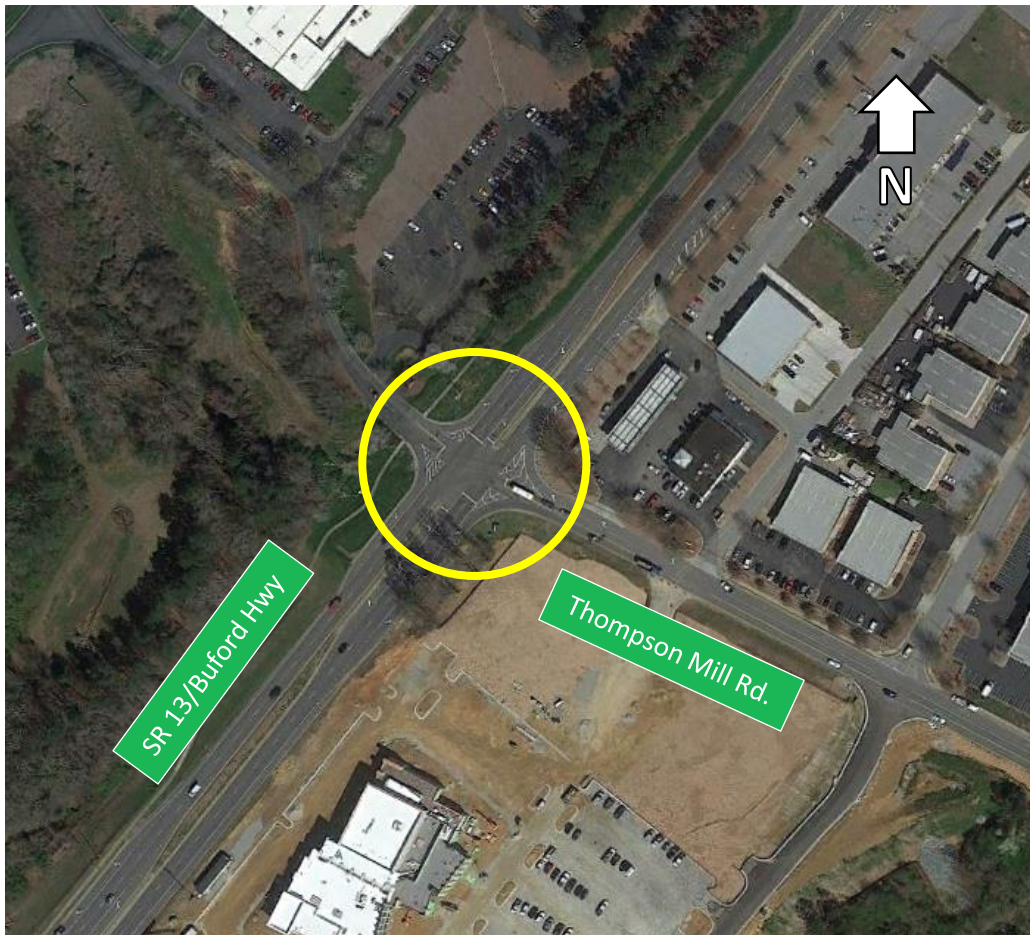


DEPARTMENT OF TRANSPORTATION STATE OF GEORGIA TRAFFIC ENGINEERING REPORT

For the intersection of:
SR 13/Buford Hwy at Thompson Mill Road
Gwinnett County
At Mile Post 21.8



Report prepared by:
Pond & Company
Andrew Antweiler, P.E.
3500 Parkway Lane, Suite 500
Peachtree Corners, GA 30092

Telephone Number: (678) 336-7740
E-mail Address: antweilera@pondco.com
Date report prepared: February 5, 2019

LOCATION

The intersection is located along SR 13/Buford Hwy at Thompson Mill Road, at approximately milepost 21.8 of Buford Hwy. Thompson Mill Road is the minor-street, which begins at the intersection and continues to the east. A private driveway for the Makita business forms the west approach at the intersection.

REASON FOR THE INVESTIGATION

This Traffic Engineering Report is submitted to Georgia Department of Transportation (GDOT) by Pond and Company on behalf of the Gwinnett County Department of Transportation. In an effort to improve operations and safety, Gwinnett County seeks to modify the existing signal phasing at this location and intersection geometry. This project is an interim project which is intended to be constructed prior to the GDOT signal upgrade project. The traffic signal will be designed to accommodate westbound dual left-turn lanes (one left-turn lane and one shared left-turn/through lane) from Thompson Mill Road onto southbound Buford Highway, and will operate split-phase for the side-street approaches. Additionally, the southbound left-turn phase is proposed to be converted from a permitted only operation to a protected/permitted operation.

