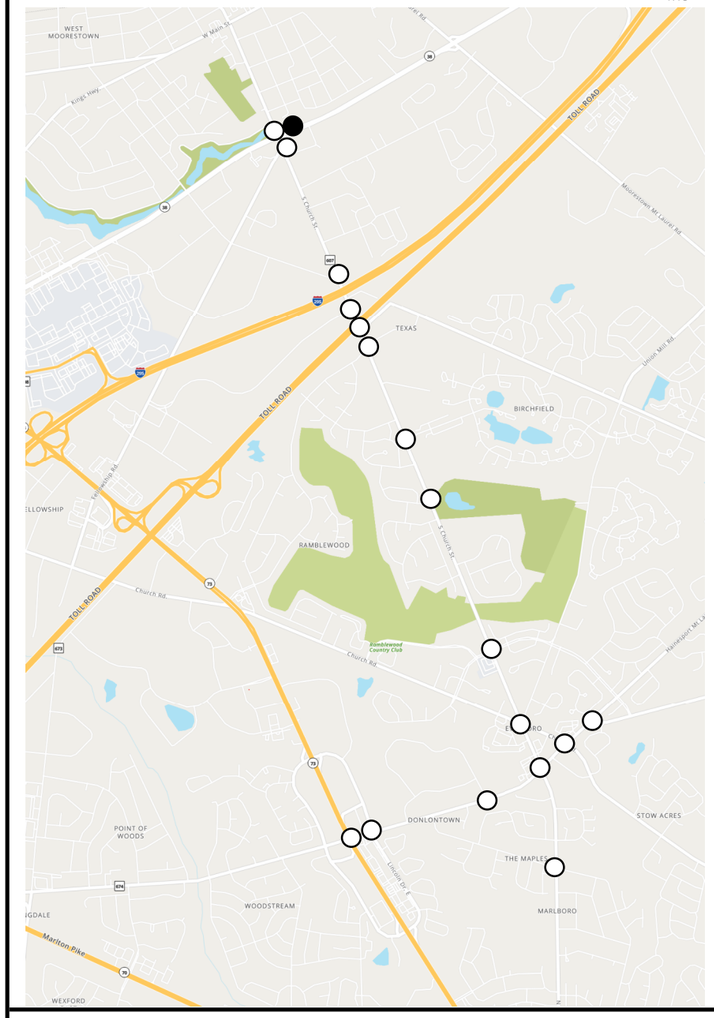
Phasing Diagram

Intersection Geometry

Intersection ID # 1003

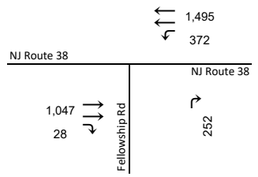
N

NTS

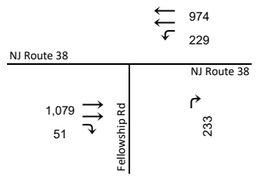


Hourly Volumes

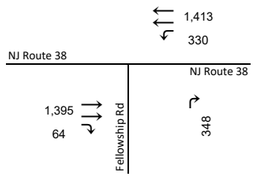
AM Peak Period



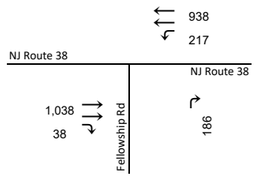
MD Peak Period



PM Peak Period

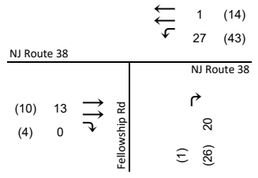


PM Off-peak Period



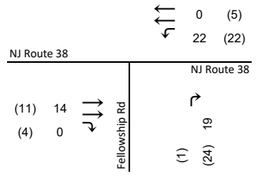
Existing Operations

AM Peak Period



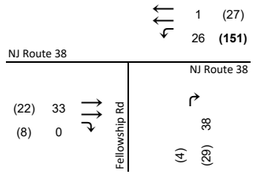
Summary				
Timing Pattern	0	Syn Delay	10	A
Actuated Cycle	90	Sim Delay	(17)	
Max v/C	1.18	ICU	66%	C

MD Peak Period



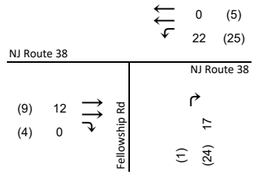
Summary				
Timing Pattern	0	Syn Delay	10	A
Actuated Cycle	90	Sim Delay	(11)	
Max v/C	0.81	ICU	61%	B

PM Peak Period



Summary				
Timing Pattern	0	Syn Delay	19	B
Actuated Cycle	90	Sim Delay	(37)	
Max v/C	1.17	ICU	77%	D

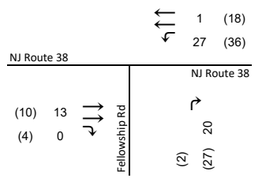
PM Off-peak Period



Summary				
Timing Pattern	0	Syn Delay	8	A
Actuated Cycle	90	Sim Delay	(10)	
Max v/C	0.79	ICU	57%	B

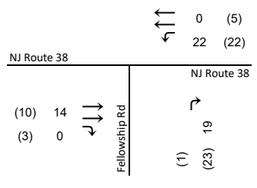
Implemented Operations

AM Peak Period



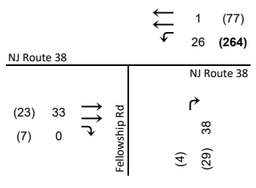
Summary				
Timing Pattern	0	Syn Delay	10	A
Actuated Cycle	90	Sim Delay	(18)	
Max v/C	1.18	ICU	66%	C

MD Peak Period



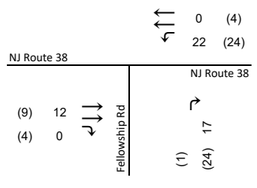
Summary				
Timing Pattern	0	Syn Delay	10	A
Actuated Cycle	90	Sim Delay	(10)	
Max v/C	0.81	ICU	61%	B

PM Peak Period



Summary				
Timing Pattern	0	Syn Delay	19	B
Actuated Cycle	90	Sim Delay	(68)	
Max v/C	1.17	ICU	77%	D

PM Off-peak Period



Summary				
Timing Pattern	0	Syn Delay	8	A
Actuated Cycle	90	Sim Delay	(9)	
Max v/C	0.79	ICU	57%	B

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

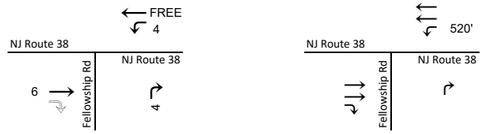
stop bar geometry

turning movement volume

Figure 22

Weekday Traffic Operations Analysis

NJ Route 38 & Fellowship Rd (CR 673)



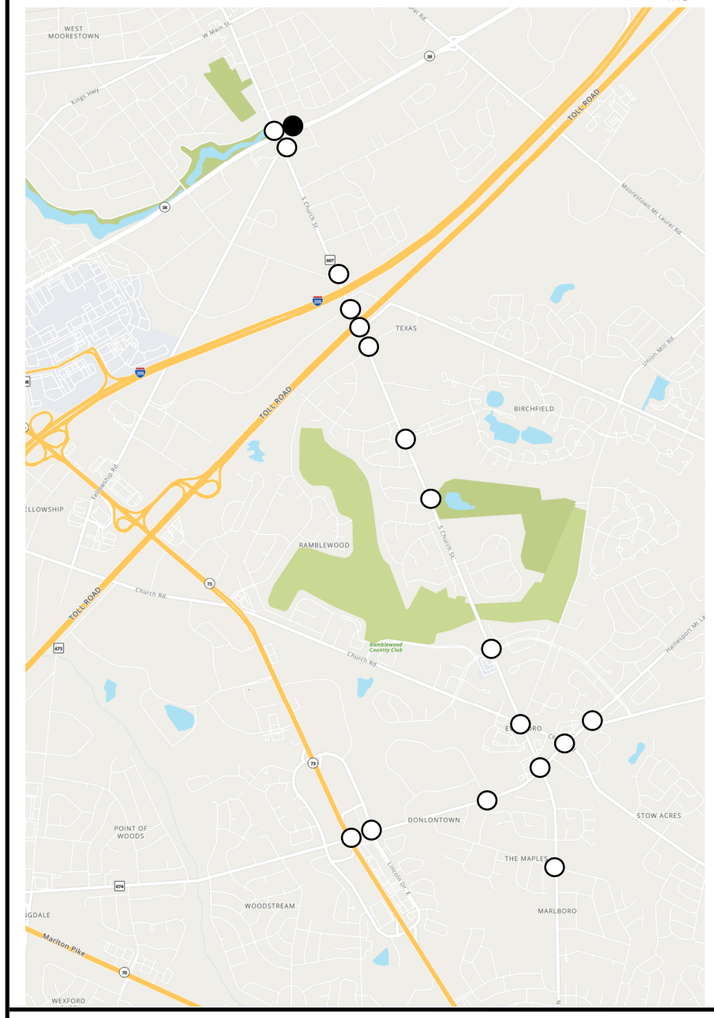
Phasing Diagram

Intersection Geometry

Intersection ID # 1003

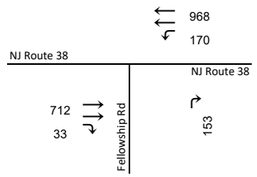
N

NTS

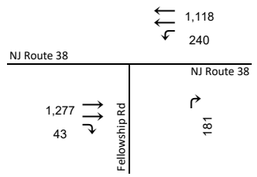


Hourly Volumes

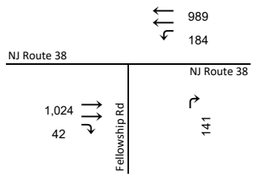
Weekend AM Peak Period



Weekend MD Peak Period

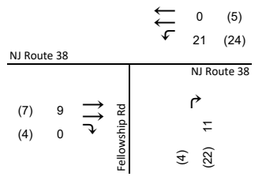


Weekend PM Peak Period



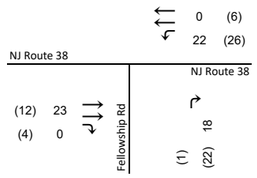
Existing Operations

Weekend AM Peak Period



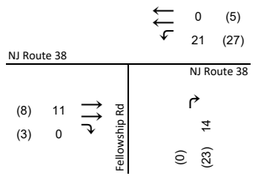
Summary				
Timing Pattern	0	Syn Delay	6	A
Actuated Cycle	90	Sim Delay	(8)	
Max v/C	0.57	ICU	49%	A

Weekend MD Peak Period



Summary				
Timing Pattern	0	Syn Delay	13	B
Actuated Cycle	90	Sim Delay	(11)	
Max v/C	0.95	ICU	65%	C

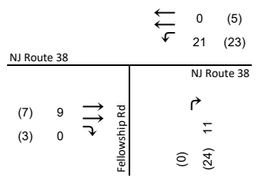
Weekend PM Peak Period



Summary				
Timing Pattern	0	Syn Delay	7	A
Actuated Cycle	90	Sim Delay	(9)	
Max v/C	0.77	ICU	55%	A

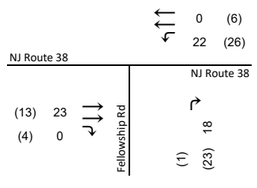
Implemented Operations

Weekend AM Peak Period



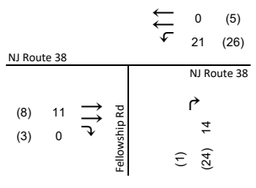
Summary				
Timing Pattern	0	Syn Delay	6	A
Actuated Cycle	90	Sim Delay	(8)	
Max v/C	0.57	ICU	49%	A

Weekend MD Peak Period



Summary				
Timing Pattern	0	Syn Delay	13	B
Actuated Cycle	90	Sim Delay	(11)	
Max v/C	0.95	ICU	65%	C

Weekend PM Peak Period



Summary				
Timing Pattern	0	Syn Delay	7	A
Actuated Cycle	90	Sim Delay	(9)	
Max v/C	0.77	ICU	55%	A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

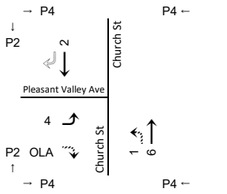
stop bar geometry

turning movement volume

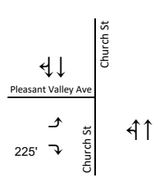
Figure 23

Weekend Traffic Operations Analysis

NJ Route 38 & Fellowship Rd (CR 673)

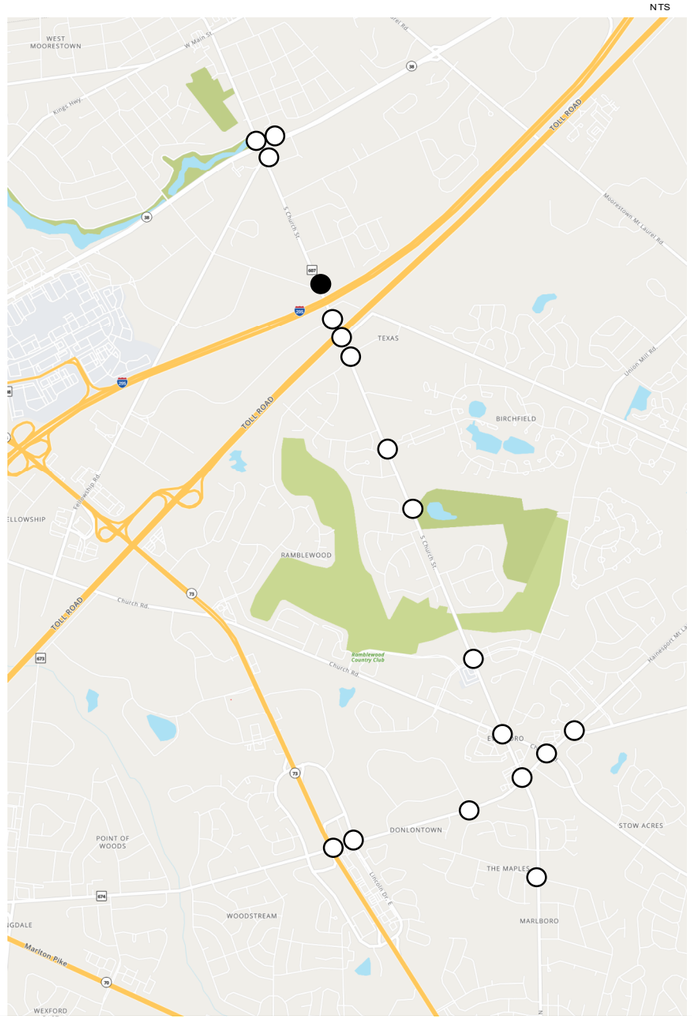


Phasing Diagram



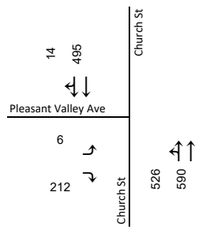
Intersection Geometry

Intersection ID # 143

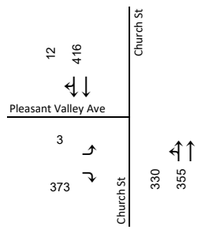


Hourly Volumes

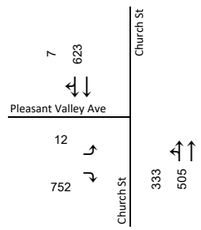
AM Peak Period



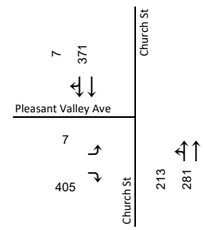
MD Peak Period



PM Peak Period

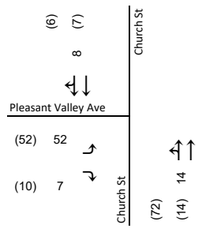


PM Off-peak Period



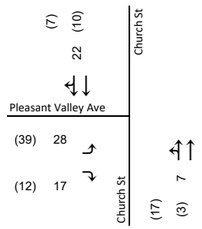
Existing Operations

AM Peak Period



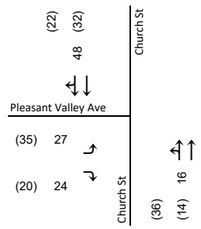
Summary				
Timing Pattern	16	Syn Delay	12	B
Actuated Cycle	120	Sim Delay	(29)	
Max v/C	0.93	ICU	72%	C

MD Peak Period



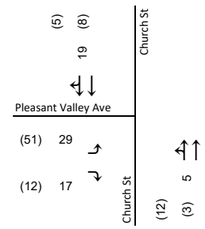
Summary				
Timing Pattern	10	Syn Delay	14	B
Actuated Cycle	105	Sim Delay	(10)	
Max v/C	0.67	ICU	59%	B

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	28	C
Actuated Cycle	115	Sim Delay	(24)	
Max v/C	0.86	ICU	75%	D

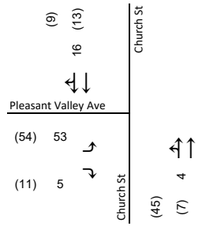
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	13	B
Actuated Cycle	105	Sim Delay	(9)	
Max v/C	0.61	ICU	55%	A

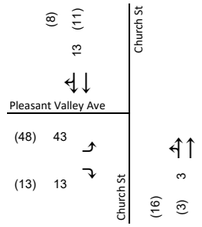
Implemented Operations

AM Peak Period



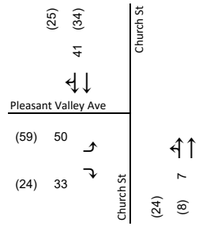
Summary				
Timing Pattern	16	Syn Delay	8	A
Actuated Cycle	120	Sim Delay	(20)	
Max v/C	0.86	ICU	72%	C

MD Peak Period



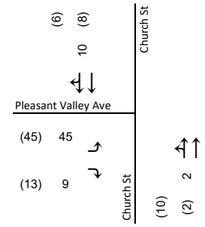
Summary				
Timing Pattern	13	Syn Delay	8	A
Actuated Cycle	110	Sim Delay	(11)	
Max v/C	0.63	ICU	60%	B

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	25	C
Actuated Cycle	120	Sim Delay	(24)	
Max v/C	0.88	ICU	75%	D

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	7	A
Actuated Cycle	110	Sim Delay	(8)	
Max v/C	0.64	ICU	56%	B

Operations with Improvements

No operational improvements recommended at this time.

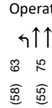
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

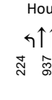


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



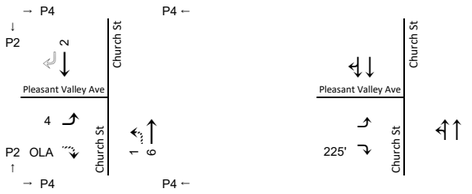
stop bar geometry

turning movement volume

Figure 24

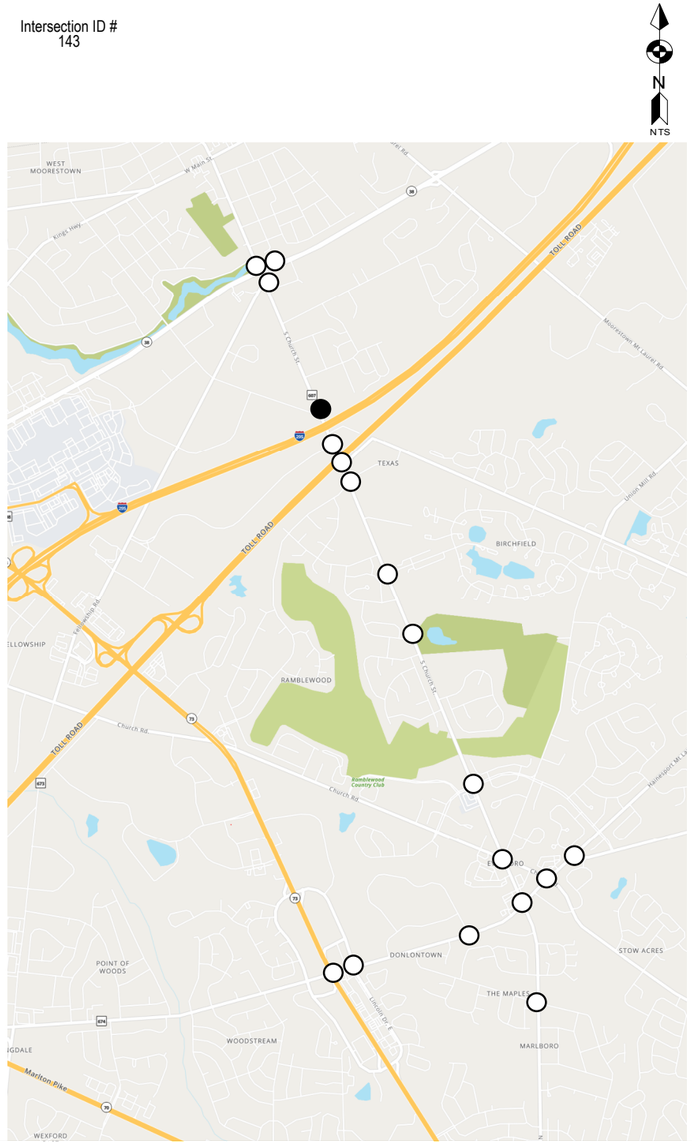
Weekday Traffic Operations Analysis

Church St (CR 607) & Pleasant Valley Ave



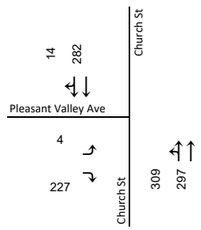
Phasing Diagram | Intersection Geometry

Intersection ID # 143

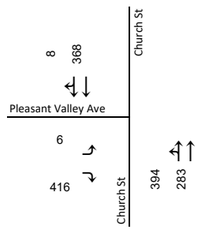


Hourly Volumes

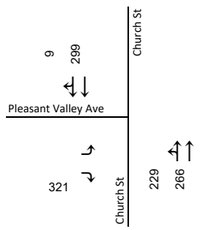
Weekend AM Peak Period



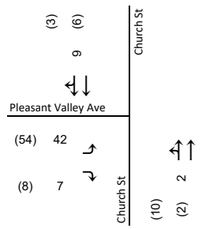
Weekend MD Peak Period



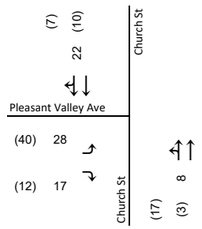
Weekend PM Peak Period



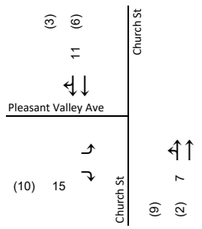
Existing Operations



Summary				
Timing Pattern	10	Syn Delay	5	A
Actuated Cycle	105	Sim Delay	(6)	
Max v/C	0.48	ICU	56%	B

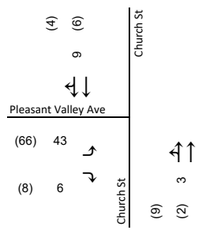


Summary				
Timing Pattern	10	Syn Delay	14	B
Actuated Cycle	105	Sim Delay	(11)	
Max v/C	0.63	ICU	61%	B

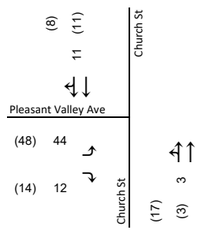


Summary				
Timing Pattern	13	Syn Delay	10	B
Actuated Cycle	115	Sim Delay	(7)	
Max v/C	0.58	ICU	46%	A

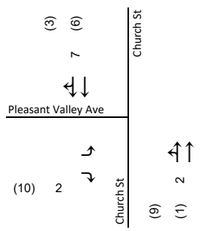
Implemented Operations



Summary				
Timing Pattern	10	Syn Delay	5	A
Actuated Cycle	100	Sim Delay	(6)	
Max v/C	0.47	ICU	57%	B



Summary				
Timing Pattern	15	Syn Delay	8	A
Actuated Cycle	110	Sim Delay	(12)	
Max v/C	0.67	ICU	62%	B



Summary				
Timing Pattern	10	Syn Delay	3	A
Actuated Cycle	100	Sim Delay	(6)	
Max v/C	0.47	ICU	46%	A

Operations with Improvements

No operational improvements recommended at this time.

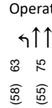
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams



stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

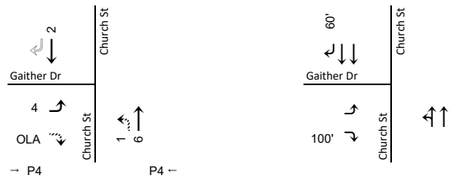
stop bar geometry

turning movement volume

Figure 25

Weekend Traffic Operations Analysis

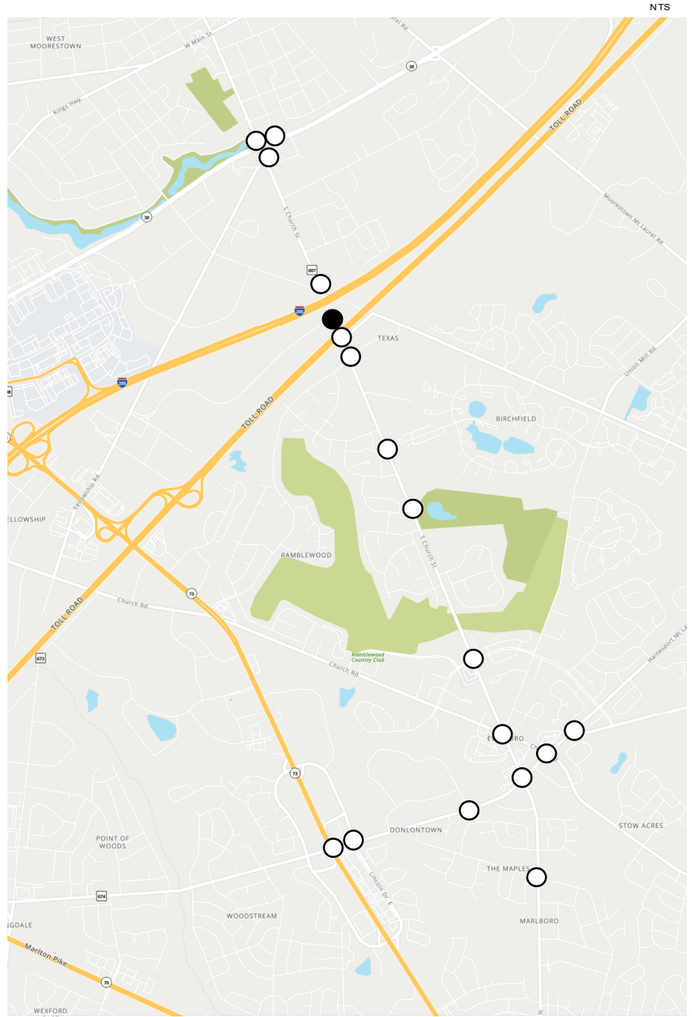
Church St (CR 607) & Pleasant Valley Ave



Phasing Diagram

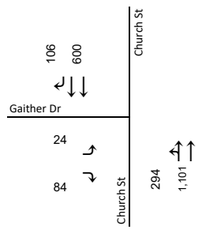
Intersection Geometry

Intersection ID # 103

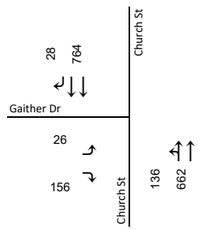


Hourly Volumes

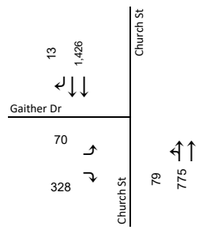
AM Peak Period



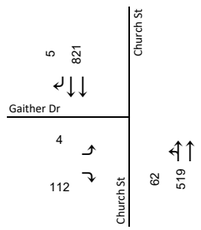
MD Peak Period



PM Peak Period

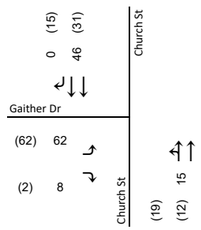


PM Off-peak Period



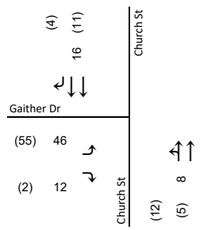
Existing Operations

AM Peak Period



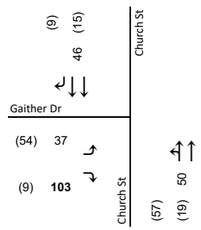
Summary				
Timing Pattern	16	Syn Delay	23	C
Actuated Cycle	120	Sim Delay	(18)	
Max v/C	0.88	ICU	80%	D

MD Peak Period



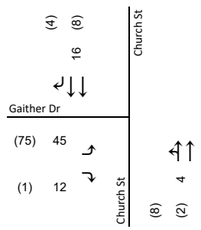
Summary				
Timing Pattern	10	Syn Delay	12	B
Actuated Cycle	105	Sim Delay	(9)	
Max v/C	0.63	ICU	67%	C

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	55	D
Actuated Cycle	115	Sim Delay	(18)	
Max v/C	1.01	ICU	88%	E

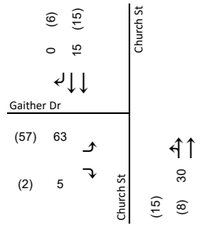
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	11	B
Actuated Cycle	105	Sim Delay	(6)	
Max v/C	0.61	ICU	62%	B

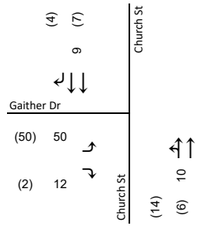
Implemented Operations

AM Peak Period



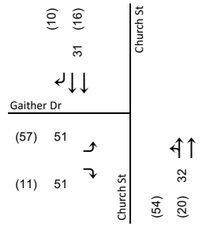
Summary				
Timing Pattern	16	Syn Delay	24	C
Actuated Cycle	120	Sim Delay	(11)	
Max v/C	0.97	ICU	78%	D

MD Peak Period



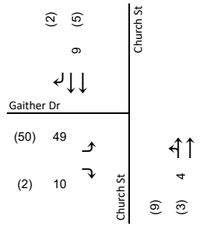
Summary				
Timing Pattern	13	Syn Delay	10	B
Actuated Cycle	110	Sim Delay	(7)	
Max v/C	0.65	ICU	66%	C

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	35	C
Actuated Cycle	120	Sim Delay	(18)	
Max v/C	0.89	ICU	86%	E

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	7	A
Actuated Cycle	110	Sim Delay	(4)	
Max v/C	0.50	ICU	61%	B

Operations with Improvements

No operational improvements recommended at this time.

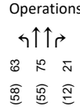
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

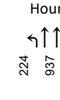


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



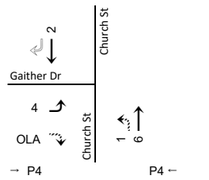
stop bar geometry

turning movement volume

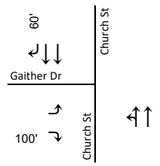
Figure 26

Weekday Traffic Operations Analysis

Church St (CR 607) & Gaither Dr

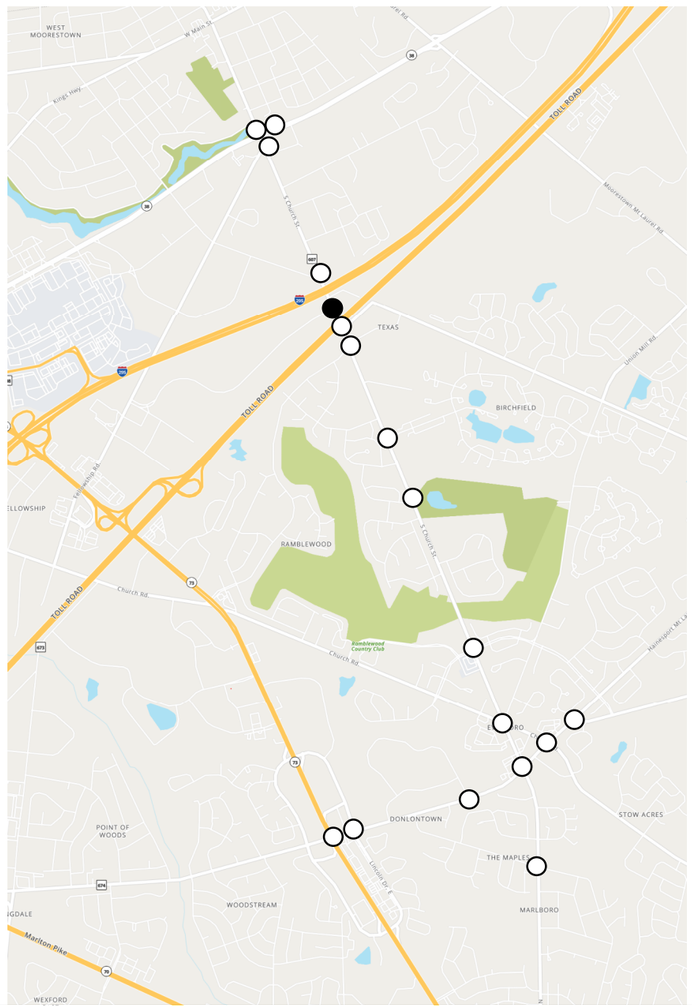


Phasing Diagram



Intersection Geometry

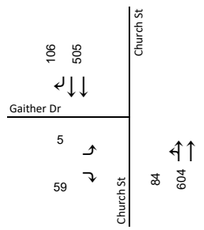
Intersection ID # 103



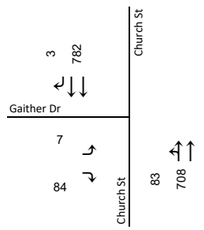
NTS

Hourly Volumes

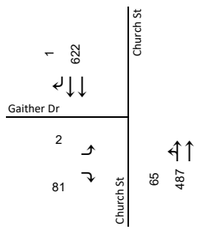
Weekend AM Peak Period



Weekend MD Peak Period

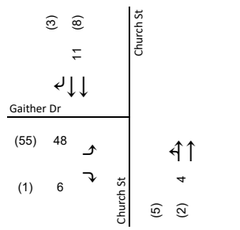


Weekend PM Peak Period



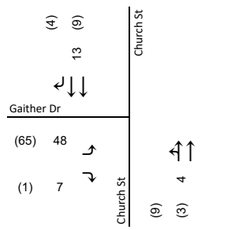
Existing Operations

Weekend AM Peak Period



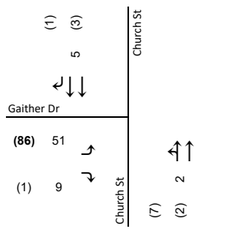
Summary				
Timing Pattern	10	Syn Delay	7	A
Actuated Cycle	105	Sim Delay	(5)	
Max v/C	0.42	ICU	58%	B

Weekend MD Peak Period



Summary				
Timing Pattern	10	Syn Delay	8	A
Actuated Cycle	105	Sim Delay	(6)	
Max v/C	0.53	ICU	67%	C

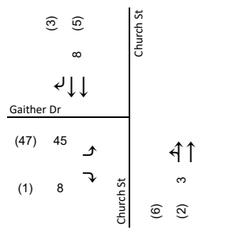
Weekend PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	4	A
Actuated Cycle	115	Sim Delay	(3)	
Max v/C	0.38	ICU	56%	B

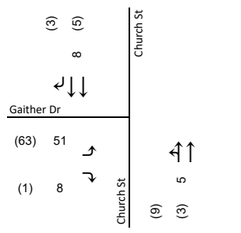
Implemented Operations

Weekend AM Peak Period



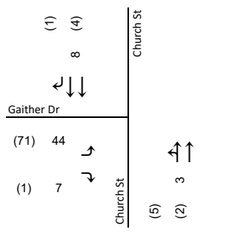
Summary				
Timing Pattern	10	Syn Delay	5	A
Actuated Cycle	100	Sim Delay	(3)	
Max v/C	0.42	ICU	57%	B

Weekend MD Peak Period



Summary				
Timing Pattern	15	Syn Delay	7	A
Actuated Cycle	110	Sim Delay	(4)	
Max v/C	0.55	ICU	66%	C

Weekend PM Peak Period



Summary				
Timing Pattern	10	Syn Delay	6	A
Actuated Cycle	100	Sim Delay	(3)	
Max v/C	0.36	ICU	55%	A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

63 75 21
(58) (55) (12)

stop bar geometry
Synchro delay (sec / veh)
SimTraffic delay (sec / veh)

Hourly Volume Diagrams

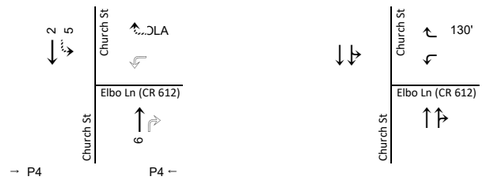
224 937 118

stop bar geometry
turning movement volume

Figure 27

Weekend Traffic Operations Analysis

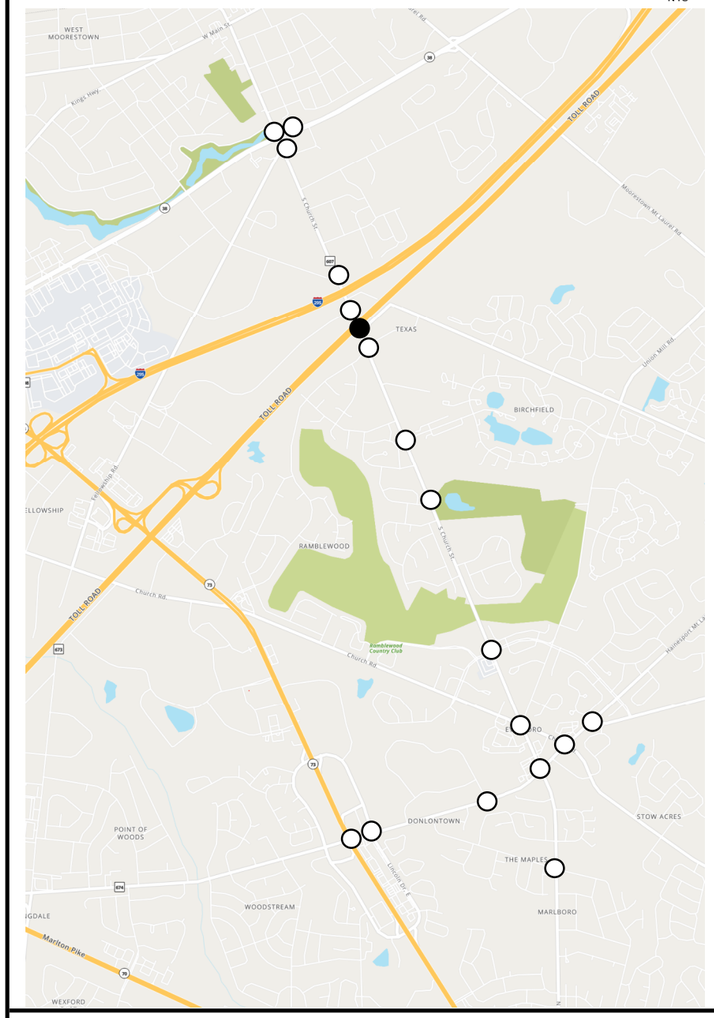
Church St (CR 607) & Gaither Dr



Phasing Diagram

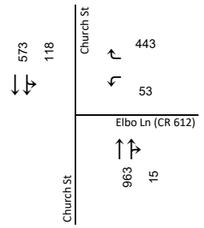
Intersection Geometry

Intersection ID # 210

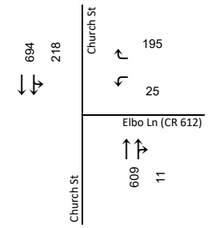


Hourly Volumes

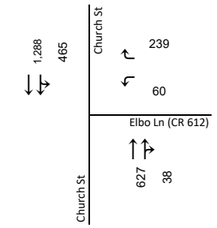
AM Peak Period



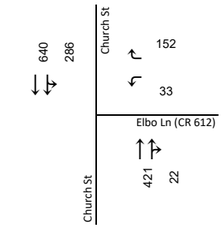
MD Peak Period



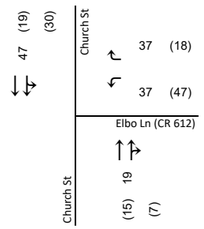
PM Peak Period



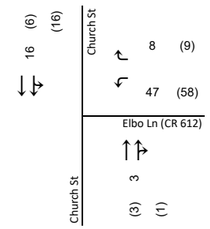
PM Off-peak Period



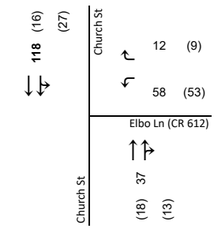
Existing Operations



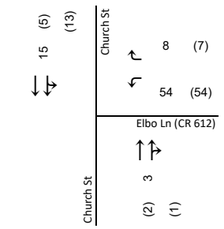
Summary				
Timing Pattern	16	Syn Delay	31	C
Actuated Cycle	120	Sim Delay	(18)	
Max v/C	0.83	ICU	70%	C



Summary				
Timing Pattern	10	Syn Delay	11	B
Actuated Cycle	105	Sim Delay	(7)	
Max v/C	0.80	ICU	67%	C

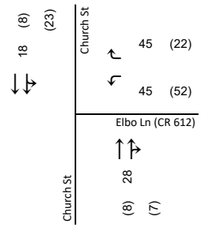


Summary				
Timing Pattern	13	Syn Delay	**86**	F
Actuated Cycle	115	Sim Delay	(19)	
Max v/C	1.20	ICU	**93%**	F

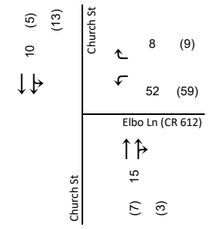


Summary				
Timing Pattern	10	Syn Delay	12	B
Actuated Cycle	105	Sim Delay	(7)	
Max v/C	0.77	ICU	66%	C

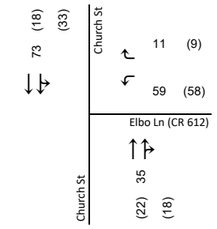
Implemented Operations



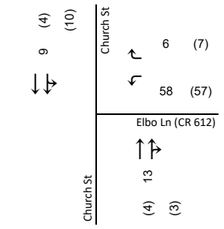
Summary				
Timing Pattern	16	Syn Delay	29	C
Actuated Cycle	120	Sim Delay	(13)	
Max v/C	0.82	ICU	69%	C



Summary				
Timing Pattern	13	Syn Delay	13	B
Actuated Cycle	110	Sim Delay	(8)	
Max v/C	0.72	ICU	65%	C



Summary				
Timing Pattern	17	Syn Delay	57	E
Actuated Cycle	120	Sim Delay	(22)	
Max v/C	1.08	ICU	91%	E



Summary				
Timing Pattern	14	Syn Delay	11	B
Actuated Cycle	110	Sim Delay	(6)	
Max v/C	0.71	ICU	64%	B

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

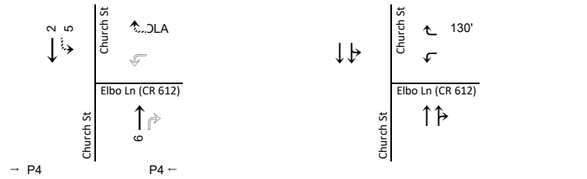
stop bar geometry

turning movement volume

Figure 28

Weekday Traffic Operations Analysis

Church St (CR 607) & Elbo Ln (CR 612)



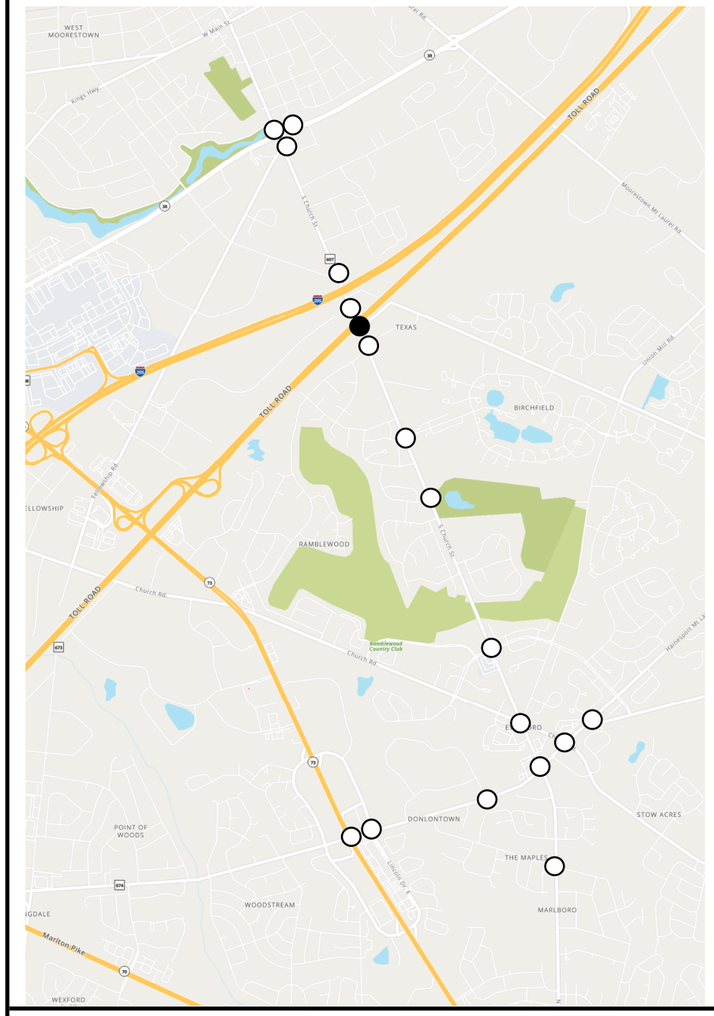
Phasing Diagram

Intersection Geometry

Intersection ID # 210

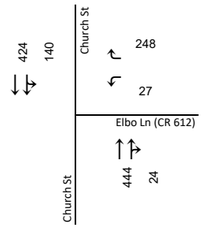
N

NTS

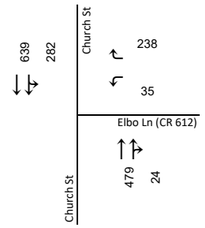


Hourly Volumes

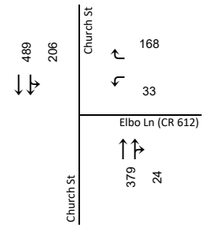
Weekend AM Peak Period



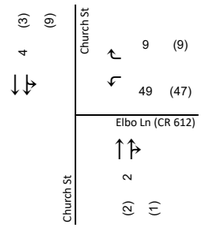
Weekend MD Peak Period



Weekend PM Peak Period

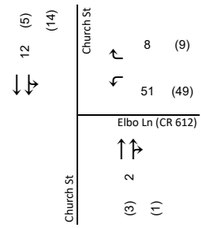


Existing Operations



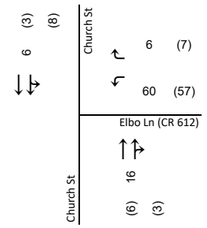
Summary

Timing Pattern	10	*Syn Delay*	5	A
Actuated Cycle	105	*Sim Delay*	(6)	
Max v/C	0.53	*ICU*	55%	A



Summary

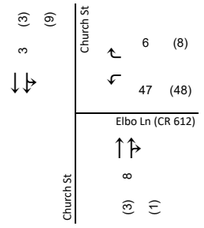
Timing Pattern	10	*Syn Delay*	9	A
Actuated Cycle	105	*Sim Delay*	(7)	
Max v/C	0.71	*ICU*	66%	C



Summary

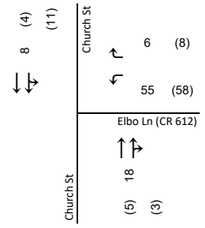
Timing Pattern	13	*Syn Delay*	11	B
Actuated Cycle	115	*Sim Delay*	(7)	
Max v/C	0.51	*ICU*	59%	B

Implemented Operations



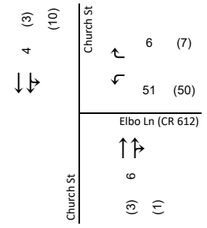
Summary

Timing Pattern	10	*Syn Delay*	6	A
Actuated Cycle	100	*Sim Delay*	(5)	
Max v/C	0.46	*ICU*	53%	A



Summary

Timing Pattern	15	*Syn Delay*	12	B
Actuated Cycle	110	*Sim Delay*	(7)	
Max v/C	0.65	*ICU*	64%	B



Summary

Timing Pattern	10	*Syn Delay*	6	A
Actuated Cycle	100	*Sim Delay*	(6)	
Max v/C	0.52	*ICU*	57%	B

Operations with Improvements

No operational improvements recommended at this time.