There is a **GDOT signal upgrade project (PI 0013230)** along the SR 13 corridor, which includes the subject intersection. Based on the in-progress project plan sheet from GDOT's consultant, Atkins, the project is proposing mast arms to replace the existing strain poles. The project proposes to install four new mast arms and all new pedestrian facilities (ramps, raised islands, signals, etc. As of April 2018, the GDOT PM stated the project is scheduled for LET 9/2019, with construction 12/2019.

Gwinnett DOT is not proposing to install new pedestrian facilities since GDOT has an active programmed project to upgrade signal and pedestrian facilities. Gwinnett DOT is not proposing to install a permissive-only phase 6A FYA signal head, due to the interim nature of the project.

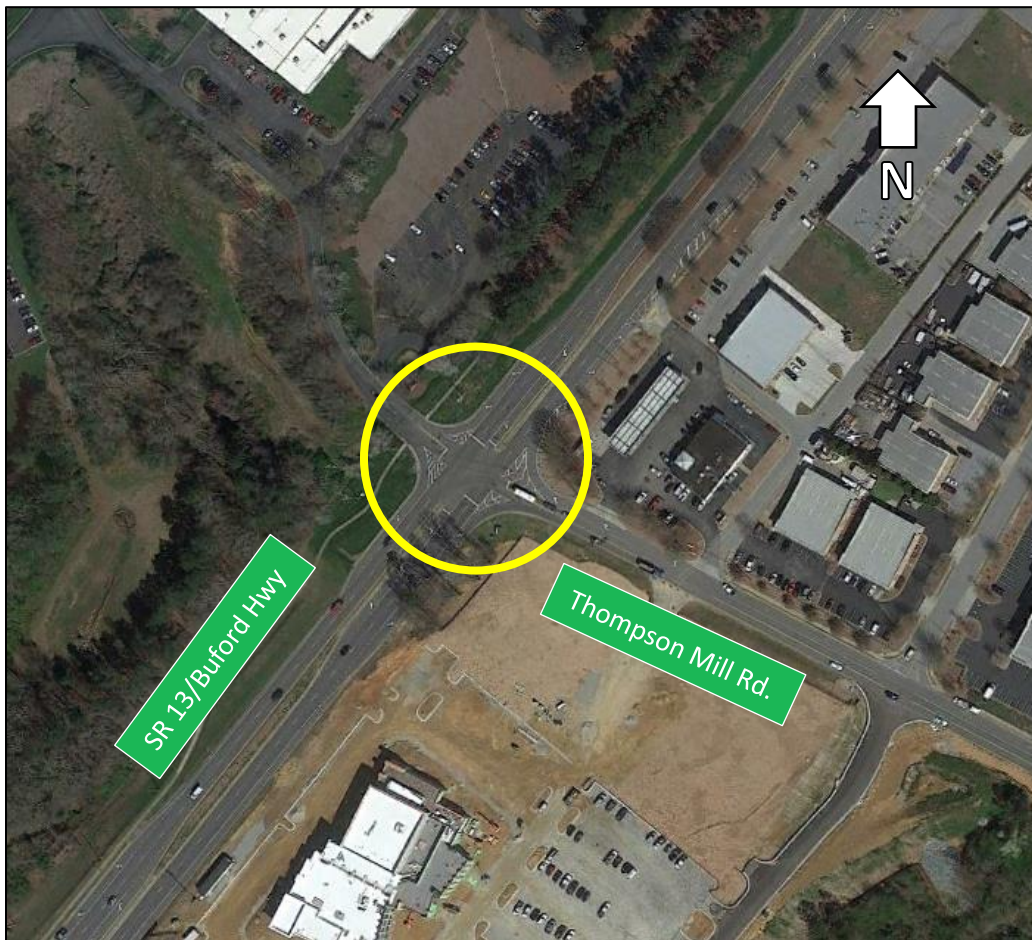
DESCRIPTION OF INTERSECTION

SR 13/Buford Hwy: The major street is a four-lane, median divided roadway with a north-south orientation at the study intersection. The roadway has some rural sections with grass ditches and some sections with curb and gutter. SR 13/Buford Hwy has a 45 MPH posted speed limit. Georgia DOT classifies the road as an urban minor arterial. There is a sidewalk along the west side of the road.

Thompson Mill Road: The minor street begins at the intersection and continues to the east. This is an east-west oriented roadway at the study intersection. The roadway has a rural section with grass ditches and a 45 MPH posted speed limit. Georgia DOT classifies the road as a major collector. There are no sidewalks along the road.

Adjacent to the site is a gas station, some retail and light industrial businesses. The Makita business is located to the west side of SR 13 and has a driveway at the intersection. A new City of Buford public

school is under construction in the southeast quadrant of the intersection. The Gwinnett County Thompson Mill project is making improvement to accommodate traffic from the new public school and surrounding developments.



TRAFFIC VOLUMES

Gwinnett County DOT performed traffic counts on Tuesday, April 17, 2018 at the study intersection. Turning movement counts were performed during the weekday 2-hour AM period (9-7am), 2-hour mid-day period (11:30am-1:30pm), and 2-hour PM period (4-6pm). The AM peak hour occurred from 7:00-8:00am. The PM peak hour occurred from 5:00-6:00pm. Figure 1 illustrates the existing traffic volumes and the intersection conditions (see Appendix A). The turning movement counts are included in the Appendix.

The daily volumes were obtained from GDOT website GEOCOUNTS. In 2016, the average daily traffic reported along SR 13, south of the intersection was 23,382 vpd. In 2012, the average daily traffic reported along Thompson Mill Road, east of the intersection was 8,295 vpd.

EXISTING TRAFFIC CONTROL

Buford Highway/SR 13 at Thompson Mill Road is a signalized intersection; with all approaches operating under permitted control. All right turn lanes operate as yield control. There are currently no crosswalks and no signalized pedestrian phases/equipment at this intersection.

VEHICLE SPEEDS

The posted speed limit for each SR 13/Buford Highway and Thompson Mill Road is 45 MPH. No vehicle speed data was collected as part of this report.

PEDESTRIAN AND BICYCLE VOLUMES

During the 6-hours of traffic counts, pedestrian and bicycle counts were performed. Seven pedestrians were observed during the 2-hour PM period, and zero bicycles observed during this period. Six of the pedestrians were crossing the west approach (Makita driveway) along the existing sidewalk. One pedestrian crossed the SR 13 southbound approach of the intersection.

EXISTING CONDITIONS CAPACITY ANALYSIS

The existing intersection is signal controlled. The delay method that was used to evaluate the existing operations at this intersection is found in the Highway Capacity Manual (HCM) 2000 edition. The intersection level of service (LOS) and delay is reported in **Table 2** for both the AM and PM peak periods. LOS thresholds are based on average vehicle delay at signalized intersections, as defined in the HCM 2010 methodology. Synchro reports for the AM and PM conditions are found in the Appendix.

Overall Intersection	Existing Conditions	
	LOS	Delay (sec/veh)
AM Peak	E	69.6
PM Peak	C	28.6

PARKING

There is no on-street parking located in proximity of this intersection.

CRASH HISTORY

Crashes were obtained from the Georgia Electronic Accident Reporting System (GEARS). Crash records for a 5-year period, for years 2013-2017, are summarized in **Table 3**. The records indicate there was a total of 85 crashes; 31 with injuries, and no fatalities. These crashes took place at or within proximity of the study site. The vast majority of angle collisions occurred when a southbound vehicle performed a left-turn onto Thompson Mill Road eastbound. Several of the rear end collisions involved a northbound right-turning vehicle.

Table 3: Crash Review Summary for Intersection Five Year Period (2013-2017)		
Crash Type	Number of Crashes	Percentage of Total Crashes
Angle	58	68%
Head On	0	0%
Not A Collision with Motor Vehicle	1	1%
Rear End	22	26%
Sideswipe-Opposite Direction	3	4%
Sideswipe-Same Direction	0	0%
Other/Unspecified	1	1%
Total Crashes	85	100%
Crashes with Injuries	31	
Crashes with Fatalities	0	
Crashes involving Bicyclists or Pedestrians	0	

PROPOSED INTERSECTION GEOMETRY

The proposed modifications to this intersection include the following:

- The proposed plan includes changes to the lane geometry at the Thompson Mill Road approach. The westbound approach is adding a 360-foot left turn bay and maintaining the current shared left-turn/through lane and separate right-turn lane.
- The proposed plan includes changes to the lane geometry at the Makita driveway. The current eastbound approach is adding a dedicated left turn lane while changing the current through-left into a through-right lane.
- The signal control for the side-street approaches (Makita driveway and Thompson Mill Road) are proposed to be split phase.
- The signal control for the SR 13/Buford Highway approaches is proposed to consist of permissive green balls for the SR 13 north/south through movements, and a protected/permissive left turn phase for the SR 13 southbound movement. Per GDOT Policy 6785-2 regarding signalized left turns, the existing peak hour left turn volumes meet the minimum guidelines indicating left turn protection is needed.
 - o The left-turn volume exceeds 125 vehicles per hour during both the AM and PM peak hours.
 - o Additionally, the cross-product results for the existing traffic volumes during the PM peak hour exceed the 50,000 value:
 - 8:00-9:00AM peak hour: $126 * 462 / 2 = 29,106$
 - 5:00-6:00PM peak hour: $145 * 781 / 2 = 56,623$

- Additionally, the crash history indicates providing a protected left-turn phase would correct a crash problem and meets the minimum criteria.
- The signal control for the left turn phase for the SR 13 northbound movement is proposed to remain permissive. Due to the interim nature of the project, Gwinnett DOT is not proposing to install a permissive-only phase 6A FYA signal head.
- Pedestrian facilities and crosswalk are not proposed as part of the proposed plan (since GDOT has an active programmed project to upgrade the signal and pedestrian facilities).

PROPOSED CONDITIONS CAPACITY ANALYSIS

Expected intersection operations under the proposed signalized conditions is summarized in **Table 6**. These results include adding the southbound left-turn protected/permitted signal phase.

Table 6: Signalized Conditions Capacity Results		
Overall Intersection	Proposed Conditions	
	LOS	Delay (sec/veh)
AM Peak	C	31.8
PM Peak	D	38.1

Converting the signal to a side-street split-phase operation is expected to provide acceptable level of service.

ADJACENT SIGNALIZED INTERSECTIONS

The nearest adjacent signal to the south is located along SR 13/Buford Highway at Robert Bell Parkway approximately 900 feet from the study location. The signal currently leads to a residential area to the east and will eventually be an entrance to the Buford High School currently under construction.

The nearest adjacent signal to the north is located along SR 13/Buford Highway at Sawnee Avenue approximately 2,200 feet from the study location. This signal serves the road that passes in front of the current Buford High School, Buford Middle School and other academic campuses.

These two signals are connected to the Gwinnett DOT TCC with spread-spectrum radio. The County has a current ATMS design project that will connect this corridor by fiber and replace the radio from the South Lee Street intersection to the Hall County line.

ROUNDBABOUT

In accordance with GDOT policy, the feasibility of a roundabout was considered at this intersection. SR 13 is a four-lane divided roadway with high traffic volumes and signalized intersections. A multi-lane roundabout would be required at this location. Considering the existing conditions along the SR 13 corridor, a roundabout is not recommended.

ICE POLICY

In accordance with GDOT Policy 4A-5 an ICE review was performed for the intersection. The request is for a signal permit revision; therefore a Level 1 approval is required. Based on the project scope, it was determined that an ICE Waiver was appropriate. The project does not substantially alter the character of the intersection. The ICE Waiver is included in this document.

RECOMMENDATIONS

It is recommended that a signal revision permit be issued to Gwinnett County DOT for the modifications listed below:

- The proposed plan includes changes to the lane geometry at the Thompson Mill Road approach. The westbound approach is adding a 360-foot left turn lane and maintaining the current shared left-turn/through lane and separate right-turn lane.
- The proposed plan includes changes to the lane geometry at the Makita driveway. The current eastbound approach is adding a dedicated left turn lane while changing the current through-left into a through-right lane.
- The signal control for the side-street approaches (Makita driveway and Thompson Mill Road) are proposed to be split phase.
- The signal control for the SR 13/Buford Highway approaches is proposed to consist of permissive green balls for the SR 13 north/south through movements, and a protected/permissive left turn phase for the SR 13 southbound movement.