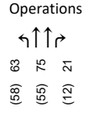
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

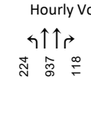


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



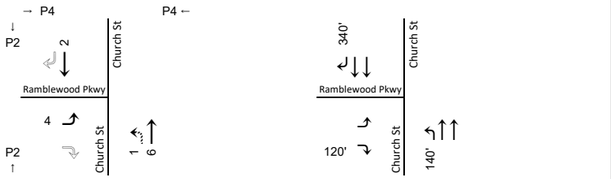
stop bar geometry

turning movement volume

Figure 29

Weekend Traffic Operations Analysis

Church St (CR 607) & Elbo Ln (CR 612)

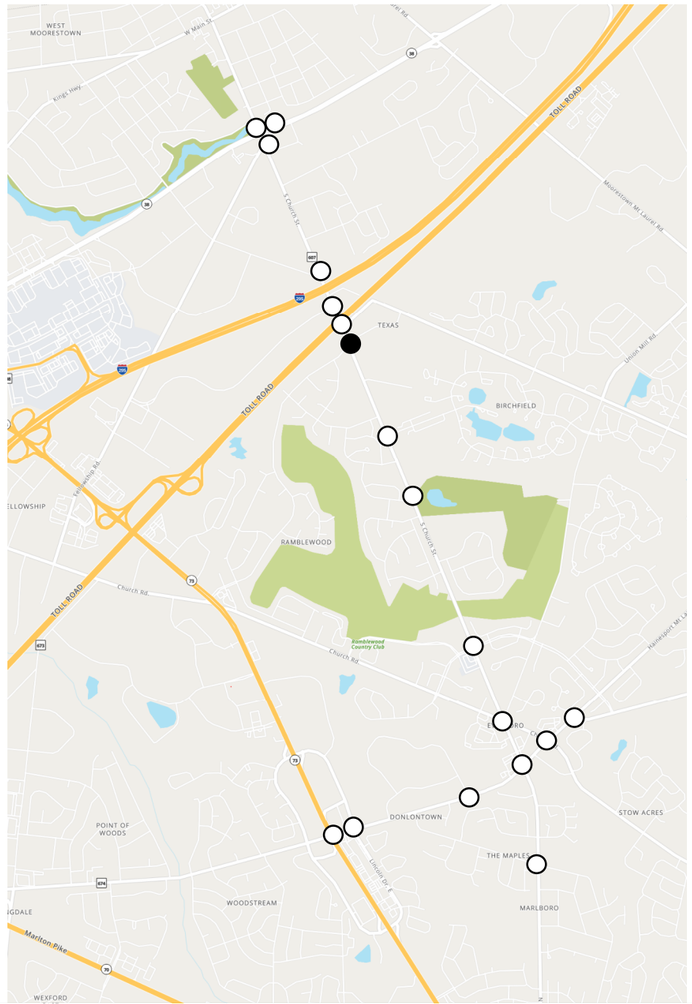


Phasing Diagram

Intersection Geometry

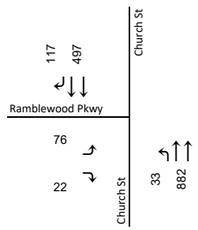
Intersection ID # 115

N NTS

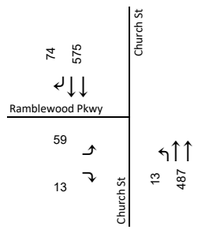


Hourly Volumes

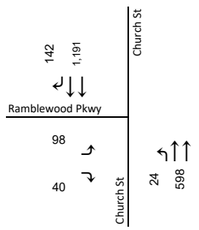
AM Peak Period



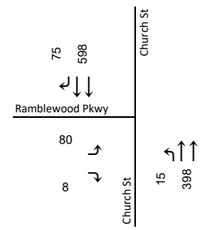
MD Peak Period



PM Peak Period

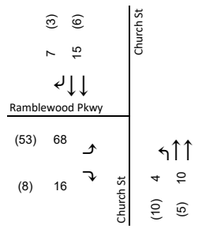


PM Off-peak Period



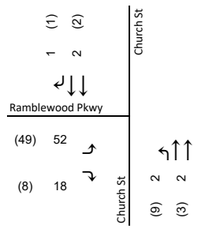
Existing Operations

AM Peak Period



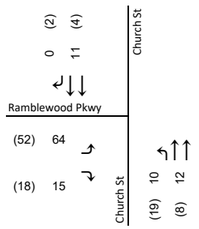
Summary				
Timing Pattern	16	Syn Delay	15	B
Actuated Cycle	120	Sim Delay	(7)	
Max v/C	0.69	ICU	45%	A

MD Peak Period



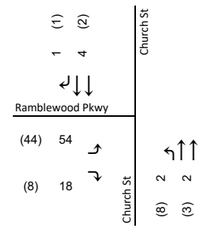
Summary				
Timing Pattern	10	Syn Delay	5	A
Actuated Cycle	105	Sim Delay	(4)	
Max v/C	0.46	ICU	41%	A

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	13	B
Actuated Cycle	115	Sim Delay	(8)	
Max v/C	0.64	ICU	51%	A

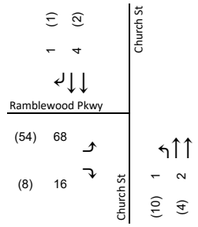
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	7	A
Actuated Cycle	105	Sim Delay	(5)	
Max v/C	0.54	ICU	41%	A

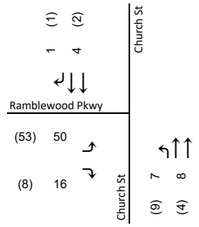
Implemented Operations

AM Peak Period



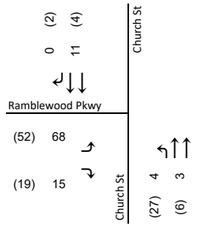
Summary				
Timing Pattern	16	Syn Delay	8	A
Actuated Cycle	120	Sim Delay	(6)	
Max v/C	0.69	ICU	44%	A

MD Peak Period



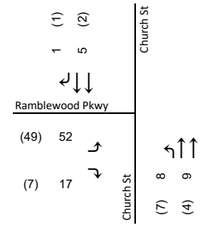
Summary				
Timing Pattern	13	Syn Delay	8	A
Actuated Cycle	110	Sim Delay	(5)	
Max v/C	0.42	ICU	40%	A

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	11	B
Actuated Cycle	120	Sim Delay	(7)	
Max v/C	0.64	ICU	50%	A

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	10	A
Actuated Cycle	110	Sim Delay	(6)	
Max v/C	0.50	ICU	40%	A

Operations with Improvements

No operational improvements recommended at this time.

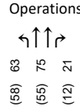
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

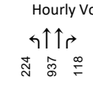


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



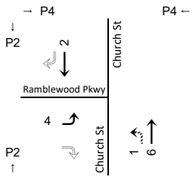
stop bar geometry

turning movement volume

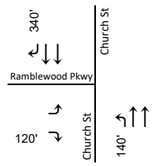
Figure 30

Weekday Traffic Operations Analysis

Church St (CR 607) & Ramblewood Pkwy

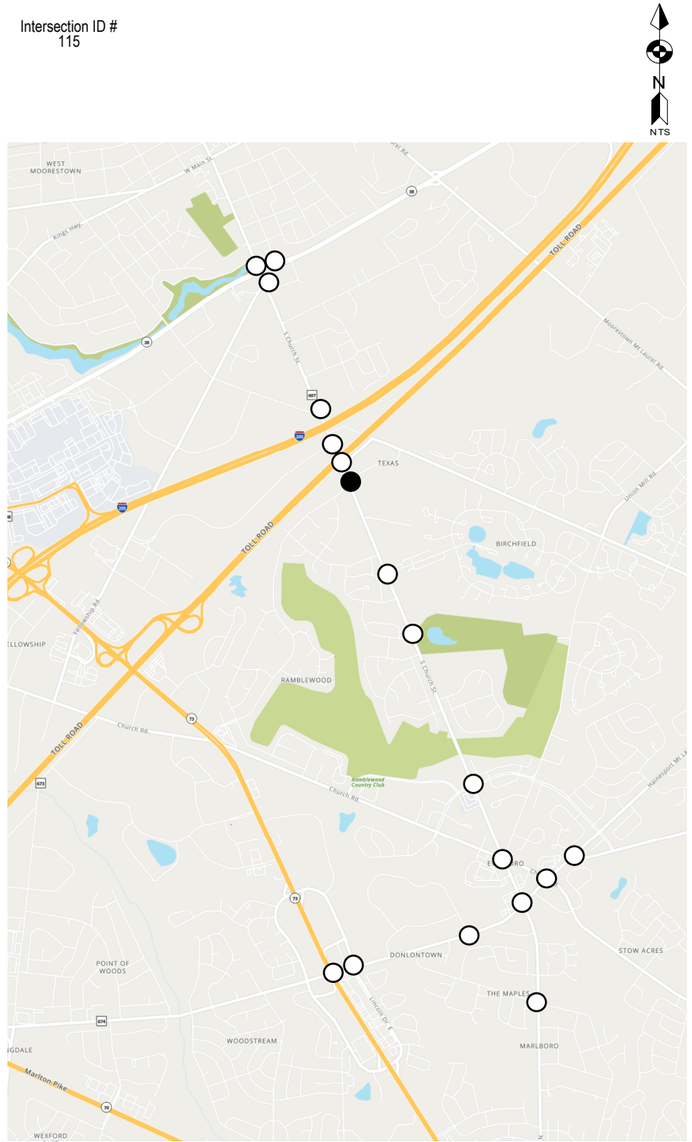


Phasing Diagram



Intersection Geometry

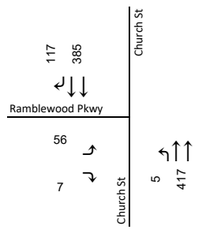
Intersection ID # 115



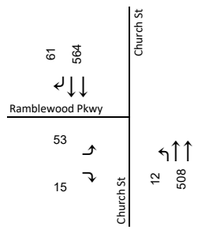
NTS

Hourly Volumes

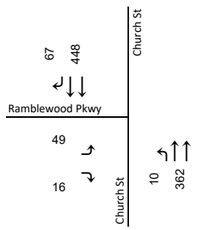
Weekend AM Peak Period



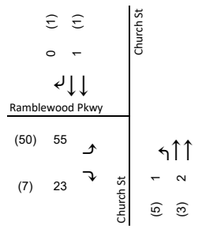
Weekend MD Peak Period



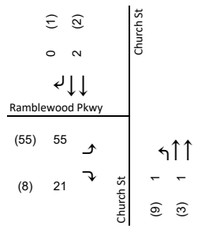
Weekend PM Peak Period



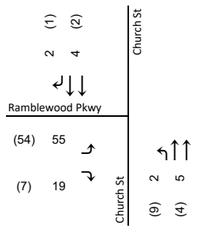
Existing Operations



Summary					
Timing Pattern	10	Syn Delay	5	A	
Actuated Cycle	105	Sim Delay	(5)		
Max v/C	0.44	ICU	41%	A	

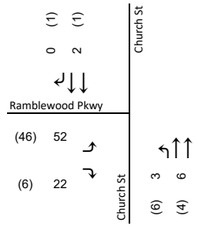


Summary					
Timing Pattern	10	Syn Delay	4	A	
Actuated Cycle	105	Sim Delay	(4)		
Max v/C	0.44	ICU	41%	A	

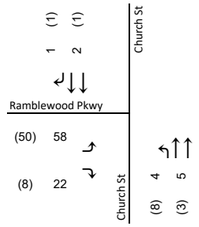


Summary					
Timing Pattern	13	Syn Delay	7	A	
Actuated Cycle	115	Sim Delay	(5)		
Max v/C	0.37	ICU	41%	A	

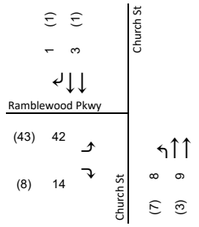
Implemented Operations



Summary					
Timing Pattern	10	Syn Delay	6	A	
Actuated Cycle	100	Sim Delay	(5)		
Max v/C	0.42	ICU	40%	A	



Summary					
Timing Pattern	15	Syn Delay	6	A	
Actuated Cycle	110	Sim Delay	(4)		
Max v/C	0.45	ICU	40%	A	



Summary					
Timing Pattern	10	Syn Delay	7	A	
Actuated Cycle	100	Sim Delay	(4)		
Max v/C	0.29	ICU	40%	A	

Operations with Improvements

No operational improvements recommended at this time.

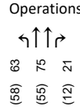
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

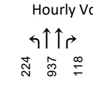


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



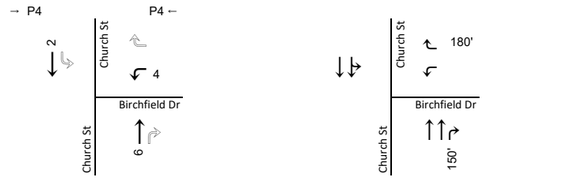
stop bar geometry

turning movement volume

Figure 31

Weekend Traffic Operations Analysis

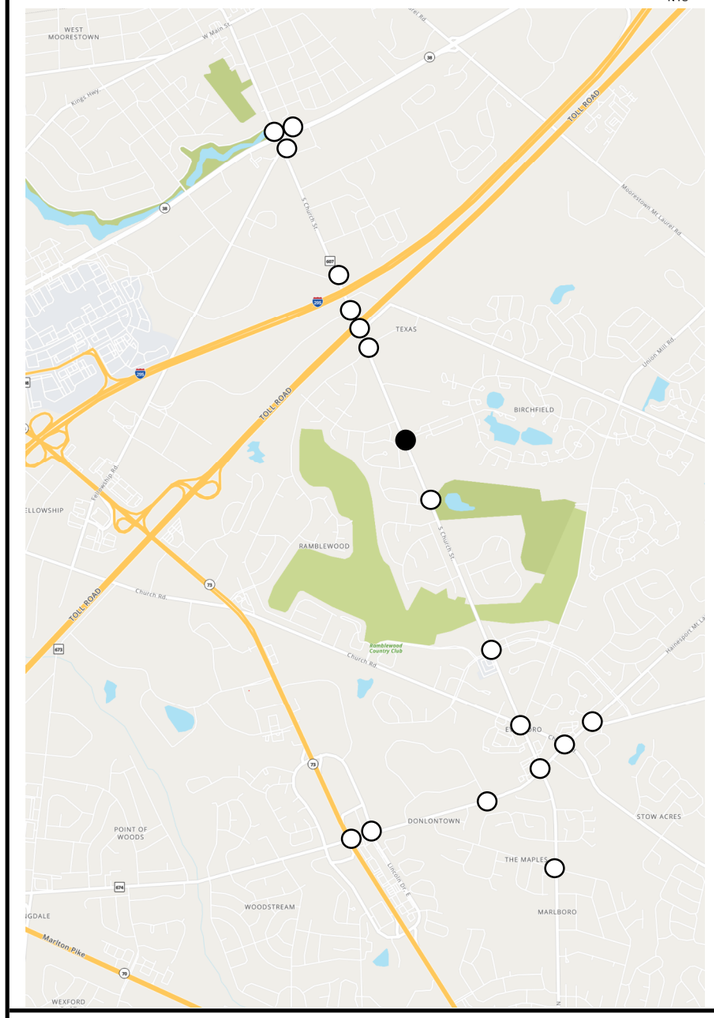
Church St (CR 607) & Ramblewood Pkwy



Phasing Diagram

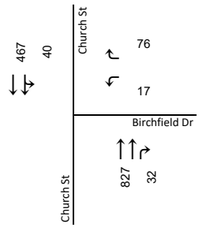
Intersection Geometry

Intersection ID # 142

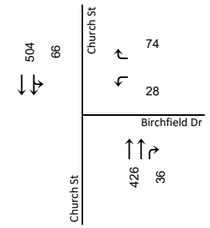


Hourly Volumes

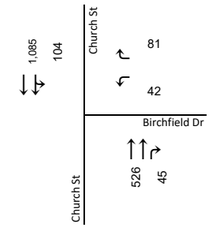
AM Peak Period



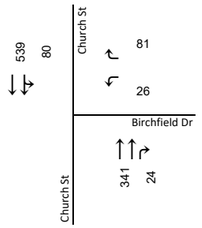
MD Peak Period



PM Peak Period

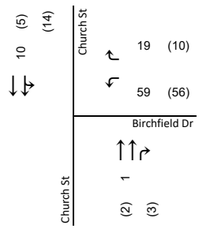


PM Off-peak Period



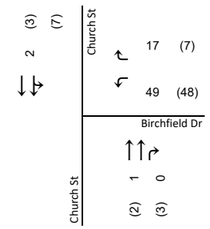
Existing Operations

AM Peak Period



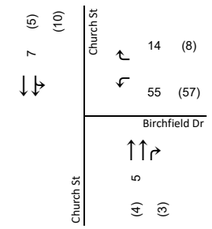
Summary				
Timing Pattern	16	Syn Delay	6	A
Actuated Cycle	120	Sim Delay	(4)	
Max v/C	0.47	ICU	62%	B

MD Peak Period



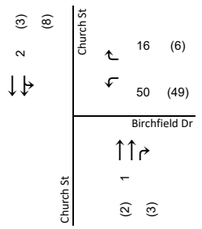
Summary				
Timing Pattern	10	Syn Delay	4	A
Actuated Cycle	105	Sim Delay	(4)	
Max v/C	0.43	ICU	53%	A

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	8	A
Actuated Cycle	115	Sim Delay	(6)	
Max v/C	0.76	ICU	73%	D

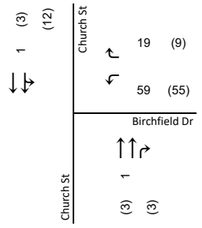
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	4	A
Actuated Cycle	105	Sim Delay	(5)	
Max v/C	0.44	ICU	54%	A

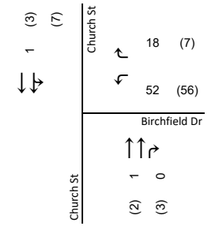
Implemented Operations

AM Peak Period



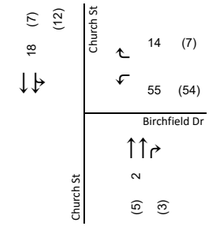
Summary				
Timing Pattern	16	Syn Delay	3	A
Actuated Cycle	120	Sim Delay	(4)	
Max v/C	0.47	ICU	60%	B

MD Peak Period



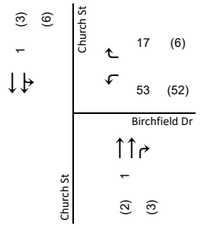
Summary				
Timing Pattern	13	Syn Delay	3	A
Actuated Cycle	110	Sim Delay	(4)	
Max v/C	0.44	ICU	51%	A

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	14	B
Actuated Cycle	120	Sim Delay	(7)	
Max v/C	0.75	ICU	72%	C

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	4	A
Actuated Cycle	110	Sim Delay	(4)	
Max v/C	0.45	ICU	52%	A

Operations with Improvements

No operational improvements recommended at this time.

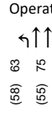
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams



stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

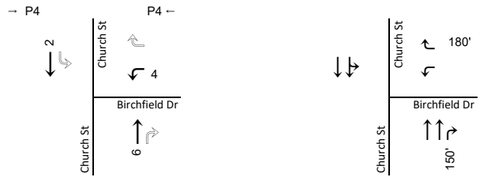
stop bar geometry

turning movement volume

Figure 32

Weekday Traffic Operations Analysis

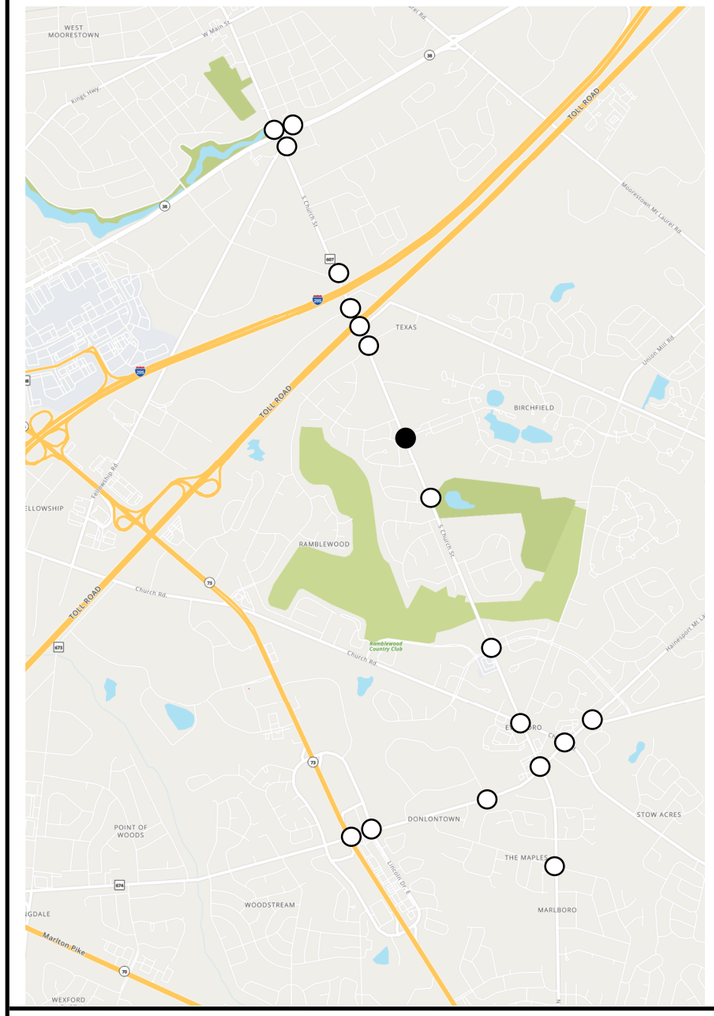
Church St (CR 607) & Birchfield Dr



Phasing Diagram

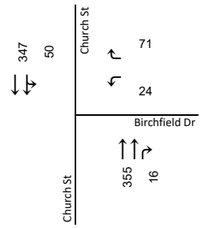
Intersection Geometry

Intersection ID # 142

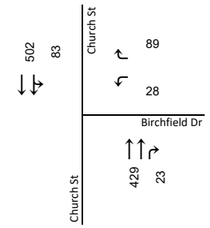


Hourly Volumes

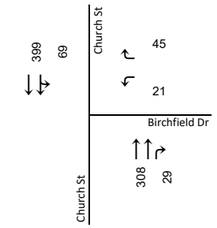
Weekend AM Peak Period



Weekend MD Peak Period

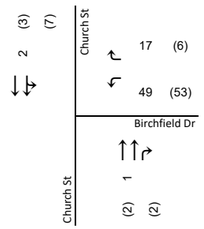


Weekend PM Peak Period



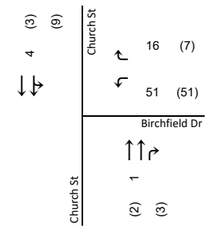
Existing Operations

Weekend AM Peak Period



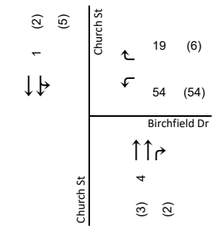
Summary				
Timing Pattern	10	Syn Delay	4	A
Actuated Cycle	105	Sim Delay	(4)	
Max v/C	0.42	ICU	48%	A

Weekend MD Peak Period



Summary				
Timing Pattern	10	Syn Delay	5	A
Actuated Cycle	105	Sim Delay	(5)	
Max v/C	0.49	ICU	53%	A

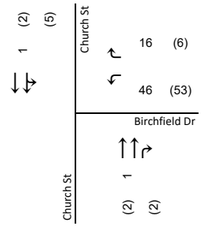
Weekend PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	5	A
Actuated Cycle	115	Sim Delay	(4)	
Max v/C	0.37	ICU	50%	A

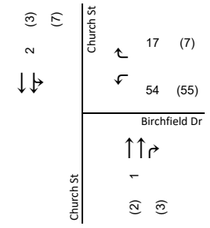
Implemented Operations

Weekend AM Peak Period



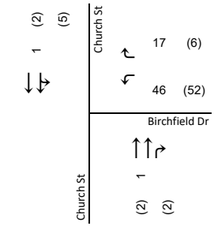
Summary				
Timing Pattern	10	Syn Delay	3	A
Actuated Cycle	100	Sim Delay	(4)	
Max v/C	0.41	ICU	47%	A

Weekend MD Peak Period



Summary				
Timing Pattern	15	Syn Delay	4	A
Actuated Cycle	110	Sim Delay	(4)	
Max v/C	0.50	ICU	51%	A

Weekend PM Peak Period



Summary				
Timing Pattern	10	Syn Delay	3	A
Actuated Cycle	100	Sim Delay	(4)	
Max v/C	0.34	ICU	48%	A

Operations with Improvements

No operational improvements recommended at this time.