RECOMMENDED BY: _____ DATE: 2/5/19

Andrew Antweiler, PE
Consulting Engineer

RECOMMENDED BY: _____ DATE: _____

District Traffic Engineer

RECOMMENDED BY: _____ DATE: _____

State Traffic Engineer

APPROVED BY: _____ DATE: _____

Director of Operations

Appendix

A: Figure 1 – Intersection Conditions and Volumes

B: Traffic Volumes Counts

C: Synchro Reports, HCM 2000 – Existing Signal Conditions

D: Synchro Reports, HCM 2000 – Proposed Signal Conditions

E: GDOT ICE Waiver Form

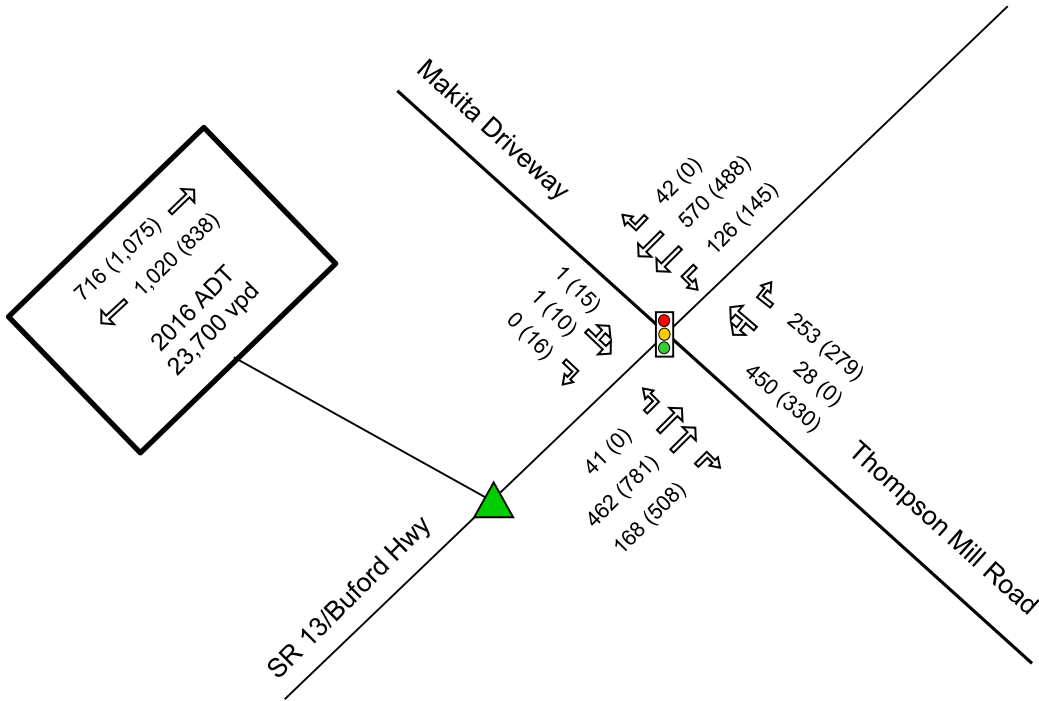
TE Report

Appendix A

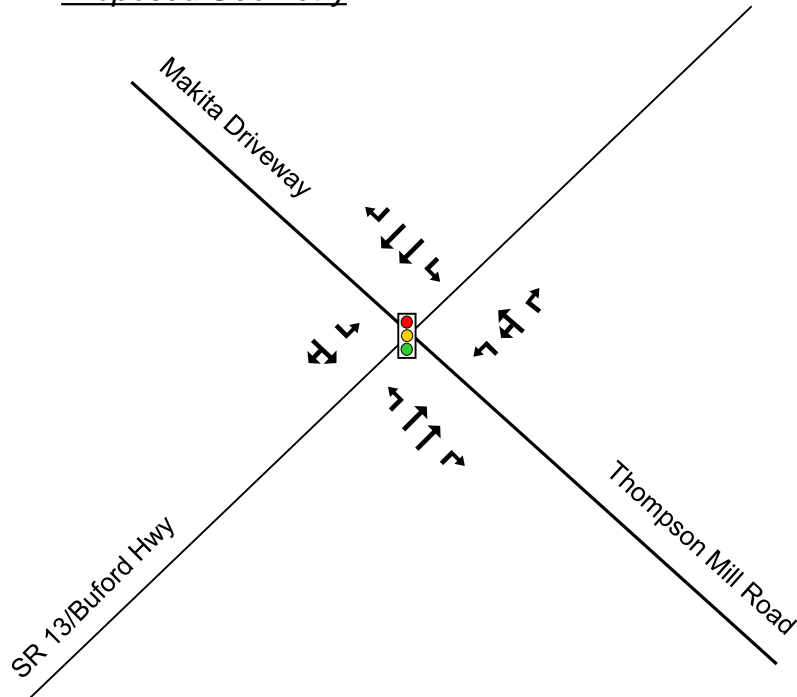
Existing Conditions and Volumes



Not to Scale



Proposed Geometry



LEGEND	
	Existing Roadway Laneage
	Proposed Project Laneage
XX	AM Peak Hour Traffic Volumes
(XX)	PM Peak Hour Traffic Volumes