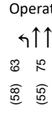
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

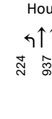


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



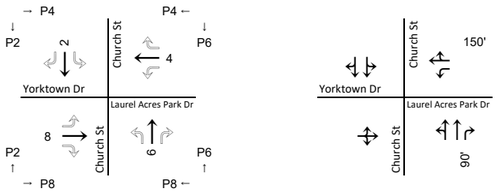
stop bar geometry

turning movement volume

Figure 33

Weekend Traffic Operations Analysis

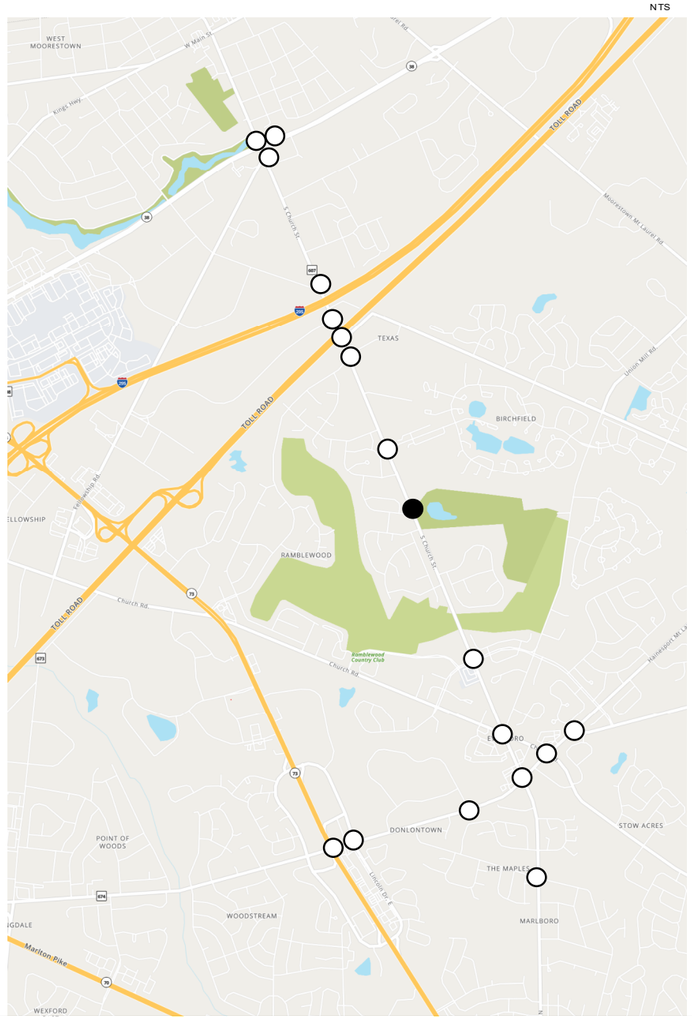
Church St (CR 607) & Birchfield Dr



Phasing Diagram

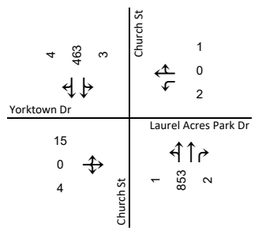
Intersection Geometry

Intersection ID # 198

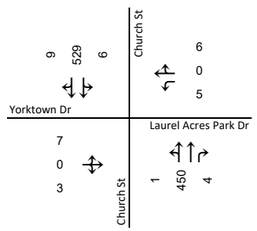


Hourly Volumes

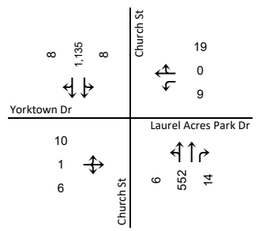
AM Peak Period



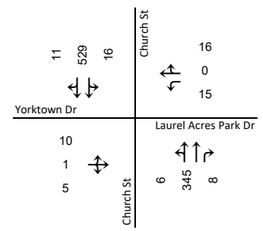
MD Peak Period



PM Peak Period

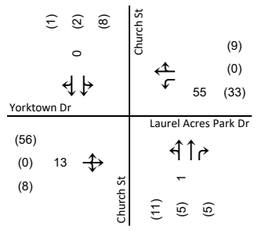


PM Off-peak Period



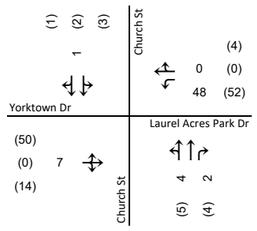
Existing Operations

AM Peak Period



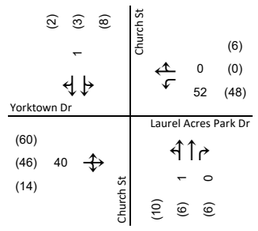
Summary				
Timing Pattern	16	Syn Delay	1	A
Actuated Cycle	120	Sim Delay	(4)	
Max v/C	0.38	ICU	50%	A

MD Peak Period



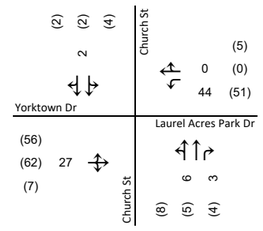
Summary				
Timing Pattern	10	Syn Delay	3	A
Actuated Cycle	105	Sim Delay	(4)	
Max v/C	0.24	ICU	52%	A

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	2	A
Actuated Cycle	115	Sim Delay	(5)	
Max v/C	0.52	ICU	69%	C

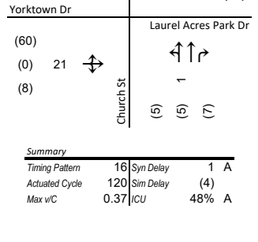
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	5	A
Actuated Cycle	105	Sim Delay	(5)	
Max v/C	0.29	ICU	52%	A

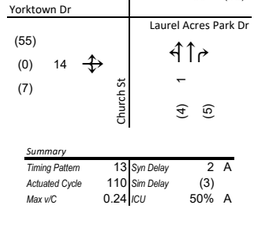
Implemented Operations

AM Peak Period



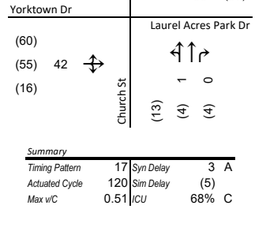
Summary				
Timing Pattern	16	Syn Delay	1	A
Actuated Cycle	120	Sim Delay	(4)	
Max v/C	0.37	ICU	48%	A

MD Peak Period



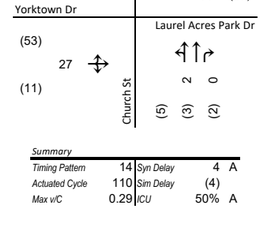
Summary				
Timing Pattern	13	Syn Delay	2	A
Actuated Cycle	110	Sim Delay	(3)	
Max v/C	0.24	ICU	50%	A

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	3	A
Actuated Cycle	120	Sim Delay	(5)	
Max v/C	0.51	ICU	68%	C

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	4	A
Actuated Cycle	110	Sim Delay	(4)	
Max v/C	0.29	ICU	50%	A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

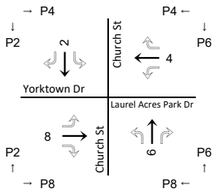
stop bar geometry

turning movement volume

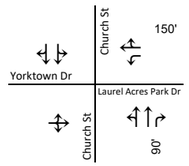
Figure 34

Weekday Traffic Operations Analysis

Church St (CR 607) & Yorktown Dr/Laurel Acres Park Dr

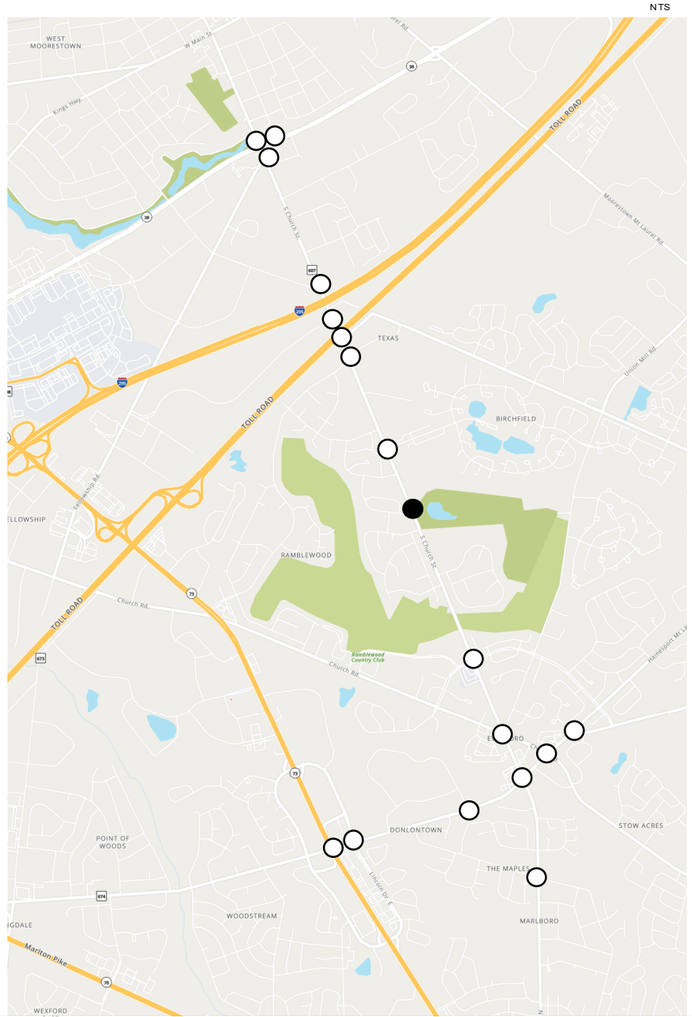


Phasing Diagram



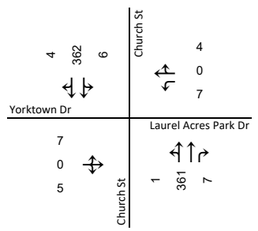
Intersection Geometry

Intersection ID # 198

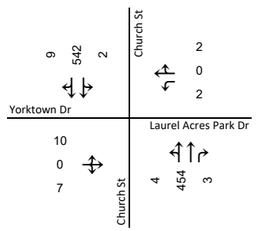


Hourly Volumes

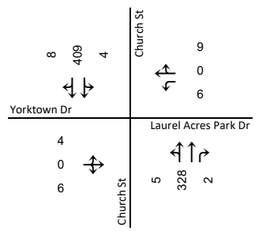
Weekend AM Peak Period



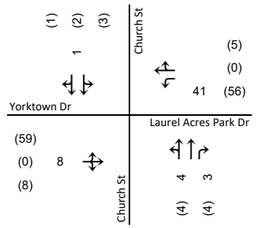
Weekend MD Peak Period



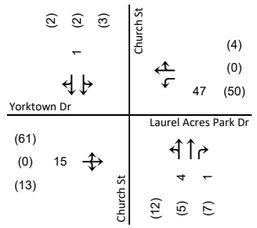
Weekend PM Peak Period



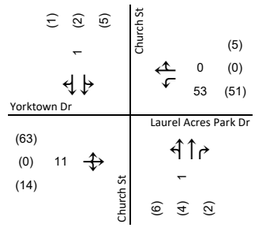
Existing Operations



Summary					
Timing Pattern	10	Syn Delay	3	A	
Actuated Cycle	105	Sim Delay	(4)		
Max v/C	0.19	ICU	48%	A	

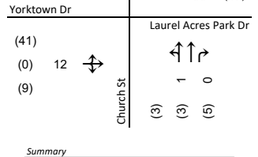


Summary					
Timing Pattern	10	Syn Delay	3	A	
Actuated Cycle	105	Sim Delay	(4)		
Max v/C	0.27	ICU	52%	A	

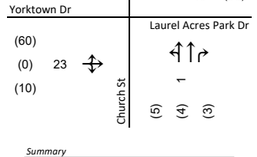


Summary					
Timing Pattern	13	Syn Delay	2	A	
Actuated Cycle	115	Sim Delay	(4)		
Max v/C	0.18	ICU	48%	A	

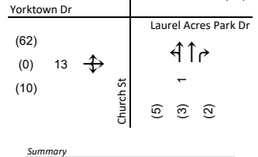
Implemented Operations



Summary					
Timing Pattern	10	Syn Delay	3	A	
Actuated Cycle	100	Sim Delay	(4)		
Max v/C	0.19	ICU	47%	A	



Summary					
Timing Pattern	15	Syn Delay	2	A	
Actuated Cycle	110	Sim Delay	(3)		
Max v/C	0.27	ICU	50%	A	



Summary					
Timing Pattern	10	Syn Delay	2	A	
Actuated Cycle	100	Sim Delay	(3)		
Max v/C	0.17	ICU	47%	A	

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

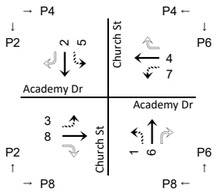
stop bar geometry

turning movement volume

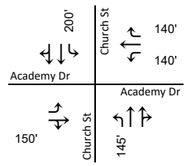
Figure 35

Weekend Traffic Operations Analysis

Church St (CR 607) & Yorktown Dr/Laurel Acres Park Dr

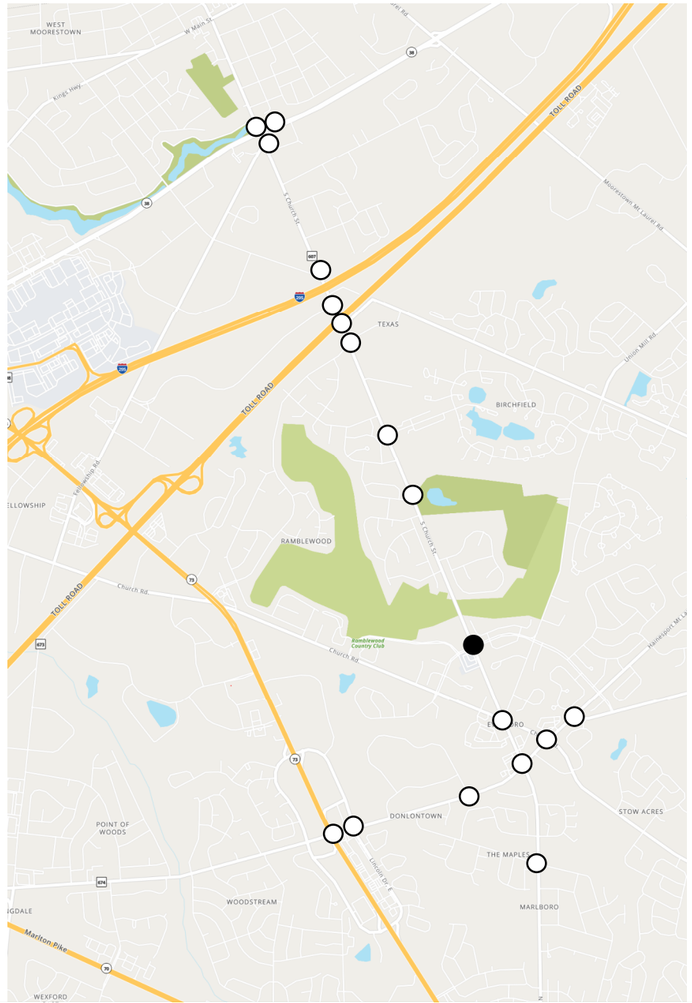


Phasing Diagram



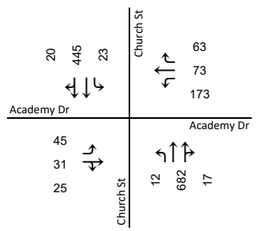
Intersection Geometry

Intersection ID # 113

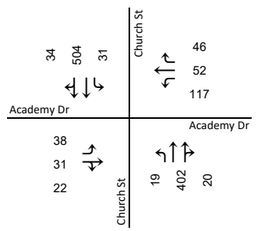


Hourly Volumes

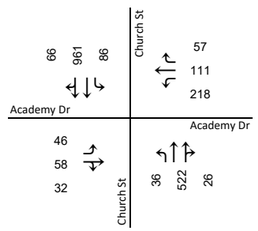
AM Peak Period



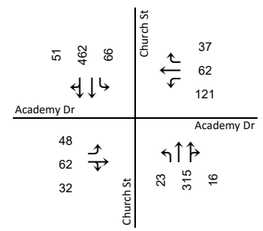
MD Peak Period



PM Peak Period

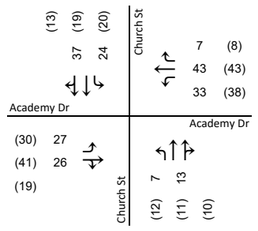


PM Off-peak Period



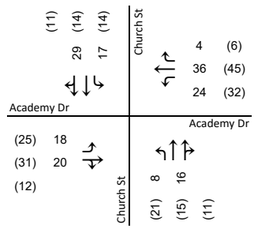
Existing Operations

AM Peak Period



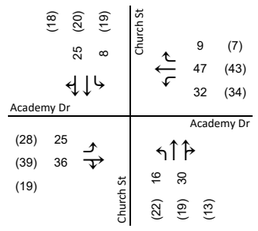
Summary				
Timing Pattern	16	Syn Delay	24	C
Actuated Cycle	120	Sim Delay	(18)	
Max v/C	0.52	ICU	52%	A

MD Peak Period



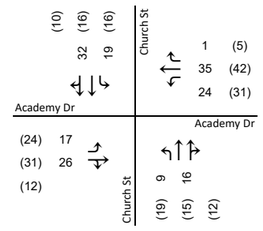
Summary				
Timing Pattern	10	Syn Delay	22	C
Actuated Cycle	105	Sim Delay	(17)	
Max v/C	0.45	ICU	51%	A

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	27	C
Actuated Cycle	115	Sim Delay	(22)	
Max v/C	0.82	ICU	68%	C

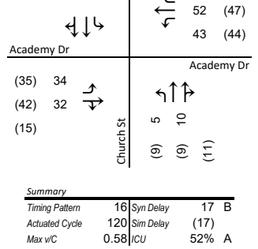
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	24	C
Actuated Cycle	105	Sim Delay	(18)	
Max v/C	0.48	ICU	57%	B

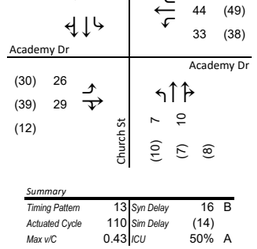
Implemented Operations

AM Peak Period



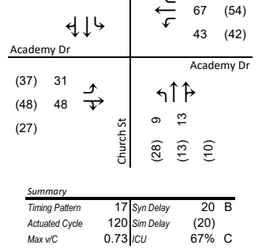
Summary				
Timing Pattern	16	Syn Delay	17	B
Actuated Cycle	120	Sim Delay	(17)	
Max v/C	0.58	ICU	52%	A

MD Peak Period



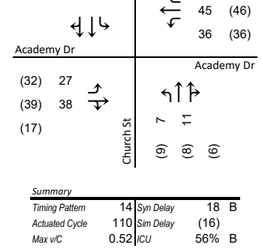
Summary				
Timing Pattern	13	Syn Delay	16	B
Actuated Cycle	110	Sim Delay	(14)	
Max v/C	0.43	ICU	50%	A

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	20	B
Actuated Cycle	120	Sim Delay	(20)	
Max v/C	0.73	ICU	67%	C

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	18	B
Actuated Cycle	110	Sim Delay	(16)	
Max v/C	0.52	ICU	56%	B

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

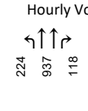
Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



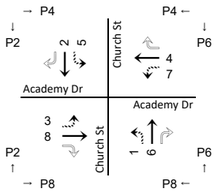
stop bar geometry

turning movement volume

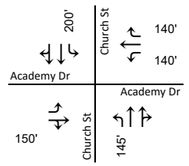
Figure 36

Weekday Traffic Operations Analysis

Church St (CR 607) & Academy Dr

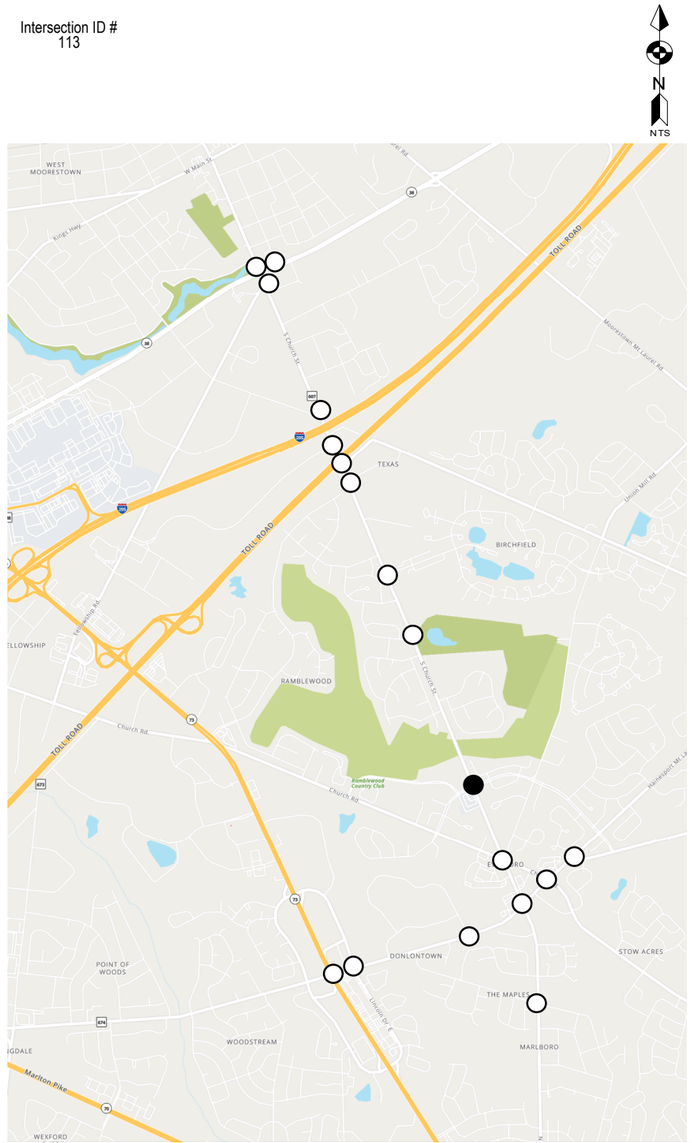


Phasing Diagram



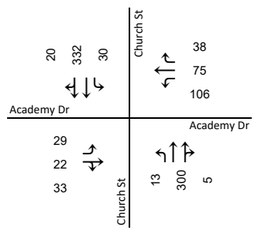
Intersection Geometry

Intersection ID # 113

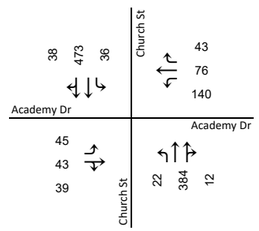


Hourly Volumes

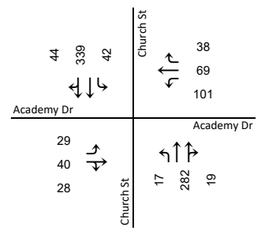
Weekend AM Peak Period



Weekend MD Peak Period

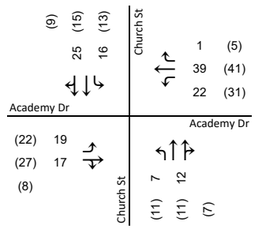


Weekend PM Peak Period



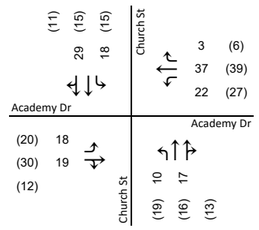
Existing Operations

Weekend AM Peak Period



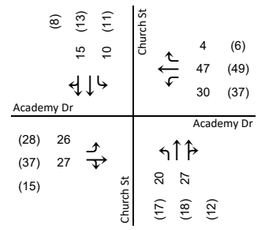
Summary				
Timing Pattern	10	Syn Delay	20	C
Actuated Cycle	105	Sim Delay	(17)	
Max v/C	0.33	ICU	50%	A

Weekend MD Peak Period



Summary				
Timing Pattern	10	Syn Delay	22	C
Actuated Cycle	105	Sim Delay	(18)	
Max v/C	0.43	ICU	57%	B

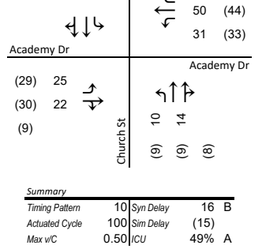
Weekend PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	23	C
Actuated Cycle	115	Sim Delay	(20)	
Max v/C	0.32	ICU	56%	B

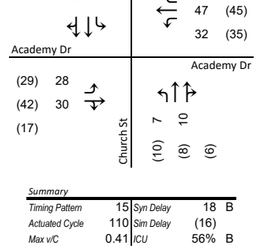
Implemented Operations

Weekend AM Peak Period



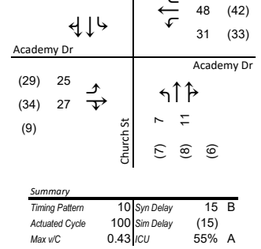
Summary				
Timing Pattern	10	Syn Delay	16	B
Actuated Cycle	100	Sim Delay	(15)	
Max v/C	0.50	ICU	49%	A

Weekend MD Peak Period



Summary				
Timing Pattern	15	Syn Delay	18	B
Actuated Cycle	110	Sim Delay	(16)	
Max v/C	0.41	ICU	56%	B

Weekend PM Peak Period



Summary				
Timing Pattern	10	Syn Delay	15	B
Actuated Cycle	100	Sim Delay	(15)	
Max v/C	0.43	ICU	55%	A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

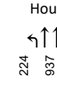
Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



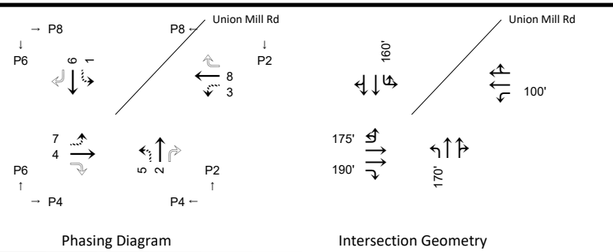
stop bar geometry

turning movement volume

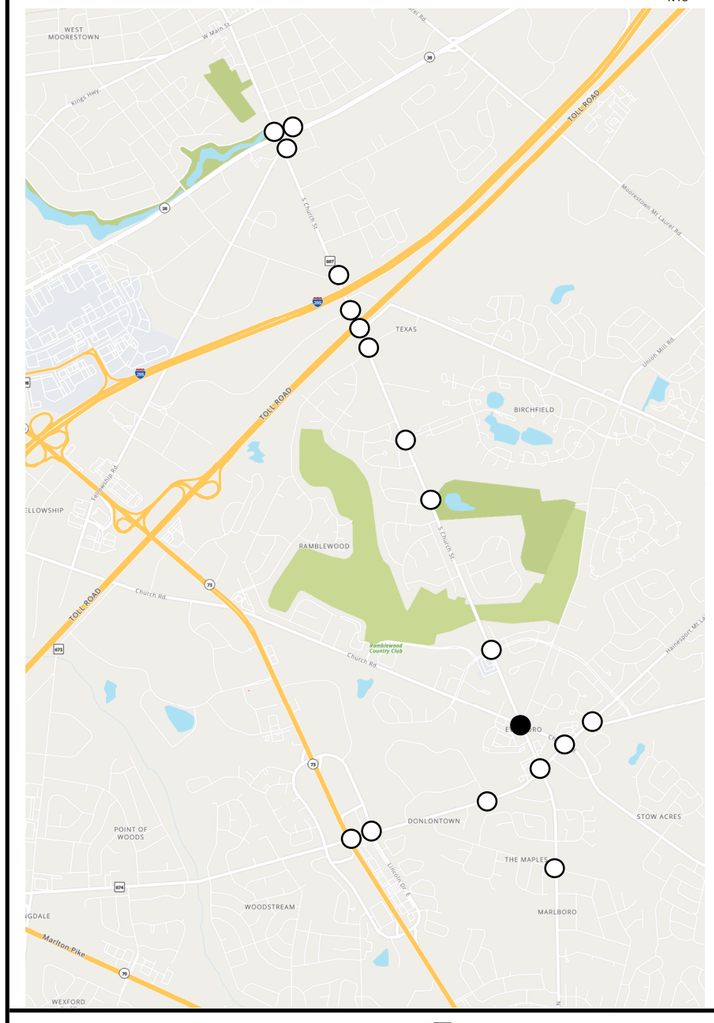
Figure 37

Weekend Traffic Operations Analysis

Church St (CR 607) & Academy Dr

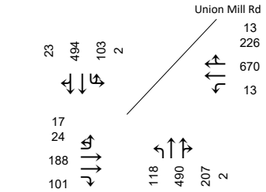


Intersection ID # 67

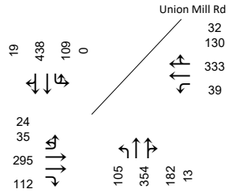


Hourly Volumes

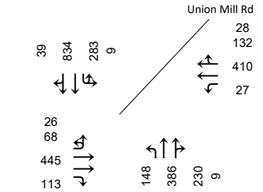
AM Peak Period



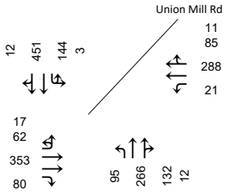
MD Peak Period



PM Peak Period

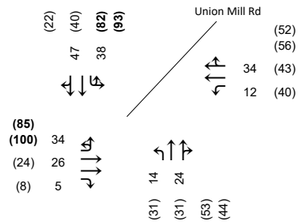


PM Off-peak Period



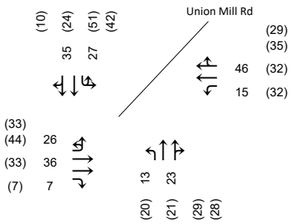
Existing Operations

AM Peak Period



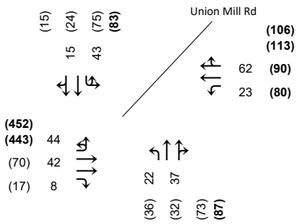
Summary				
Timing Pattern	16	Syn Delay	31	C
Actuated Cycle	120	Sim Delay	(41)	
Max v/C	0.95	ICU	76%	D

MD Peak Period



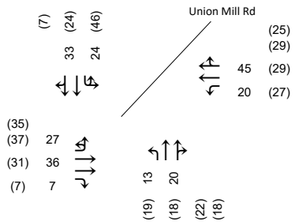
Summary				
Timing Pattern	10	Syn Delay	31	C
Actuated Cycle	105	Sim Delay	(27)	
Max v/C	0.87	ICU	60%	B

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	35	C
Actuated Cycle	115	Sim Delay	(65)	
Max v/C	0.95	ICU	77%	D

PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	30	C
Actuated Cycle	105	Sim Delay	(26)	
Max v/C	0.78	ICU	55%	B

Implemented Operations

AM Peak Period

Summary				
Timing Pattern	16	Syn Delay	37	D
Actuated Cycle	120	Sim Delay	(53)	
Max v/C	1.00	ICU	76%	D

MD Peak Period

Summary				
Timing Pattern	13	Syn Delay	29	C
Actuated Cycle	110	Sim Delay	(28)	
Max v/C	0.89	ICU	60%	B

PM Peak Period

Summary				
Timing Pattern	17	Syn Delay	36	D
Actuated Cycle	120	Sim Delay	(79)	
Max v/C	0.98	ICU	77%	D

PM Off-peak Period

Summary				
Timing Pattern	14	Syn Delay	28	C
Actuated Cycle	110	Sim Delay	(26)	
Max v/C	0.80	ICU	55%	B

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

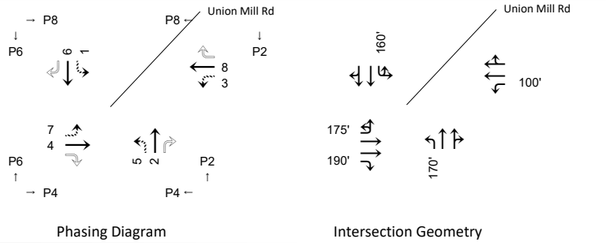
stop bar geometry

turning movement volume

Figure 38

Weekday Traffic Operations Analysis

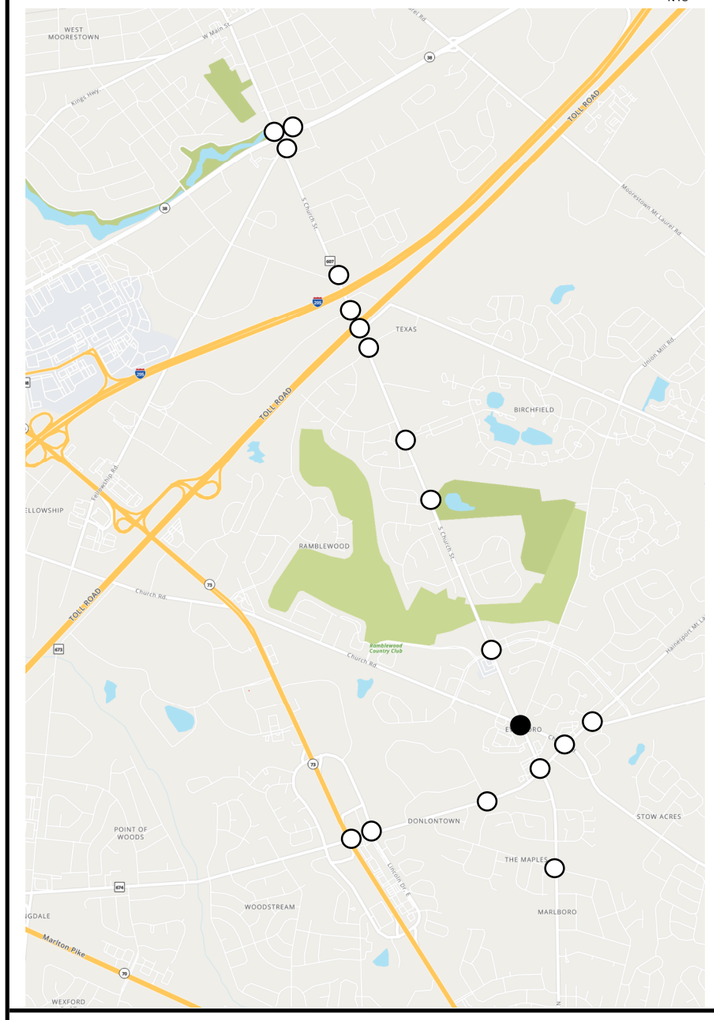
Maple Ave/Church St (CR 607) & Church Rd (CR 616)/Union Mill Rd



Phasing Diagram

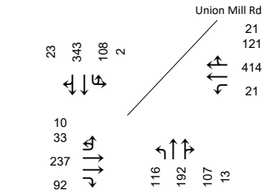
Intersection Geometry

Intersection ID # 67

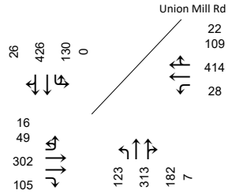


Hourly Volumes

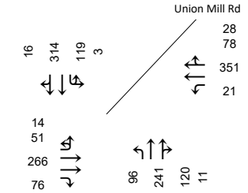
Weekend AM Peak Period



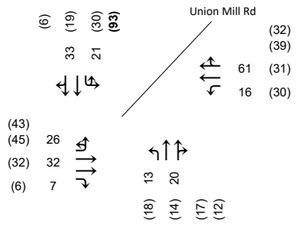
Weekend MD Peak Period



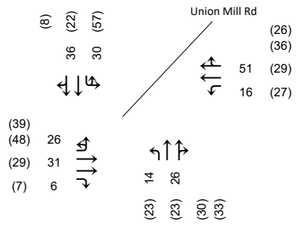
Weekend PM Peak Period



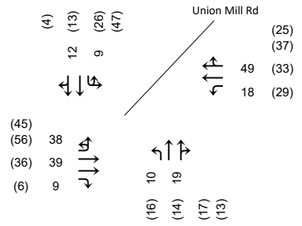
Existing Operations



Summary				
Timing Pattern	10	Syn Delay	36	D
Actuated Cycle	105	Sim Delay	(24)	
Max v/C	0.99	ICU	55%	B

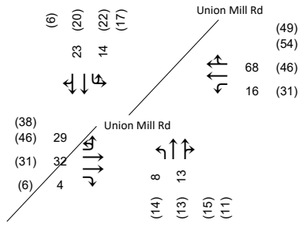


Summary				
Timing Pattern	10	Syn Delay	33	C
Actuated Cycle	105	Sim Delay	(28)	
Max v/C	0.93	ICU	61%	B

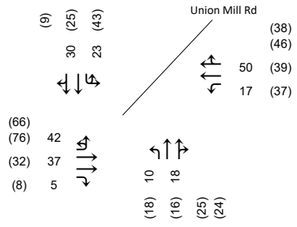


Summary				
Timing Pattern	13	Syn Delay	27	C
Actuated Cycle	115	Sim Delay	(24)	
Max v/C	0.87	ICU	54%	A

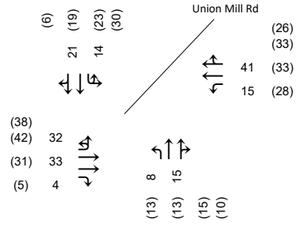
Implemented Operations



Summary				
Timing Pattern	10	Syn Delay	35	C
Actuated Cycle	100	Sim Delay	(29)	
Max v/C	1.02	ICU	57%	B



Summary				
Timing Pattern	15	Syn Delay	30	C
Actuated Cycle	110	Sim Delay	(29)	
Max v/C	0.93	ICU	61%	B



Summary				
Timing Pattern	10	Syn Delay	25	C
Actuated Cycle	100	Sim Delay	(23)	
Max v/C	0.85	ICU	55%	B

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

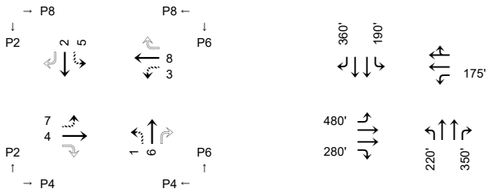
stop bar geometry

turning movement volume

Figure 39

Weekend Traffic Operations Analysis

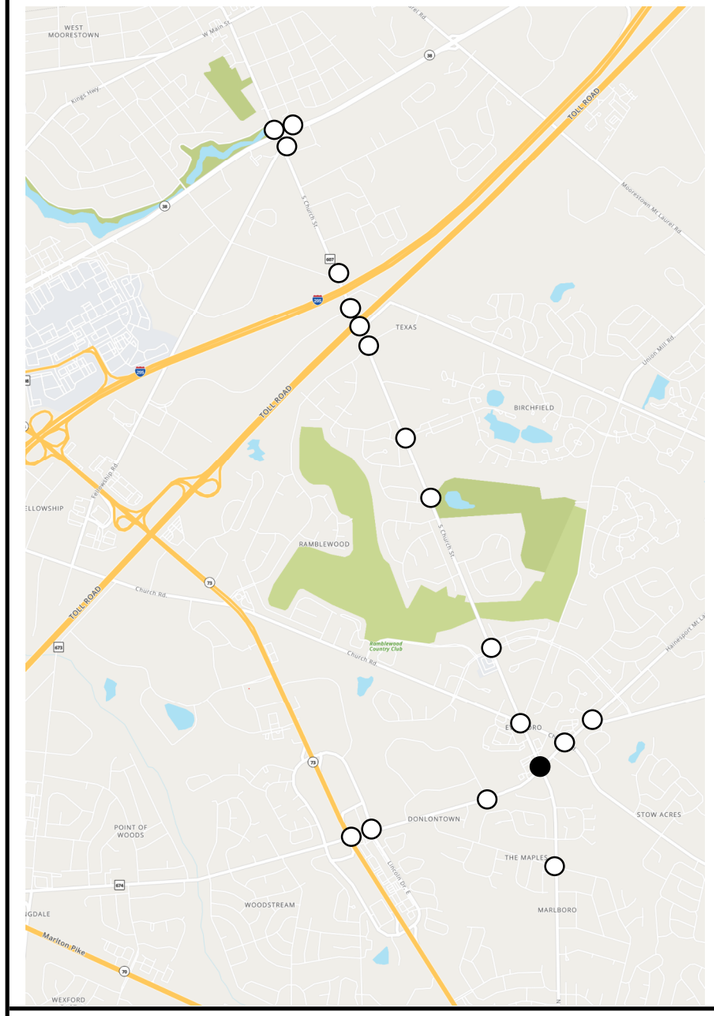
Maple Ave/Church St (CR 607) & Church Rd (CR 616)/Union Mill Rd



Phasing Diagram

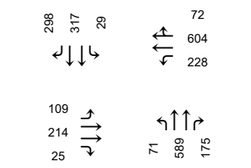
Intersection Geometry

Intersection ID # 101

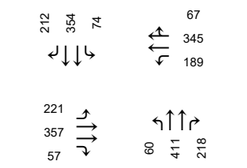


Hourly Volumes

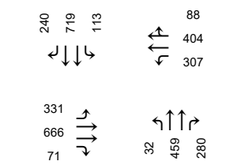
AM Peak Period



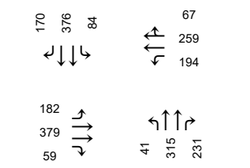
MD Peak Period



PM Peak Period

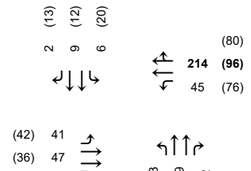


PM Off-peak Period



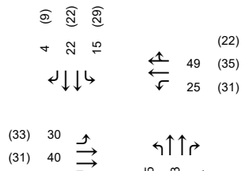
Existing Operations

AM Peak Period



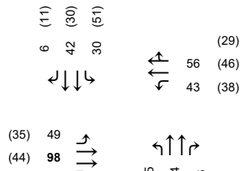
Summary				
Timing Pattern	16	Syn Delay	72	E
Actuated Cycle	120	Sim Delay	(42)	
Max v/C	1.36	ICU	66%	C

MD Peak Period



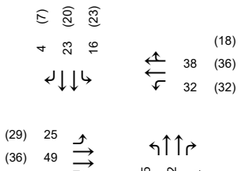
Summary				
Timing Pattern	10	Syn Delay	26	C
Actuated Cycle	100	Sim Delay	(24)	
Max v/C	0.84	ICU	60%	B

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	48	D
Actuated Cycle	110	Sim Delay	(33)	
Max v/C	1.08	ICU	81%	D

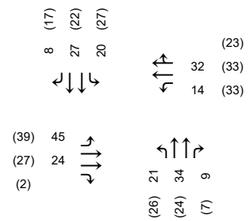
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	26	C
Actuated Cycle	100	Sim Delay	(24)	
Max v/C	0.82	ICU	58%	B

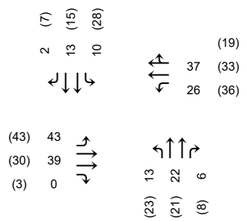
Implemented Operations

AM Peak Period



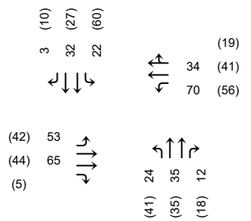
Summary				
Timing Pattern	16	Syn Delay	25	C
Actuated Cycle	120	Sim Delay	(25)	
Max v/C	0.89	ICU	66%	C

MD Peak Period



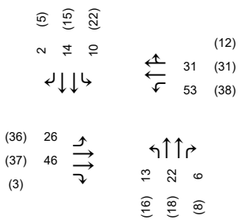
Summary				
Timing Pattern	13	Syn Delay	23	C
Actuated Cycle	110	Sim Delay	(24)	
Max v/C	0.84	ICU	60%	B

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	40	D
Actuated Cycle	120	Sim Delay	(35)	
Max v/C	0.99	ICU	81%	D

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	25	C
Actuated Cycle	110	Sim Delay	(23)	
Max v/C	0.82	ICU	58%	B

Operations with Improvements

No operational improvements recommended at this time.

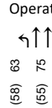
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams



stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

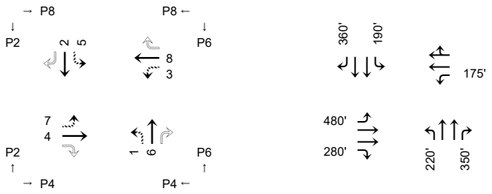
stop bar geometry

turning movement volume

Figure 40

Weekday Traffic Operations Analysis

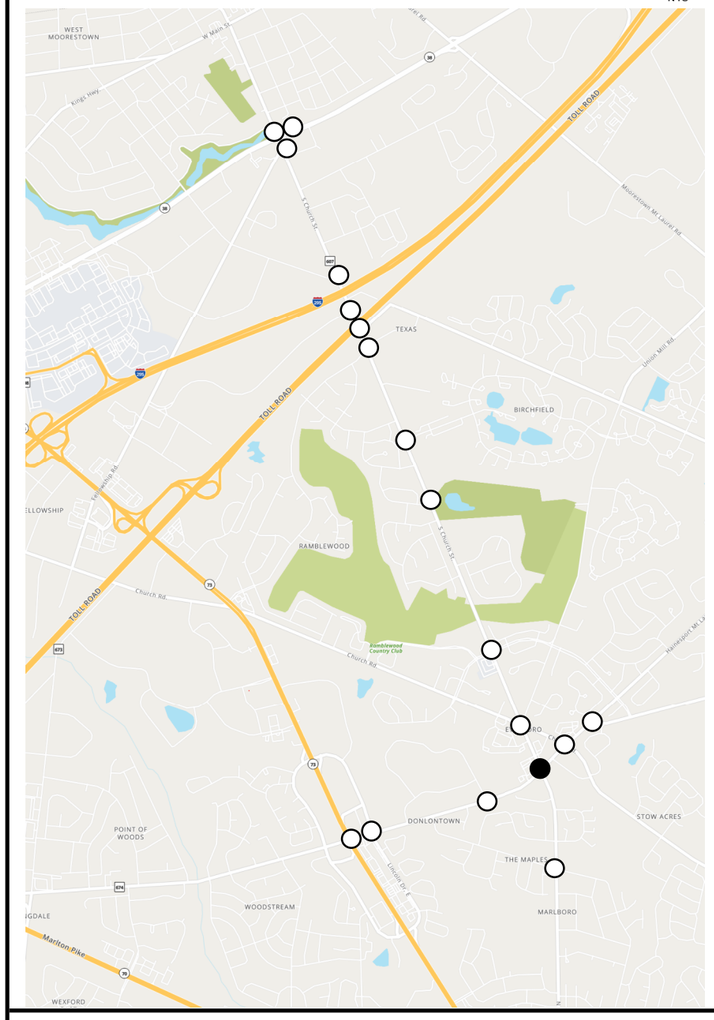
Maple Ave (CR 607) & Greentree Rd (CR 674)



Phasing Diagram

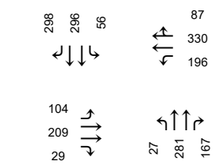
Intersection Geometry

Intersection ID # 101

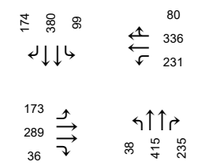


Hourly Volumes

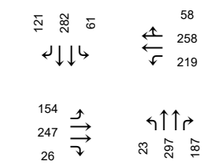
Weekend AM Peak Period



Weekend MD Peak Period

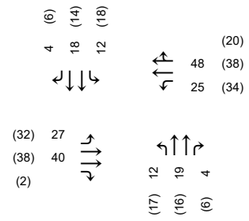


Weekend PM Peak Period



Existing Operations

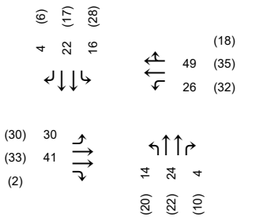
Weekend AM Peak Period



Summary

Timing Pattern	10	*Syn Delay*	25	C
Actuated Cycle	100	*Sim Delay*	(23)	
Max v/C	0.82	*ICU*	54%	A

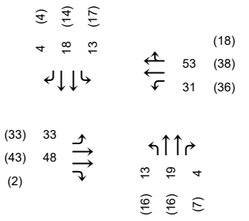
Weekend MD Peak Period



Summary

Timing Pattern	10	*Syn Delay*	26	C
Actuated Cycle	100	*Sim Delay*	(24)	
Max v/C	0.84	*ICU*	59%	B

Weekend PM Peak Period

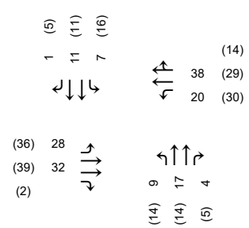


Summary

Timing Pattern	13	*Syn Delay*	28	C
Actuated Cycle	110	*Sim Delay*	(24)	
Max v/C	0.78	*ICU*	55%	A

Implemented Operations

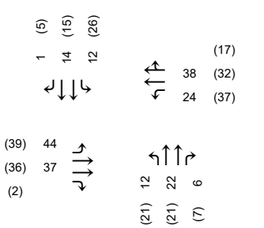
Weekend AM Peak Period



Summary

Timing Pattern	10	*Syn Delay*	20	C
Actuated Cycle	100	*Sim Delay*	(20)	
Max v/C	0.82	*ICU*	54%	A

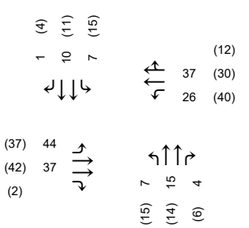
Weekend MD Peak Period



Summary

Timing Pattern	15	*Syn Delay*	23	C
Actuated Cycle	110	*Sim Delay*	(23)	
Max v/C	0.85	*ICU*	59%	B

Weekend PM Peak Period



Summary

Timing Pattern	10	*Syn Delay*	22	C
Actuated Cycle	100	*Sim Delay*	(23)	
Max v/C	0.77	*ICU*	55%	A

Operations with Improvements

No operational improvements recommended at this time.