**Buford Highway at Thompson Mill Road Improvements
 Gwinnett County, Georgia**

Traffic Conditions & Volumes

Figure 1

TE Report

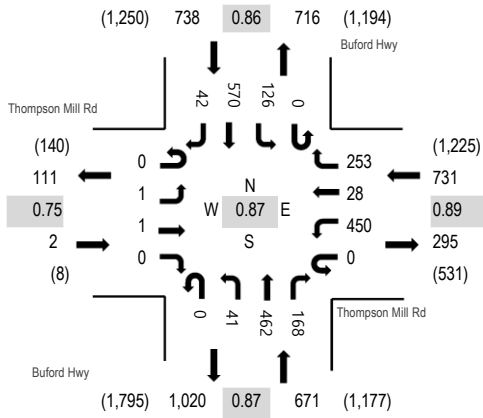
Appendix B



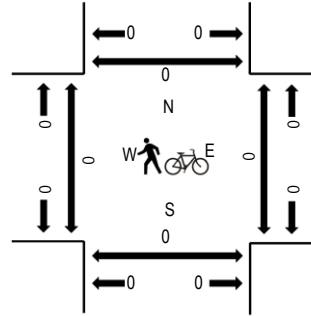
(303) 216-2439
www.alltrafficdata.net

Location: B Buford Hwy & Thompson Mill Rd AM
Date and Start Time: Tuesday, April 17, 2018
Peak Hour: 07:00 AM - 08:00 AM
Peak 15-Minutes: 07:15 AM - 07:30 AM

Peak Hour - All Vehicles



Peak Hour - Pedestrians/Bicycles in Crosswalk



Note: Total study counts contained in parentheses.

Traffic Counts

Interval Start Time	Thompson Mill Rd Eastbound				Thompson Mill Rd Westbound				Buford Hwy Northbound			Buford Hwy Southbound				Total	Rolling Hour	Pedestrian Crossings				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru			Right	West	East	South	North
7:00 AM	0	0	1	0	0	136	3	67	0	8	114	39	0	34	135	6	543	2,142	0	0	0	0
7:15 AM	0	0	0	0	0	122	9	75	0	10	142	44	0	38	163	13	616	2,089	0	0	0	0
7:30 AM	0	1	0	0	0	87	7	55	0	11	104	49	0	32	161	6	513	1,856	0	0	0	0
7:45 AM	0	0	0	0	0	105	9	56	0	12	102	36	0	22	111	17	470	1,652	0	0	0	0
8:00 AM	0	0	0	1	0	112	1	58	1	5	113	50	0	24	118	7	490	1,518	0	0	0	0
8:15 AM	0	0	0	1	0	87	1	40	0	1	82	39	0	32	98	2	383		0	0	0	0
8:30 AM	0	0	0	2	0	65	1	20	0	5	76	32	0	10	97	1	309		0	0	0	0
8:45 AM	0	0	0	2	0	87	2	20	0	0	68	34	1	15	104	3	336		0	0	0	0

Peak Rolling Hour Flow Rates

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	1	2	3	0	0	3	0	9
Lights	0	1	1	0	0	435	28	250	0	39	447	150	0	116	536	42	2,045
Mediums	0	0	0	0	0	15	0	3	0	1	13	15	0	10	31	0	88
Total	0	1	1	0	0	450	28	253	0	41	462	168	0	126	570	42	2,142