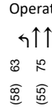
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams



stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

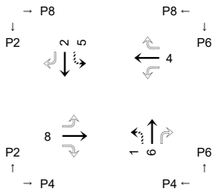
stop bar geometry

turning movement volume

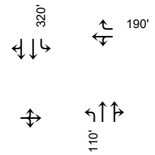
Figure 41

Weekend Traffic Operations Analysis

Maple Ave (CR 607) & Greentree Rd (CR 674)

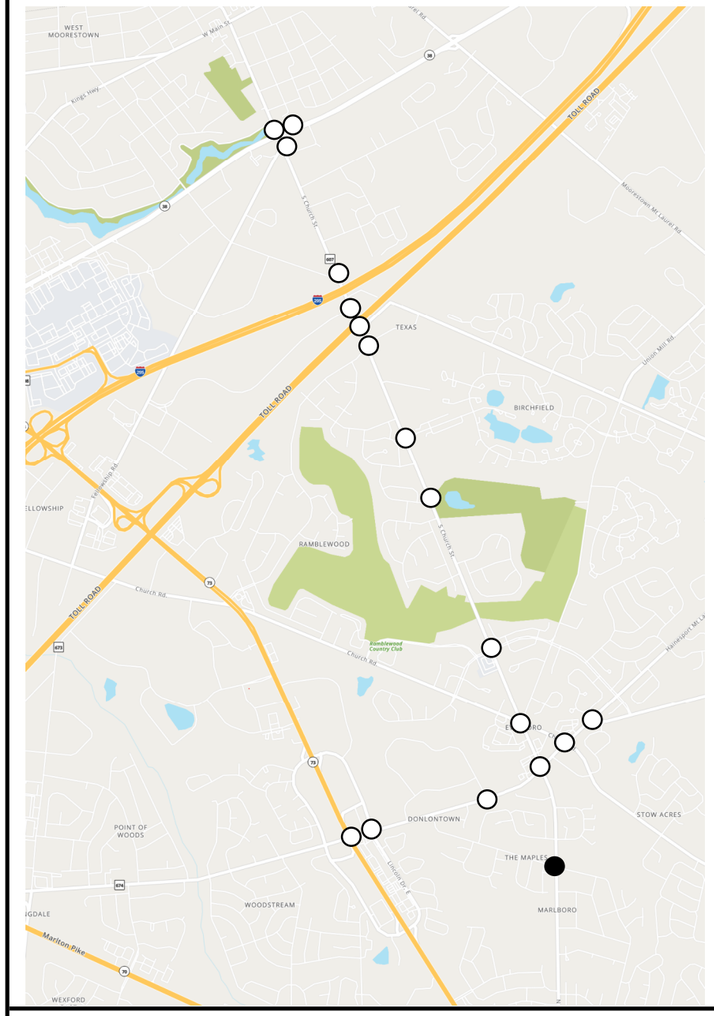


Phasing Diagram



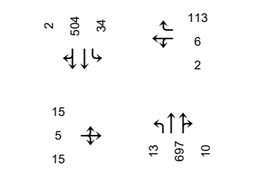
Intersection Geometry

Intersection ID # 17

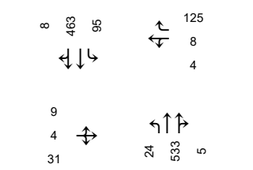


Hourly Volumes

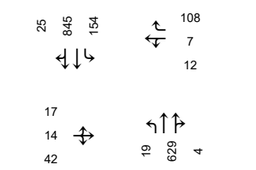
AM Peak Period



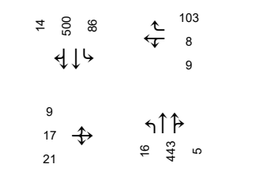
MD Peak Period



PM Peak Period

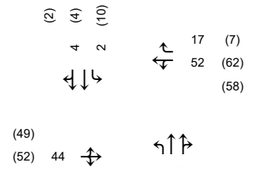


PM Off-peak Period



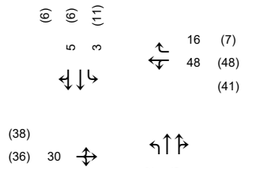
Existing Operations

AM Peak Period



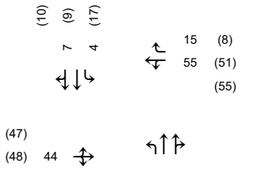
Summary				
Timing Pattern	16	Syn Delay	8	A
Actuated Cycle	120	Sim Delay	(5)	
Max v/C	0.59	ICU	50%	A

MD Peak Period



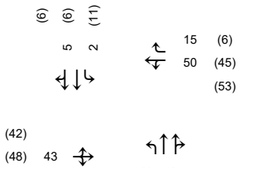
Summary				
Timing Pattern	10	Syn Delay	8	A
Actuated Cycle	105	Sim Delay	(6)	
Max v/C	0.59	ICU	46%	A

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	10	A
Actuated Cycle	115	Sim Delay	(10)	
Max v/C	0.62	ICU	54%	A

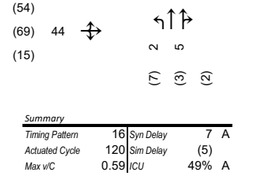
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	9	A
Actuated Cycle	105	Sim Delay	(7)	
Max v/C	0.52	ICU	42%	A

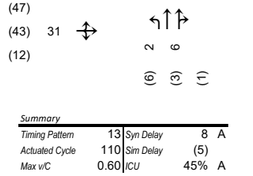
Implemented Operations

AM Peak Period



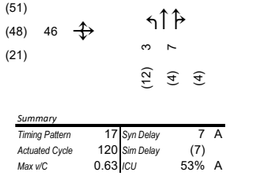
Summary				
Timing Pattern	16	Syn Delay	7	A
Actuated Cycle	120	Sim Delay	(5)	
Max v/C	0.59	ICU	49%	A

MD Peak Period



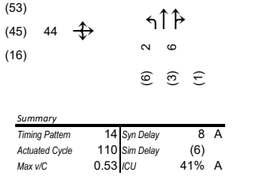
Summary				
Timing Pattern	13	Syn Delay	8	A
Actuated Cycle	110	Sim Delay	(5)	
Max v/C	0.60	ICU	45%	A

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	7	A
Actuated Cycle	120	Sim Delay	(7)	
Max v/C	0.63	ICU	53%	A

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	8	A
Actuated Cycle	110	Sim Delay	(6)	
Max v/C	0.53	ICU	41%	A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

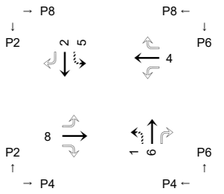
stop bar geometry

turning movement volume

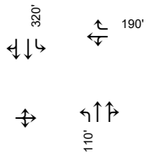
Figure 42

Weekday Traffic Operations Analysis

Maple Ave (CR 607) & Locust Ave

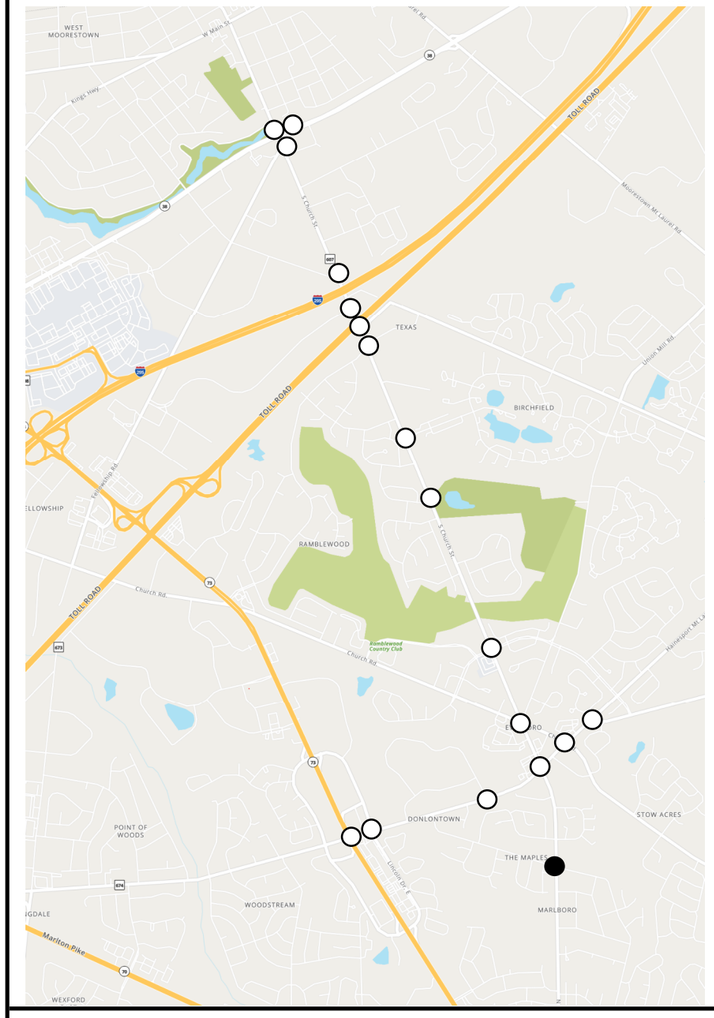


Phasing Diagram



Intersection Geometry

Intersection ID # 17

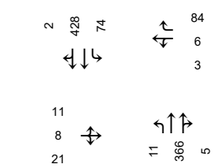


N

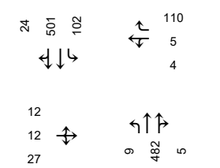
NTS

Hourly Volumes

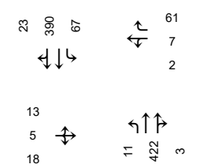
Weekend AM Peak Period



Weekend MD Peak Period

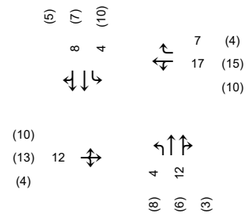


Weekend PM Peak Period



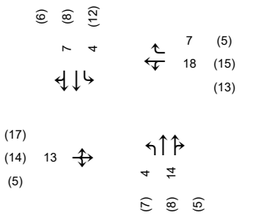
Existing Operations

Weekend AM Peak Period



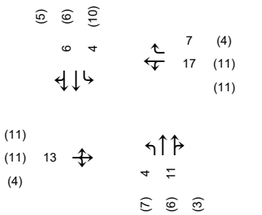
Summary				
Timing Pattern	Free	Syn Delay	9	A
Actuated Cycle	43.7	Sim Delay	(7)	
Max v/C	0.32	ICU	42%	A

Weekend MD Peak Period



Summary				
Timing Pattern	Free	Syn Delay	10	A
Actuated Cycle	44.1	Sim Delay	(8)	
Max v/C	0.44	ICU	44%	A

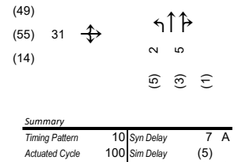
Weekend PM Peak Period



Summary				
Timing Pattern	Free	Syn Delay	8	A
Actuated Cycle	41.1	Sim Delay	(6)	
Max v/C	0.32	ICU	42%	A

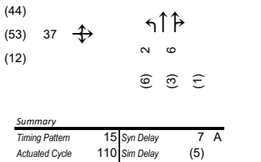
Implemented Operations

Weekend AM Peak Period



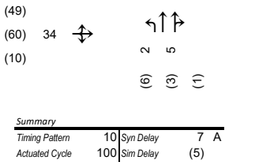
Summary				
Timing Pattern	10	Syn Delay	7	A
Actuated Cycle	100	Sim Delay	(5)	
Max v/C	0.46	ICU	41%	A

Weekend MD Peak Period



Summary				
Timing Pattern	15	Syn Delay	7	A
Actuated Cycle	110	Sim Delay	(5)	
Max v/C	0.54	ICU	43%	A

Weekend PM Peak Period



Summary				
Timing Pattern	10	Syn Delay	7	A
Actuated Cycle	100	Sim Delay	(5)	
Max v/C	0.39	ICU	41%	A

Operations with Improvements

No operational improvements recommended at this time.

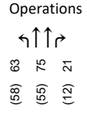
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

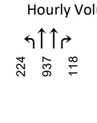


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



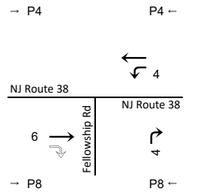
stop bar geometry

turning movement volume

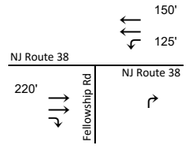
Figure 43

Weekend Traffic Operations Analysis

Maple Ave (CR 607) & Locust Ave

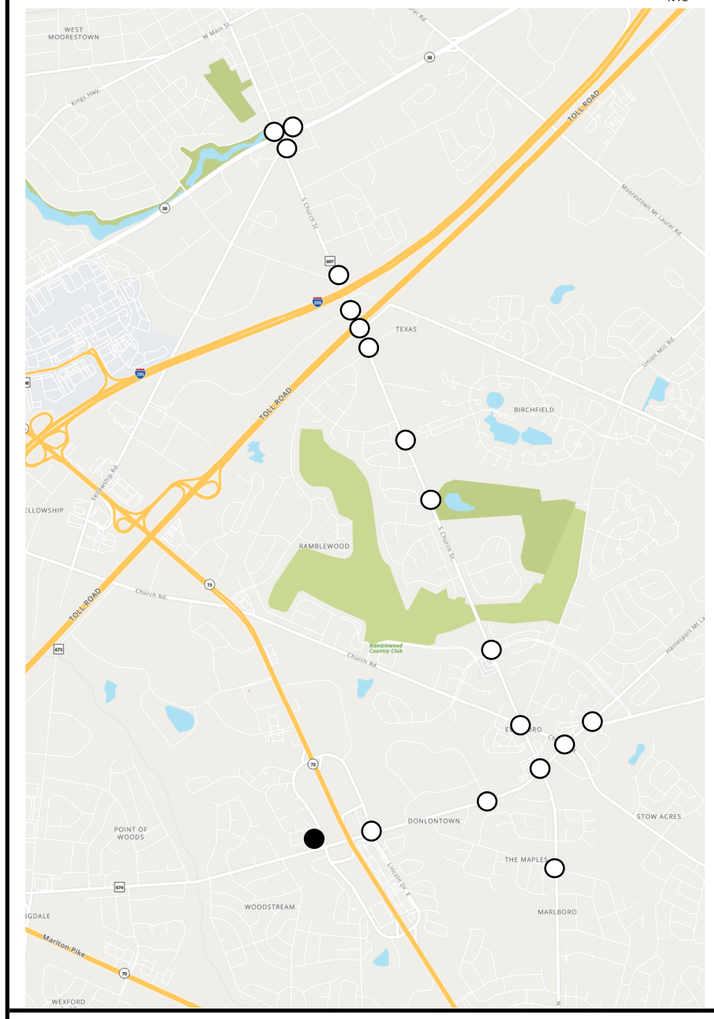


Phasing Diagram



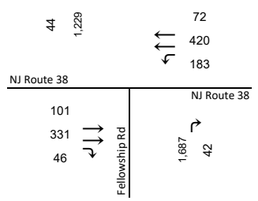
Intersection Geometry

Intersection ID # 1004

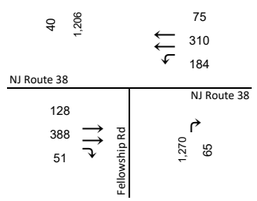


Hourly Volumes

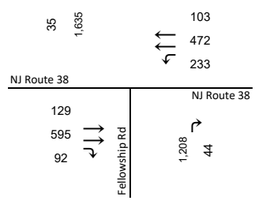
AM Peak Period



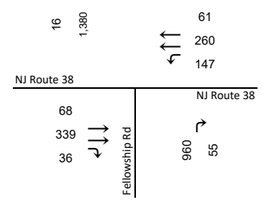
MD Peak Period



PM Peak Period

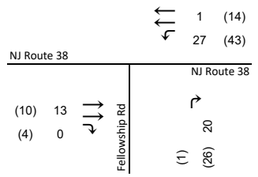


PM Off-peak Period



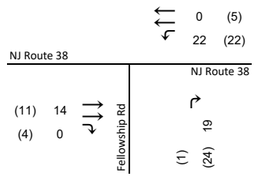
Existing Operations

AM Peak Period



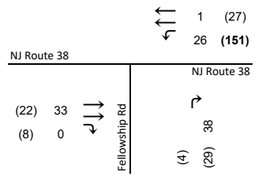
Summary				
Timing Pattern	1	Syn Delay	10	A
Actuated Cycle	90	Sim Delay	(17)	
Max v/C	1.18	ICU	66%	C

MD Peak Period



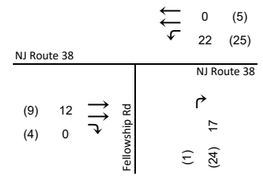
Summary				
Timing Pattern	1	Syn Delay	10	A
Actuated Cycle	90	Sim Delay	(11)	
Max v/C	0.81	ICU	61%	B

PM Peak Period



Summary				
Timing Pattern	1	Syn Delay	19	B
Actuated Cycle	90	Sim Delay	(37)	
Max v/C	1.17	ICU	77%	D

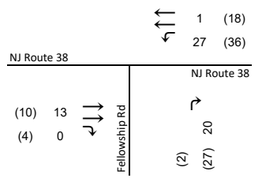
PM Off-peak Period



Summary				
Timing Pattern	1	Syn Delay	8	A
Actuated Cycle	90	Sim Delay	(10)	
Max v/C	0.79	ICU	57%	B

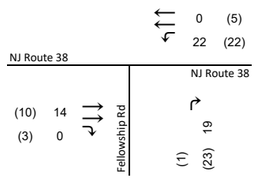
Implemented Operations

AM Peak Period



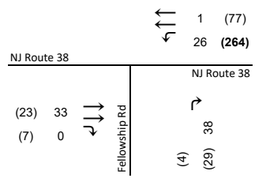
Summary				
Timing Pattern	1	Syn Delay	10	A
Actuated Cycle	90	Sim Delay	(18)	
Max v/C	1.18	ICU	66%	C

MD Peak Period



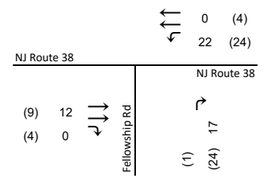
Summary				
Timing Pattern	1	Syn Delay	10	A
Actuated Cycle	90	Sim Delay	(10)	
Max v/C	0.81	ICU	61%	B

PM Peak Period



Summary				
Timing Pattern	1	Syn Delay	19	B
Actuated Cycle	90	Sim Delay	(68)	
Max v/C	1.17	ICU	77%	D

PM Off-peak Period



Summary				
Timing Pattern	1	Syn Delay	8	A
Actuated Cycle	90	Sim Delay	(9)	
Max v/C	0.79	ICU	57%	B

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

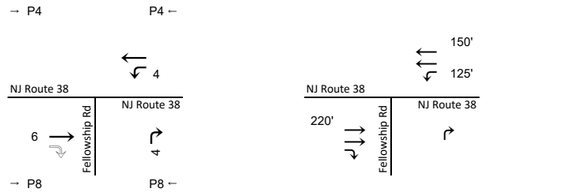
stop bar geometry

turning movement volume

Figure 44

Weekday Traffic Operations Analysis

NJ Route 38 & Fellowship Rd (CR 673)



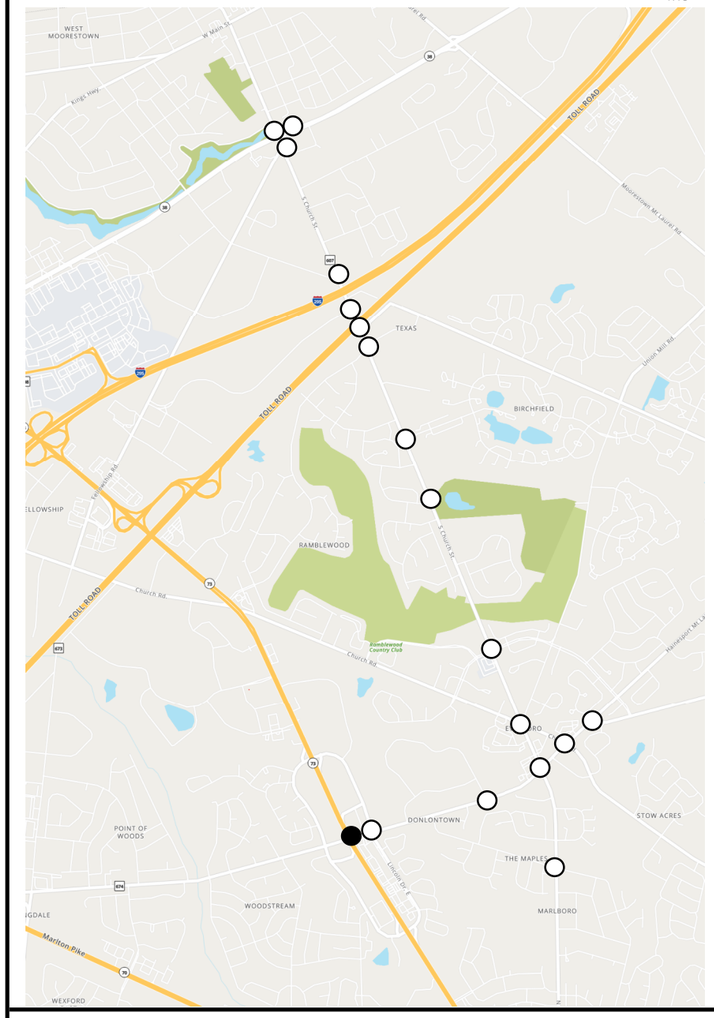
Phasing Diagram

Intersection Geometry

Intersection ID # 1004

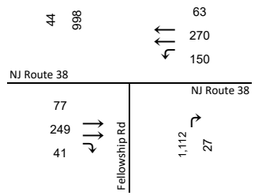
N

NTS

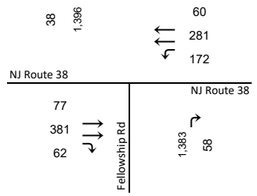


Hourly Volumes

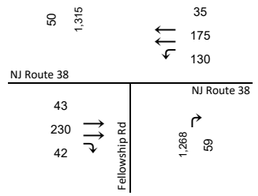
Weekend AM Peak Period



Weekend MD Peak Period

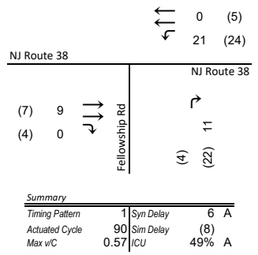


Weekend PM Peak Period



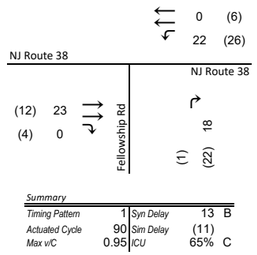
Existing Operations

Weekend AM Peak Period



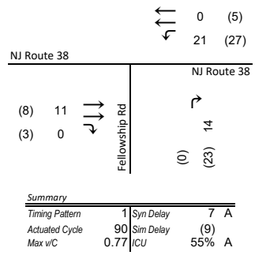
Summary					
Timing Pattern	1	Syn Delay	6	A	
Actuated Cycle	90	Sim Delay	(8)		
Max v/C	0.57	ICU	49%	A	

Weekend MD Peak Period



Summary					
Timing Pattern	1	Syn Delay	13	B	
Actuated Cycle	90	Sim Delay	(11)		
Max v/C	0.95	ICU	65%	C	

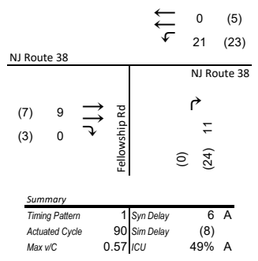
Weekend PM Peak Period



Summary					
Timing Pattern	1	Syn Delay	7	A	
Actuated Cycle	90	Sim Delay	(9)		
Max v/C	0.77	ICU	55%	A	

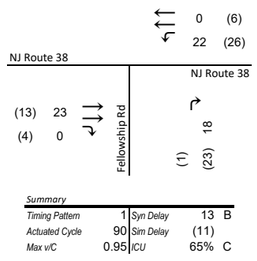
Implemented Operations

Weekend AM Peak Period



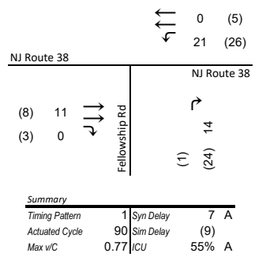
Summary					
Timing Pattern	1	Syn Delay	6	A	
Actuated Cycle	90	Sim Delay	(8)		
Max v/C	0.57	ICU	49%	A	

Weekend MD Peak Period



Summary					
Timing Pattern	1	Syn Delay	13	B	
Actuated Cycle	90	Sim Delay	(11)		
Max v/C	0.95	ICU	65%	C	

Weekend PM Peak Period



Summary					
Timing Pattern	1	Syn Delay	7	A	
Actuated Cycle	90	Sim Delay	(9)		
Max v/C	0.77	ICU	55%	A	

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

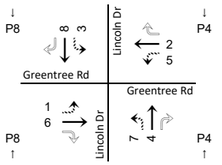
stop bar geometry

turning movement volume

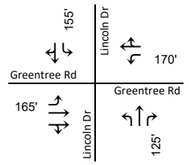
Figure 45

Weekend Traffic Operations Analysis

NJ Route 38 & Fellowship Rd (CR 673)

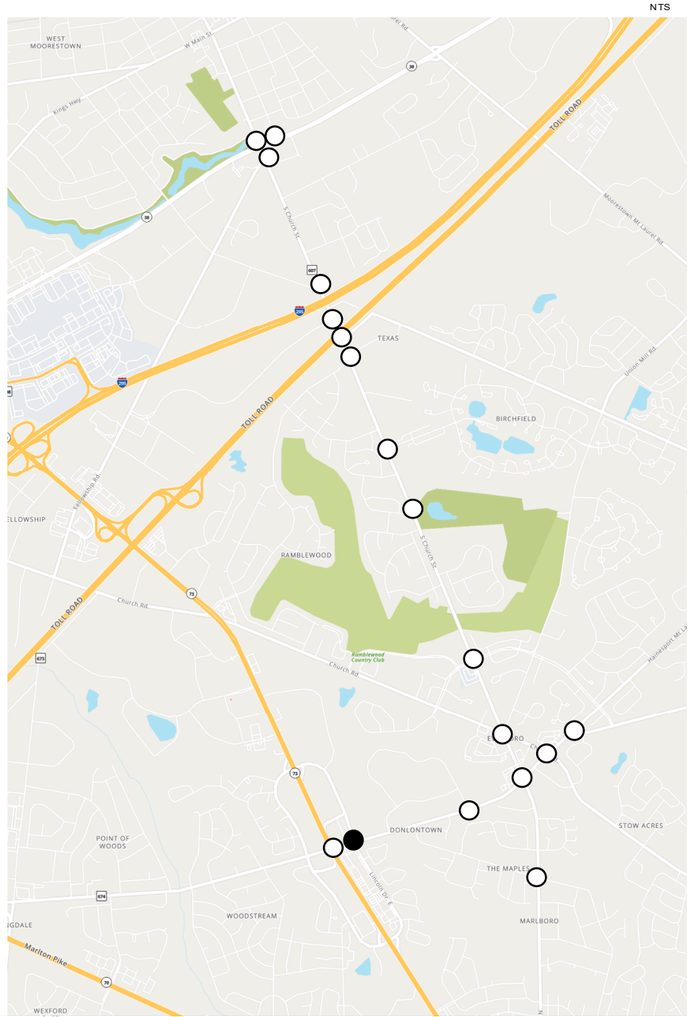


Phasing Diagram



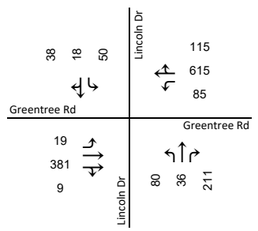
Intersection Geometry

Intersection ID # 180

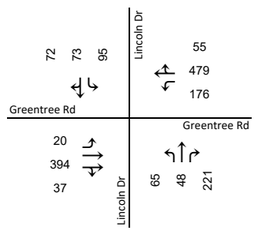


Hourly Volumes

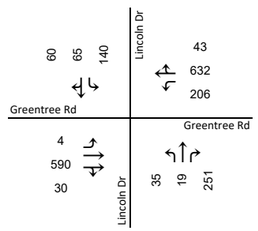
AM Peak Period



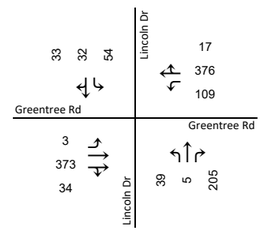
MD Peak Period



PM Peak Period

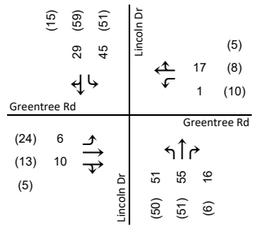


PM Off-peak Period



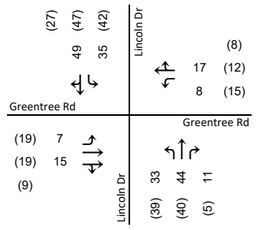
Existing Operations

AM Peak Period



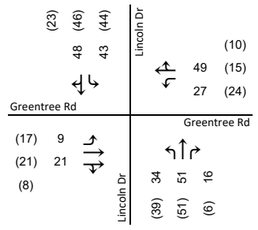
Summary				
Timing Pattern	16	Syn Delay	18	B
Actuated Cycle	120	Sim Delay	(14)	
Max v/C	0.87	ICU	71%	C