(303) 216-2439
www.alltrafficdata.net

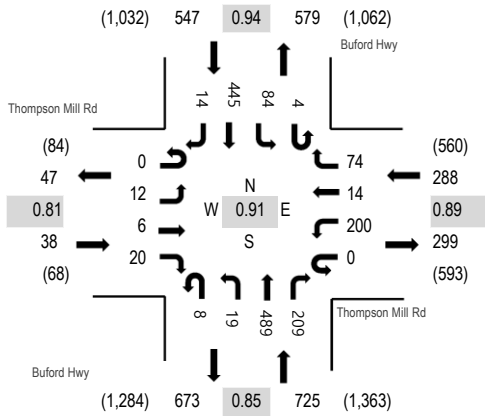
Location: B Buford Hwy & Thompson Mill Rd Noon

Date and Start Time: Tuesday, April 17, 2018

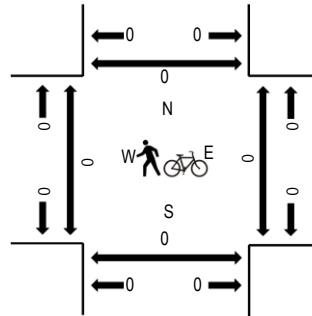
Peak Hour: 12:15 PM - 01:15 PM

Peak 15-Minutes: 01:00 PM - 01:15 PM

Peak Hour - All Vehicles



Peak Hour - Pedestrians/Bicycles in Crosswalk



Note: Total study counts contained in parentheses.

Traffic Counts

Interval Start Time	Thompson Mill Rd Eastbound				Thompson Mill Rd Westbound				Buford Hwy Northbound				Buford Hwy Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
11:30 AM	0	2	0	5	0	54	1	14	0	0	88	58	1	12	83	6	324	1,457	0	0	0	0
11:45 AM	0	4	2	7	0	40	3	22	0	6	83	45	0	31	95	3	341	1,509	0	0	0	0
12:00 PM	0	2	1	6	0	61	2	19	1	5	111	52	1	23	122	4	410	1,569	0	0	0	0
12:15 PM	0	4	1	5	0	44	2	23	3	2	128	46	2	20	102	0	382	1,598	0	0	0	0
12:30 PM	0	5	1	4	0	42	2	15	0	5	110	50	1	19	116	6	376	1,566	0	0	0	0
12:45 PM	0	3	2	4	0	57	6	18	1	8	115	41	0	28	114	4	401		0	0	0	0
1:00 PM	0	0	2	7	0	57	4	18	4	4	136	72	1	17	113	4	439		0	0	0	0
1:15 PM	0	0	0	1	0	45	1	10	2	5	126	56	0	14	89	1	350		0	0	0	0

Peak Rolling Hour Flow Rates

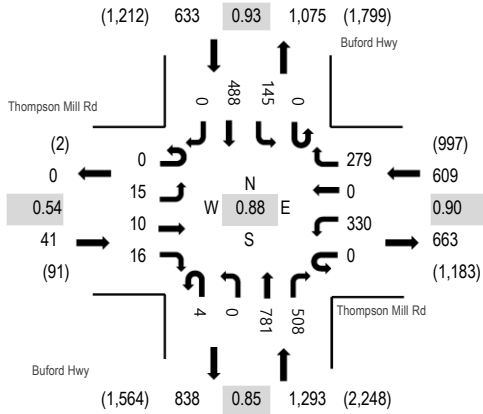
Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	2	0	1	0	1	0	0	0	1	6	1	1	0	2	1	16
Lights	0	9	6	16	0	194	14	65	8	18	465	202	3	74	432	12	1,518
Mediums	0	1	0	3	0	5	0	9	0	0	18	6	0	10	11	1	64
Total	0	12	6	20	0	200	14	74	8	19	489	209	4	84	445	14	1,598



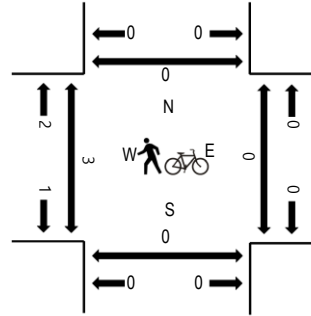
(303) 216-2439
www.alltrafficdata.net

Location: B Buford Hwy & Thompson Mill Rd PM
Date and Start Time: Tuesday, April 17, 2018
Peak Hour: 05:00 PM - 06:00 PM
Peak 15-Minutes: 05:00 PM - 05:15 PM

Peak Hour - All Vehicles



Peak Hour - Pedestrians/Bicycles in Crosswalk



Note: Total study counts contained in parentheses.