MD Peak Period



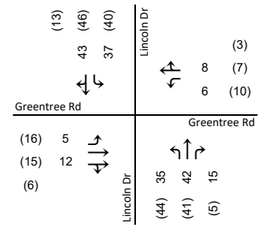
Summary				
Timing Pattern	10	Syn Delay	20	C
Actuated Cycle	105	Sim Delay	(18)	
Max v/C	0.73	ICU	64%	C

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	35	C
Actuated Cycle	115	Sim Delay	(20)	
Max v/C	0.94	ICU	74%	D

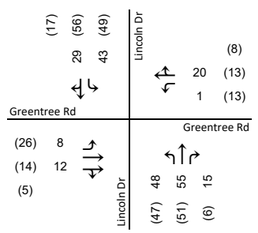
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	14	B
Actuated Cycle	105	Sim Delay	(13)	
Max v/C	0.68	ICU	50%	A

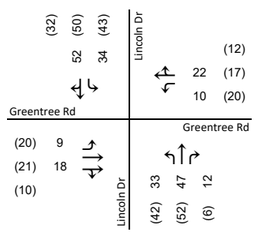
Implemented Operations

AM Peak Period



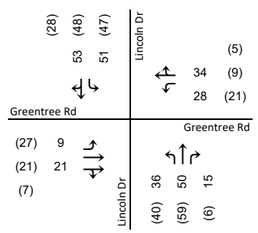
Summary				
Timing Pattern	16	Syn Delay	20	B
Actuated Cycle	120	Sim Delay	(16)	
Max v/C	0.91	ICU	71%	C

MD Peak Period



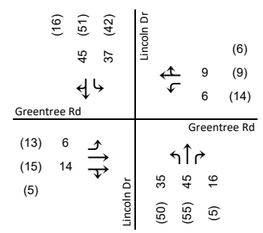
Summary				
Timing Pattern	13	Syn Delay	23	C
Actuated Cycle	110	Sim Delay	(22)	
Max v/C	0.76	ICU	64%	C

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	31	C
Actuated Cycle	120	Sim Delay	(18)	
Max v/C	0.93	ICU	74%	D

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	16	B
Actuated Cycle	110	Sim Delay	(15)	
Max v/C	0.70	ICU	50%	A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

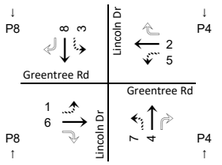
stop bar geometry

turning movement volume

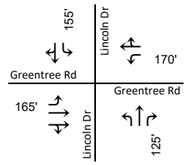
Figure 46

Weekday Traffic Operations Analysis

Greentree Rd (CR 674) & Lincoln Dr

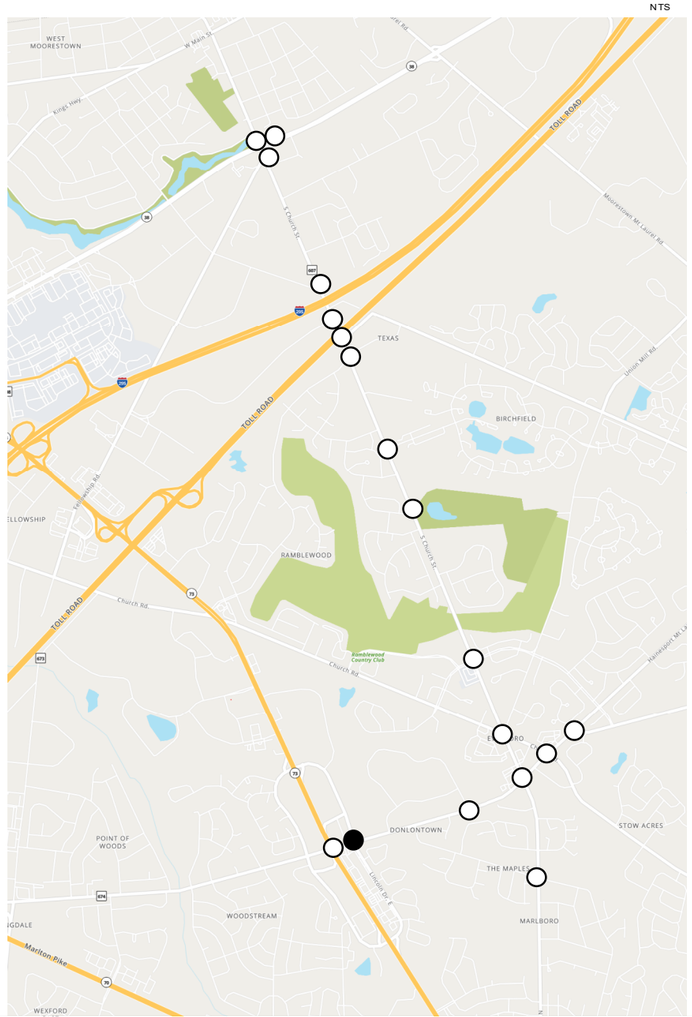


Phasing Diagram



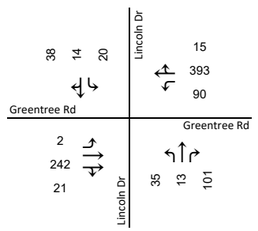
Intersection Geometry

Intersection ID # 180

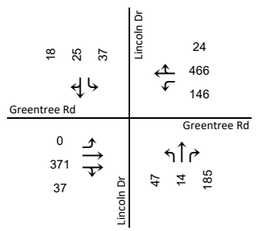


Hourly Volumes

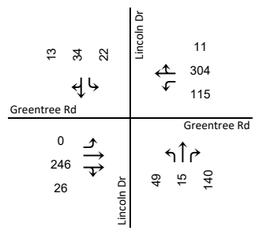
Weekend AM Peak Period



Weekend MD Peak Period

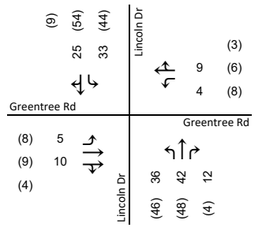


Weekend PM Peak Period



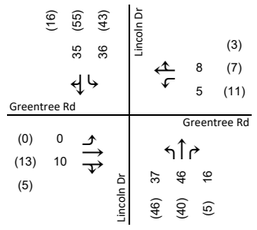
Existing Operations

Weekend AM Peak Period



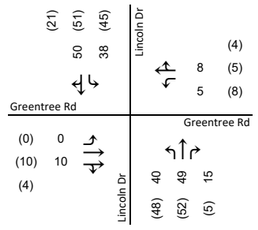
Summary					
Timing Pattern	Free	Syn Delay	12	B	
Actuated Cycle	105	Sim Delay	(10)		
Max v/C	0.51	ICU	50%	A	

Weekend MD Peak Period



Summary					
Timing Pattern	Free	Syn Delay	13	B	
Actuated Cycle	105	Sim Delay	(12)		
Max v/C	0.64	ICU	55%	A	

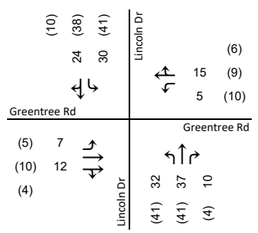
Weekend PM Peak Period



Summary					
Timing Pattern	Free	Syn Delay	15	B	
Actuated Cycle	115	Sim Delay	(12)		
Max v/C	0.60	ICU	45%	A	

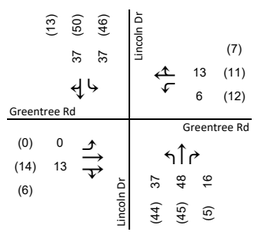
Implemented Operations

Weekend AM Peak Period



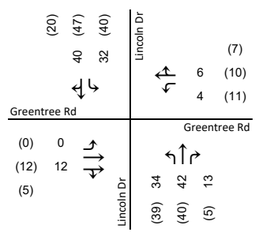
Summary					
Timing Pattern	10	Syn Delay	15	B	
Actuated Cycle	100	Sim Delay	(12)		
Max v/C	0.48	ICU	50%	A	

Weekend MD Peak Period



Summary					
Timing Pattern	15	Syn Delay	15	B	
Actuated Cycle	110	Sim Delay	(14)		
Max v/C	0.65	ICU	55%	A	

Weekend PM Peak Period



Summary					
Timing Pattern	10	Syn Delay	13	B	
Actuated Cycle	100	Sim Delay	(14)		
Max v/C	0.54	ICU	45%	A	

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

63 75 21
(58) (55) (12)

stop bar geometry
Synchro delay (sec / veh)
SimTraffic delay (sec / veh)

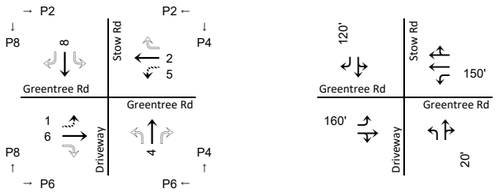
Hourly Volume Diagrams

224 937 118

stop bar geometry
turning movement volume

Figure 47

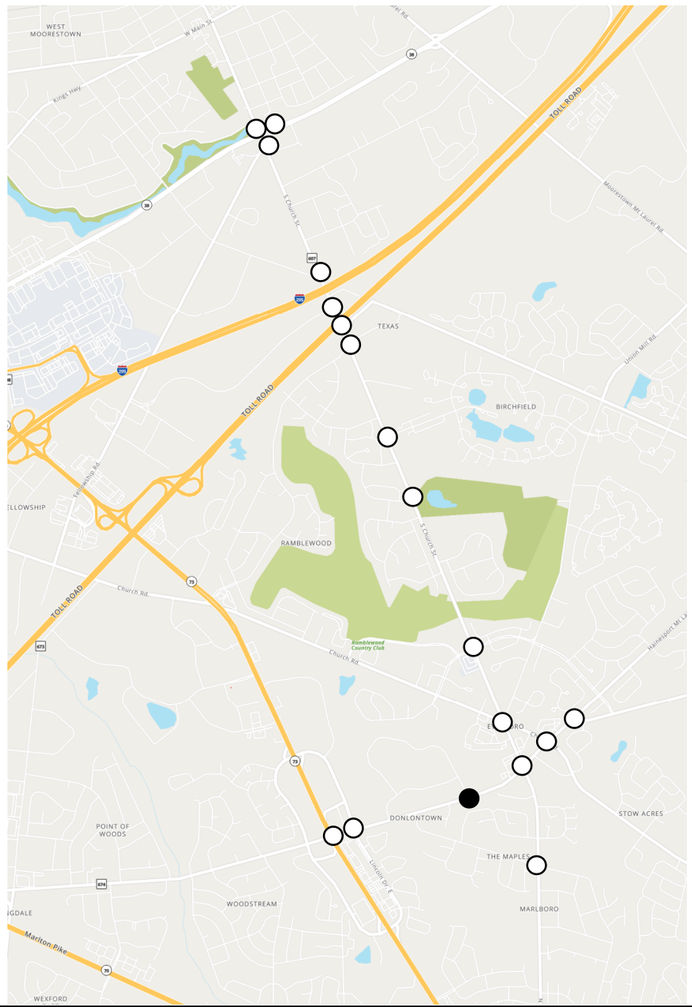
Weekend Traffic Operations Analysis
Greentree Rd (CR 674) & Lincoln Dr



Phasing Diagram

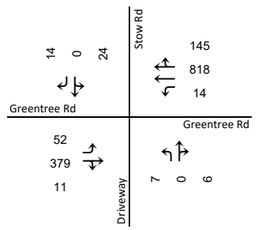
Intersection Geometry

Intersection ID # 202

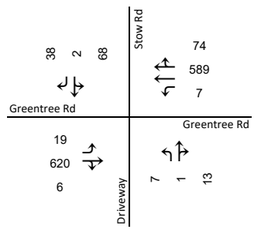


Hourly Volumes

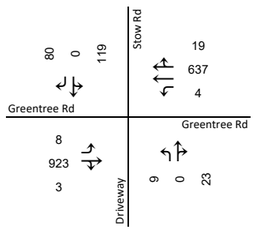
AM Peak Period



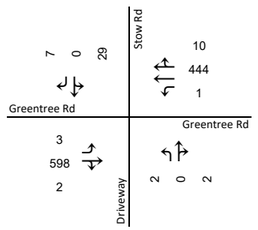
MD Peak Period



PM Peak Period

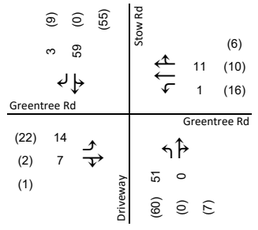


PM Off-peak Period



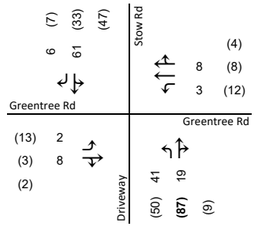
Existing Operations

AM Peak Period



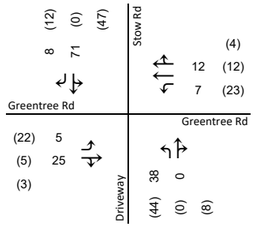
Summary					
Timing Pattern	16	Syn Delay	12	B	
Actuated Cycle	120	Sim Delay	(8)		
Max v/C	0.72	ICU	58%	B	

MD Peak Period



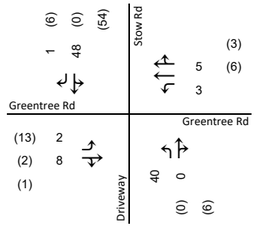
Summary					
Timing Pattern	10	Syn Delay	11	B	
Actuated Cycle	105	Sim Delay	(7)		
Max v/C	0.62	ICU	56%	B	

PM Peak Period



Summary					
Timing Pattern	13	Syn Delay	24	C	
Actuated Cycle	115	Sim Delay	(11)		
Max v/C	0.90	ICU	76%	D	

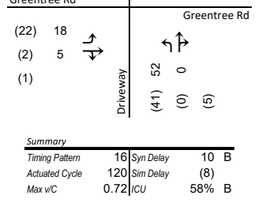
PM Off-peak Period



Summary					
Timing Pattern	10	Syn Delay	8	A	
Actuated Cycle	105	Sim Delay	(5)		
Max v/C	0.54	ICU	52%	A	

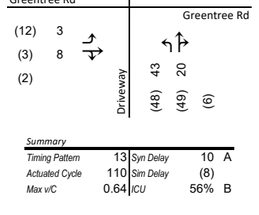
Implemented Operations

AM Peak Period



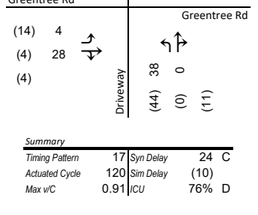
Summary					
Timing Pattern	16	Syn Delay	10	B	
Actuated Cycle	120	Sim Delay	(8)		
Max v/C	0.72	ICU	58%	B	

MD Peak Period



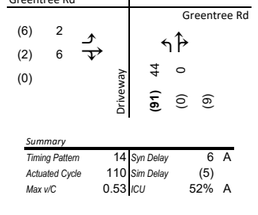
Summary					
Timing Pattern	13	Syn Delay	10	A	
Actuated Cycle	110	Sim Delay	(8)		
Max v/C	0.64	ICU	56%	B	

PM Peak Period



Summary					
Timing Pattern	17	Syn Delay	24	C	
Actuated Cycle	120	Sim Delay	(10)		
Max v/C	0.91	ICU	76%	D	

PM Off-peak Period



Summary					
Timing Pattern	14	Syn Delay	6	A	
Actuated Cycle	110	Sim Delay	(5)		
Max v/C	0.53	ICU	52%	A	

Operations with Improvements

No operational improvements recommended at this time.

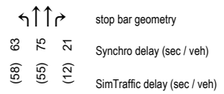
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

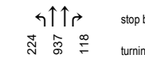


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



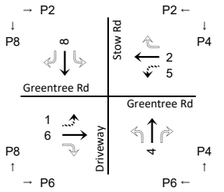
stop bar geometry

turning movement volume

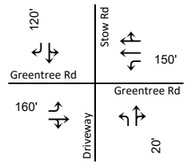
Figure 48

Weekday Traffic Operations Analysis

Greentree Rd (CR 674) & Stow Rd

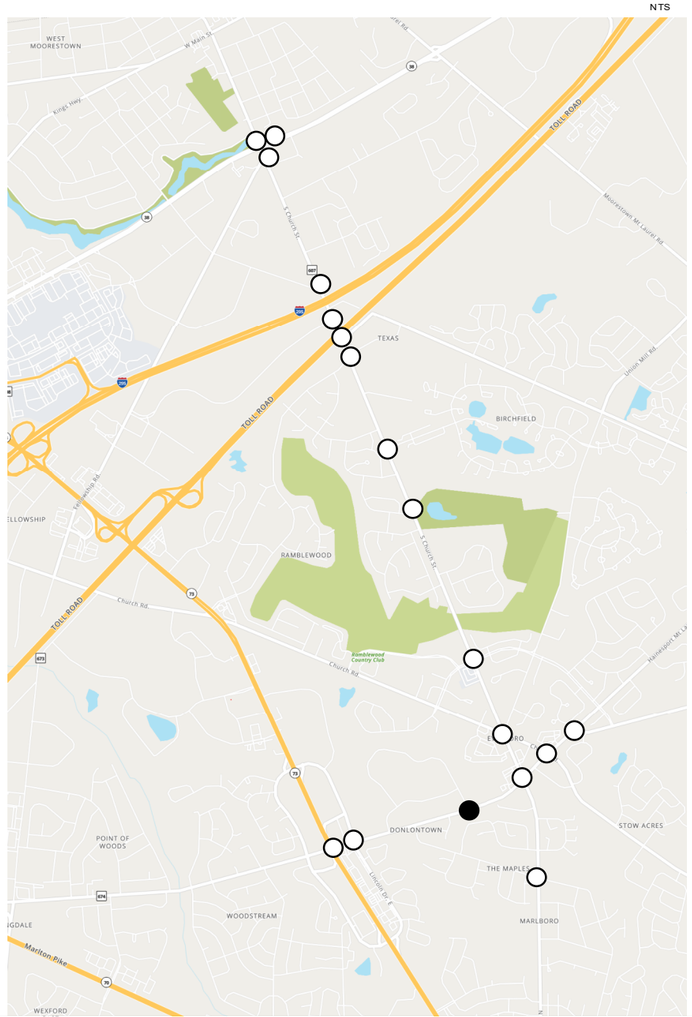


Phasing Diagram



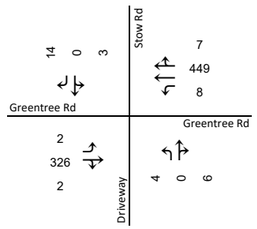
Intersection Geometry

Intersection ID # 202

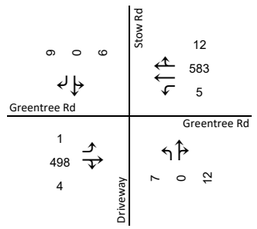


Hourly Volumes

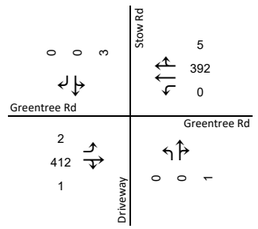
Weekend AM Peak Period



Weekend MD Peak Period

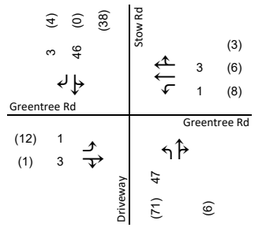


Weekend PM Peak Period



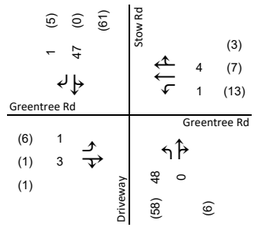
Existing Operations

Weekend AM Peak Period



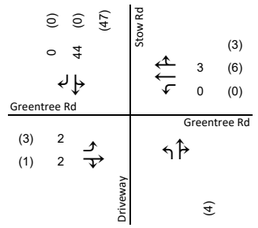
Summary				
Timing Pattern	10	Syn Delay	4	A
Actuated Cycle	105	Sim Delay	(4)	
Max v/C	0.26	ICU	46%	A

Weekend MD Peak Period



Summary				
Timing Pattern	10	Syn Delay	4	A
Actuated Cycle	105	Sim Delay	(4)	
Max v/C	0.36	ICU	47%	A

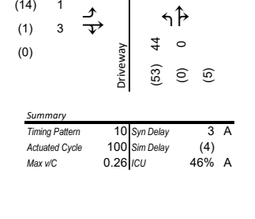
Weekend PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	3	A
Actuated Cycle	115	Sim Delay	(4)	
Max v/C	0.28	ICU	40%	A

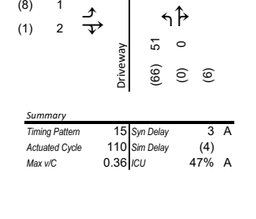
Implemented Operations

Weekend AM Peak Period



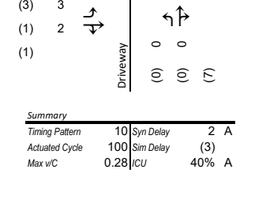
Summary				
Timing Pattern	10	Syn Delay	3	A
Actuated Cycle	100	Sim Delay	(4)	
Max v/C	0.26	ICU	46%	A

Weekend MD Peak Period



Summary				
Timing Pattern	15	Syn Delay	3	A
Actuated Cycle	110	Sim Delay	(4)	
Max v/C	0.36	ICU	47%	A

Weekend PM Peak Period



Summary				
Timing Pattern	10	Syn Delay	2	A
Actuated Cycle	100	Sim Delay	(3)	
Max v/C	0.28	ICU	40%	A

Operations with Improvements

No operational improvements recommended at this time.

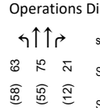
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

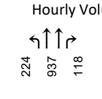


stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams



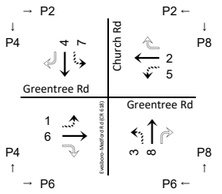
stop bar geometry

turning movement volume

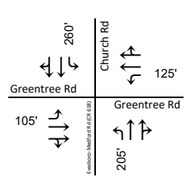
Figure 49

Weekend Traffic Operations Analysis

Greentree Rd (CR 674) & Stow Rd

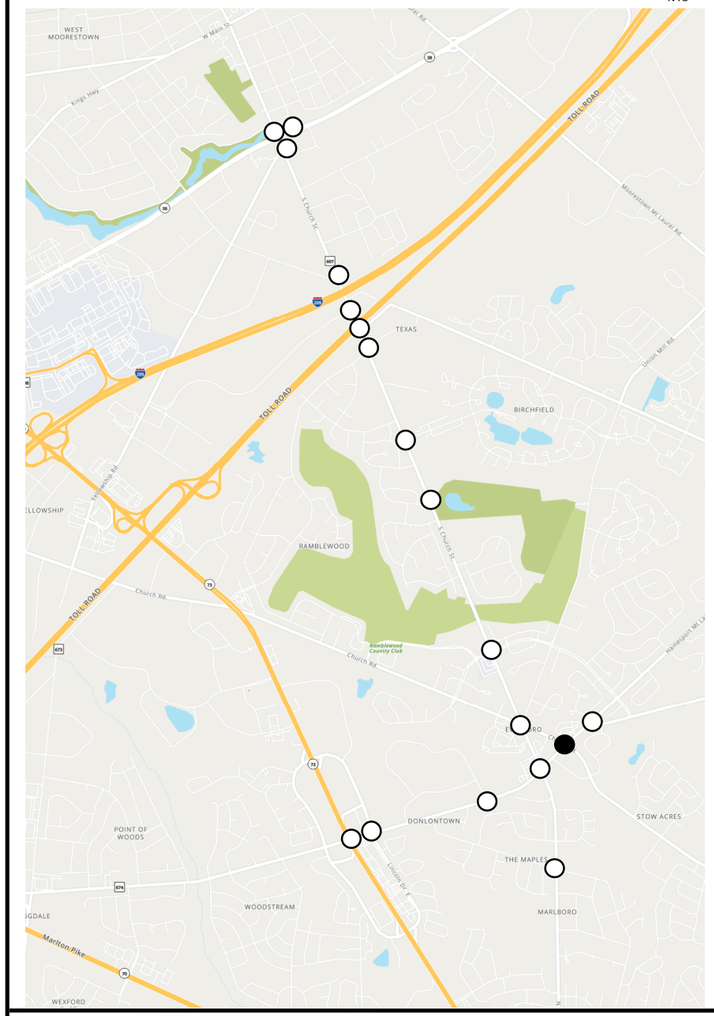


Phasing Diagram



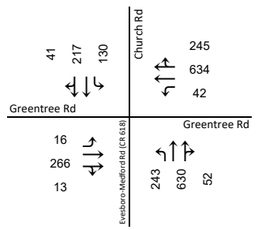
Intersection Geometry

Intersection ID # 160

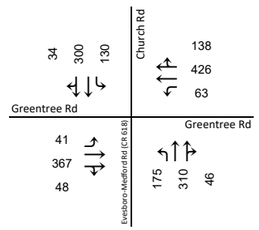


Hourly Volumes

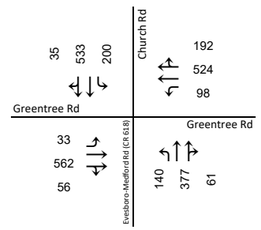
AM Peak Period



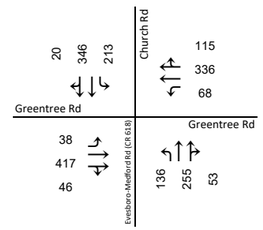
MD Peak Period



PM Peak Period

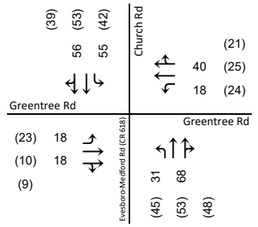


PM Off-peak Period



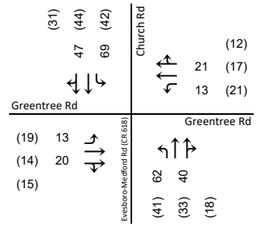
Existing Operations

AM Peak Period



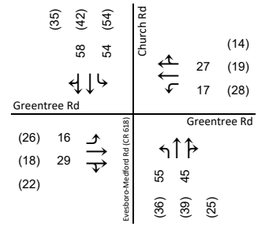
Summary				
Timing Pattern	16	Syn Delay	45	D
Actuated Cycle	120	Sim Delay	(35)	
Max v/C	0.97	ICU	78%	D

MD Peak Period



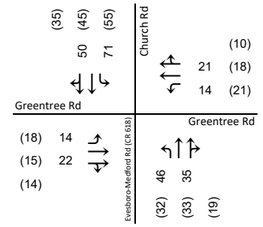
Summary				
Timing Pattern	10	Syn Delay	35	D
Actuated Cycle	105	Sim Delay	(25)	
Max v/C	0.87	ICU	69%	C

PM Peak Period



Summary				
Timing Pattern	13	Syn Delay	39	D
Actuated Cycle	115	Sim Delay	(28)	
Max v/C	0.86	ICU	76%	D

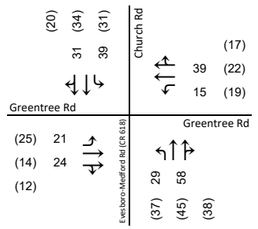
PM Off-peak Period



Summary				
Timing Pattern	10	Syn Delay	34	C
Actuated Cycle	105	Sim Delay	(27)	
Max v/C	0.88	ICU	71%	C

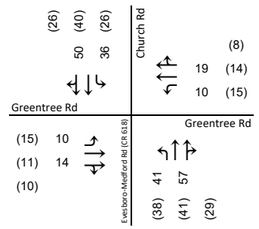
Implemented Operations

AM Peak Period



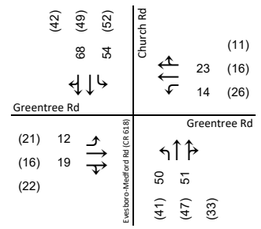
Summary				
Timing Pattern	16	Syn Delay	40	D
Actuated Cycle	120	Sim Delay	(29)	
Max v/C	0.92	ICU	78%	D

MD Peak Period



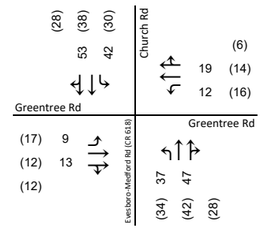
Summary				
Timing Pattern	13	Syn Delay	33	C
Actuated Cycle	110	Sim Delay	(23)	
Max v/C	0.84	ICU	69%	C

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	38	D
Actuated Cycle	120	Sim Delay	(29)	
Max v/C	0.91	ICU	76%	D

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	31	C
Actuated Cycle	110	Sim Delay	(23)	
Max v/C	0.84	ICU	71%	C

Operations with Improvements

No operational improvements recommended at this time.

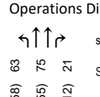
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams



stop bar geometry
Synchro delay (sec / veh)
SimTraffic delay (sec / veh)

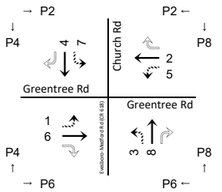
Hourly Volume Diagrams

stop bar geometry
turning movement volume

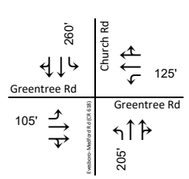
Figure 50

Weekday Traffic Operations Analysis

Greentree Rd (CR 674) & Evesboro-Medford Rd (CR 618)/Church Rd (CR 616)

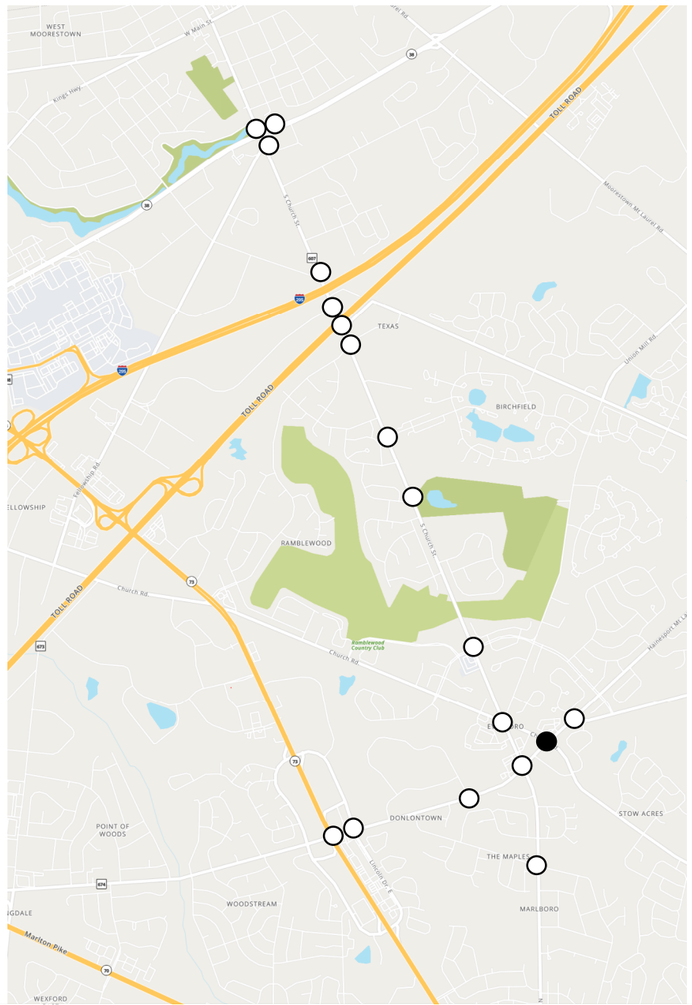


Phasing Diagram



Intersection Geometry

Intersection ID # 160

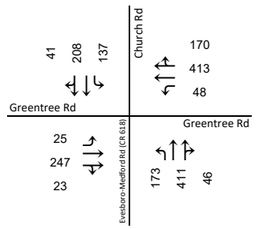


N

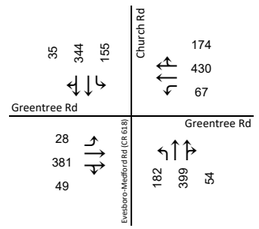
NTS

Hourly Volumes

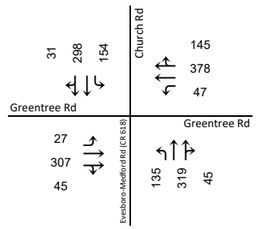
Weekend AM Peak Period



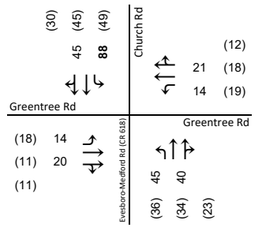
Weekend MD Peak Period



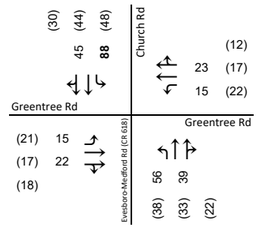
Weekend PM Peak Period



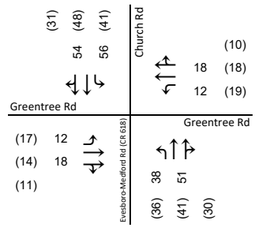
Existing Operations



Summary				
Timing Pattern	10	Syn Delay	35	D
Actuated Cycle	105	Sim Delay	(26)	
Max v/C	0.91	ICU	70%	C

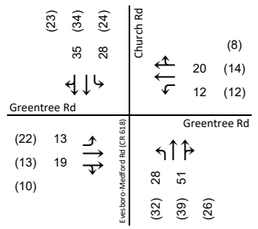


Summary				
Timing Pattern	10	Syn Delay	36	D
Actuated Cycle	105	Sim Delay	(27)	
Max v/C	0.94	ICU	71%	C

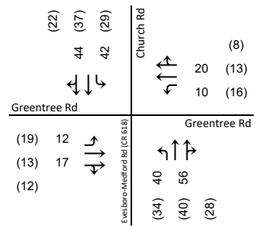


Summary				
Timing Pattern	13	Syn Delay	35	C
Actuated Cycle	115	Sim Delay	(28)	
Max v/C	0.78	ICU	68%	C

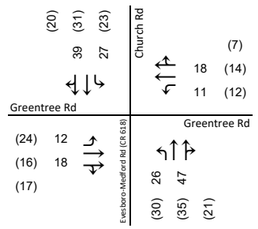
Implemented Operations



Summary				
Timing Pattern	10	Syn Delay	30	C
Actuated Cycle	100	Sim Delay	(23)	
Max v/C	0.85	ICU	70%	C



Summary				
Timing Pattern	15	Syn Delay	33	C
Actuated Cycle	110	Sim Delay	(23)	
Max v/C	0.86	ICU	71%	C



Summary				
Timing Pattern	10	Syn Delay	28	C
Actuated Cycle	100	Sim Delay	(22)	
Max v/C	0.75	ICU	68%	C

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

stop bar geometry

Synchro delay (sec / veh)

SimTraffic delay (sec / veh)

Hourly Volume Diagrams

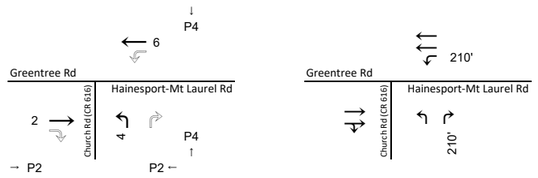
stop bar geometry

turning movement volume

Figure 51

Weekend Traffic Operations Analysis

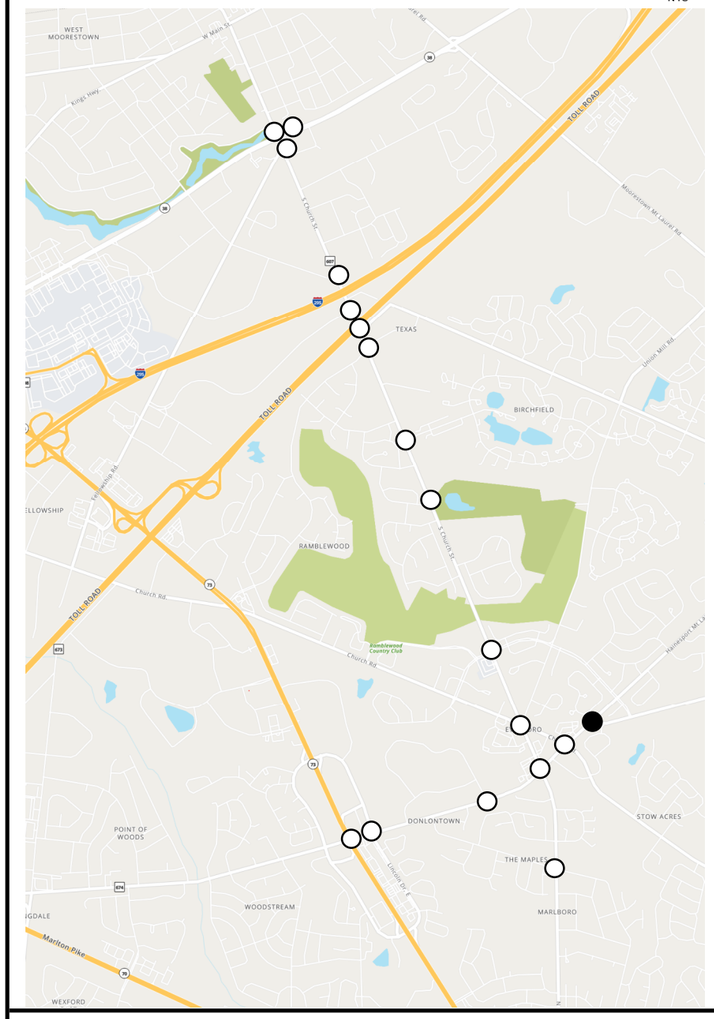
Greentree Rd (CR 674) & Evesboro-Medford Rd (CR 618)/Church Rd (CR 616)



Phasing Diagram

Intersection Geometry

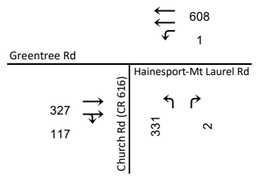
Intersection ID # 171



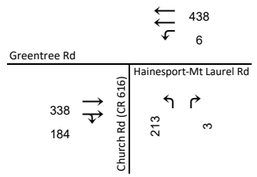
NTS

Hourly Volumes

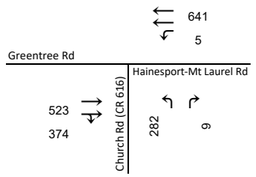
AM Peak Period



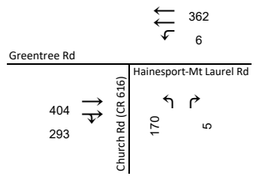
MD Peak Period



PM Peak Period

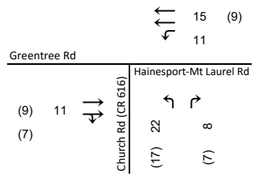


PM Off-peak Period



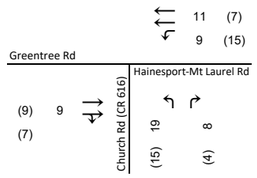
Existing Operations

AM Peak Period



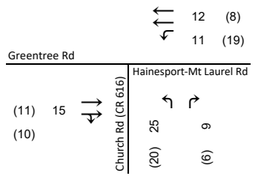
Summary				
Timing Pattern	Free	Syn Delay	15	B
Actuated Cycle	46.3	Sim Delay	(11)	
Max v/C	0.70	ICU	48%	A

MD Peak Period



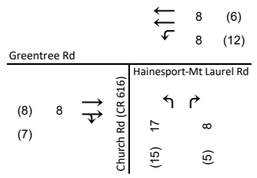
Summary				
Timing Pattern	Free	Syn Delay	12	B
Actuated Cycle	40.2	Sim Delay	(9)	
Max v/C	0.58	ICU	40%	A

PM Peak Period



Summary				
Timing Pattern	Free	Syn Delay	15	B
Actuated Cycle	51.9	Sim Delay	(11)	
Max v/C	0.77	ICU	56%	B

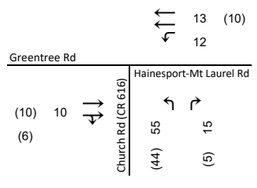
PM Off-peak Period



Summary				
Timing Pattern	Free	Syn Delay	10	A
Actuated Cycle	41	Sim Delay	(8)	
Max v/C	0.57	ICU	42%	A

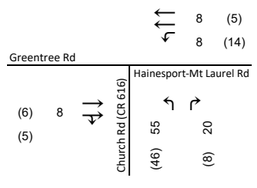
Implemented Operations

AM Peak Period



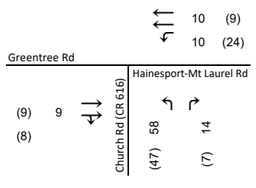
Summary				
Timing Pattern	16	Syn Delay	22	C
Actuated Cycle	120	Sim Delay	(18)	
Max v/C	0.81	ICU	48%	A

MD Peak Period



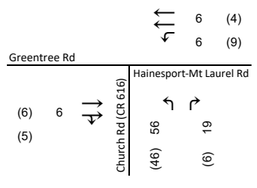
Summary				
Timing Pattern	13	Syn Delay	17	B
Actuated Cycle	110	Sim Delay	(12)	
Max v/C	0.76	ICU	40%	A

PM Peak Period



Summary				
Timing Pattern	17	Syn Delay	17	B
Actuated Cycle	120	Sim Delay	(14)	
Max v/C	0.79	ICU	56%	B

PM Off-peak Period



Summary				
Timing Pattern	14	Syn Delay	12	B
Actuated Cycle	110	Sim Delay	(11)	
Max v/C	0.69	ICU	43%	A

Operations with Improvements

No operational improvements recommended at this time.

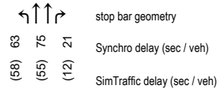
HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams



Hourly Volume Diagrams

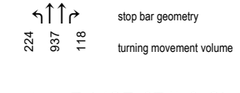
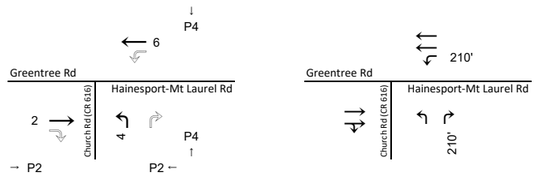


Figure 52

Weekday Traffic Operations Analysis

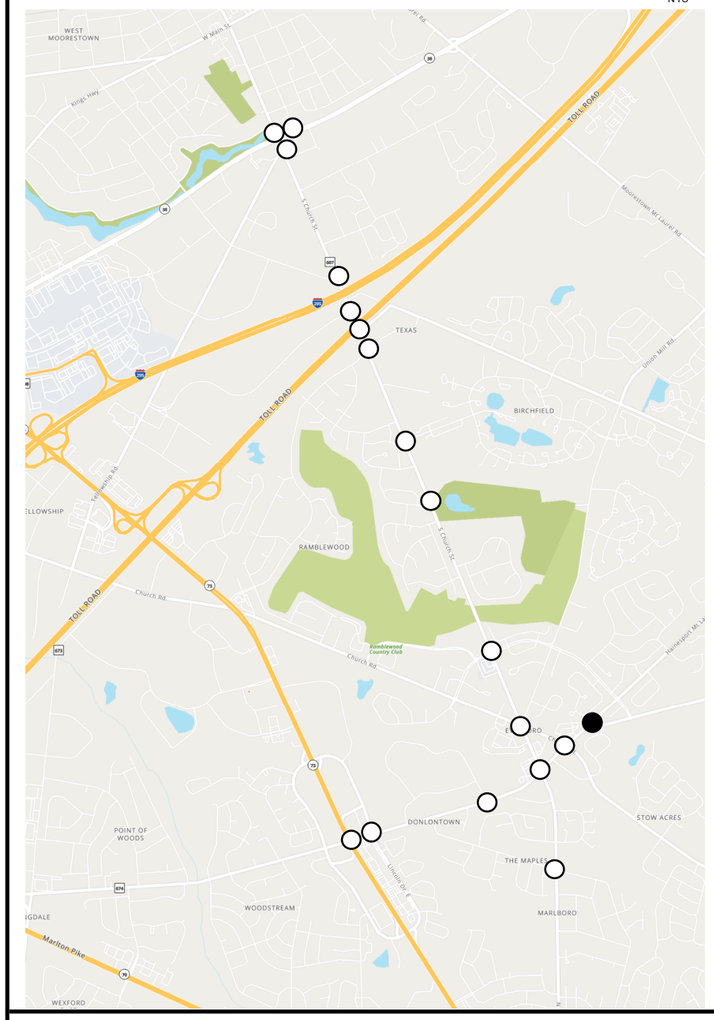
Greentree Rd (CR 674) & Church Rd (CR 616)/Hainesport-Mt Laurel Rd (CR 674)



Phasing Diagram

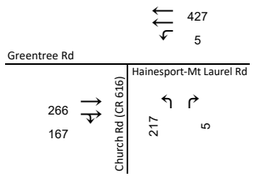
Intersection Geometry

Intersection ID # 171

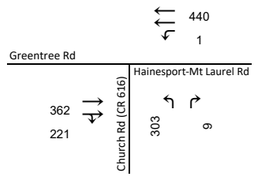


Hourly Volumes

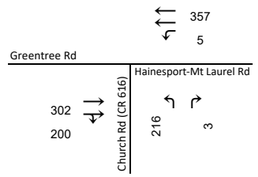
Weekend AM Peak Period



Weekend MD Peak Period

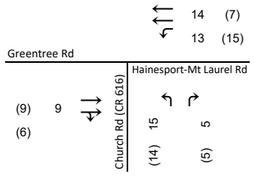


Weekend PM Peak Period



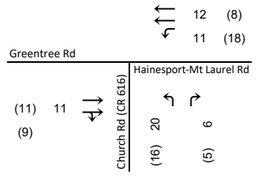
Existing Operations

Weekend AM Peak Period



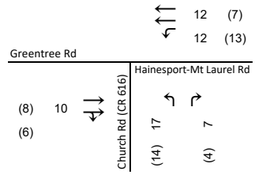
Summary				
Timing Pattern	Free	Syn Delay	12	B
Actuated Cycle	43.6	Sim Delay	(9)	
Max v/C	0.48	ICU	37%	A

Weekend MD Peak Period



Summary				
Timing Pattern	Free	Syn Delay	13	B
Actuated Cycle	42.8	Sim Delay	(10)	
Max v/C	0.68	ICU	47%	A

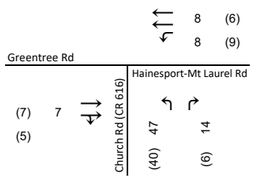
Weekend PM Peak Period



Summary				
Timing Pattern	Free	Syn Delay	12	B
Actuated Cycle	44.9	Sim Delay	(8)	
Max v/C	0.51	ICU	40%	A

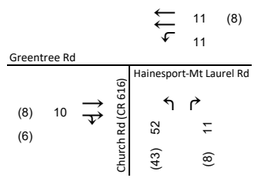
Implemented Operations

Weekend AM Peak Period



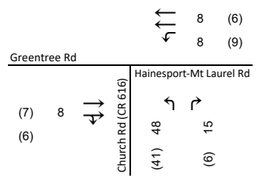
Summary				
Timing Pattern	10	Syn Delay	15	B
Actuated Cycle	100	Sim Delay	(13)	
Max v/C	0.71	ICU	37%	A

Weekend MD Peak Period



Summary				
Timing Pattern	15	Syn Delay	20	C
Actuated Cycle	110	Sim Delay	(16)	
Max v/C	0.81	ICU	47%	A

Weekend PM Peak Period



Summary				
Timing Pattern	10	Syn Delay	16	B
Actuated Cycle	100	Sim Delay	(13)	
Max v/C	0.72	ICU	40%	A

Operations with Improvements

No operational improvements recommended at this time.

HCM Levels of Service

LOS	Delay/Veh (s)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

ICU Levels of Service

LOS	Utilization (%)
A	≤55%
B	>55% and ≤64%
C	>64% and ≤73%
D	>73% and ≤82%
E	>82% and ≤91%
F	>91% and ≤100%
G	>100% and ≤109%
H	>109%

Operations Diagrams

63 75 21
(58) (55) (12)

stop bar geometry
Synchro delay (sec / veh)
SimTraffic delay (sec / veh)

Hourly Volume Diagrams

224 937 118

stop bar geometry
turning movement volume

Figure 53

Weekend Traffic Operations Analysis

Greentree Rd (CR 674) & Church Rd (CR 616)/Hainesport-Mt Laurel Rd (CR 674)