Traffic Counts

Interval Start Time	Thompson Mill Rd Eastbound				Thompson Mill Rd Westbound				Buford Hwy Northbound				Buford Hwy Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:30 PM	0	8	11	10	0	65	0	23	2	1	161	98	0	41	118	1	539	2,507	0	0	0	0
4:45 PM	0	3	2	10	0	66	0	30	3	0	142	117	0	42	124	0	539	2,572	2	0	0	0
5:00 PM	0	5	4	7	0	79	0	70	2	0	231	149	0	42	140	0	729	2,576	3	0	0	0
5:15 PM	0	1	2	0	0	88	0	81	1	0	198	143	0	43	143	0	700	2,313	0	0	0	0
5:30 PM	0	6	4	2	0	86	0	66	1	0	180	118	0	38	103	0	604	2,041	0	0	0	0
5:45 PM	0	3	0	7	0	77	0	62	0	0	172	98	0	22	102	0	543		0	0	0	0
6:00 PM	0	2	0	3	0	75	0	37	0	0	152	63	0	37	97	0	466		1	0	0	1
6:15 PM	0	1	0	0	0	59	0	33	1	0	132	83	0	26	93	0	428		0	0	0	0

Peak Rolling Hour Flow Rates

Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	1	0	1	0	0	0	0	11	2	0	1	16	0	32
Lights	0	15	10	15	0	329	0	274	4	0	764	499	0	143	467	0	2,520
Mediums	0	0	0	0	0	0	0	5	0	0	6	7	0	1	5	0	24
Total	0	15	10	16	0	330	0	279	4	0	781	508	0	145	488	0	2,576



(303) 216-2439
www.alltrafficdata.net

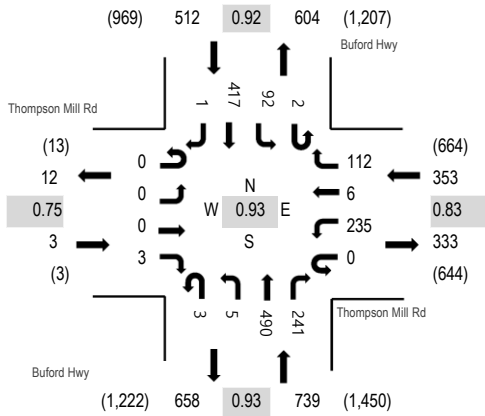
Location: B Buford Hwy & Thompson Mill Rd Noon

Date and Start Time: Saturday, April 14, 2018

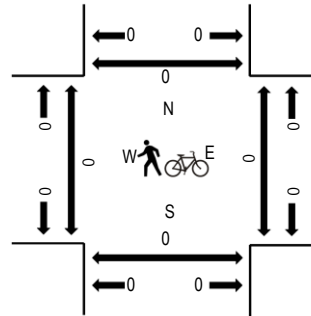
Peak Hour: 11:30 AM - 12:30 PM

Peak 15-Minutes: 12:00 PM - 12:15 PM

Peak Hour - All Vehicles



Peak Hour - Pedestrians/Bicycles in Crosswalk



Note: Total study counts contained in parentheses.

Traffic Counts

Interval Start Time	Thompson Mill Rd Eastbound				Thompson Mill Rd Westbound				Buford Hwy Northbound				Buford Hwy Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
11:30 AM	0	0	0	1	0	62	3	32	2	3	113	57	0	27	101	1	402	1,607	0	0	0	0
11:45 AM	0	0	0	1	0	45	0	27	0	1	132	61	0	20	110	0	397	1,599	0	0	0	0
12:00 PM	0	0	0	1	0	66	2	38	0	1	124	60	1	24	114	0	431	1,592	0	0	0	0
12:15 PM	0	0	0	0	0	62	1	15	1	0	121	63	1	21	92	0	377	1,512	0	0	0	0
12:30 PM	0	0	0	0	0	50	0	27	0	0	157	49	1	17	93	0	394	1,479	0	0	0	0
12:45 PM	0	0	0	0	0	50	1	33	2	0	126	53	3	32	90	0	390		0	0	0	0
1:00 PM	0	0	0	0	0	62	0	28	0	0	108	59	0	22	72	0	351		0	0	0	0
1:15 PM	0	0	0	0	0	51	0	9	1	0	110	46	1	33	93	0	344		0	0	0	0

Peak Rolling Hour Flow Rates























Vehicle Type	Eastbound				Westbound				Northbound				Southbound				Total
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	
Articulated Trucks	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2	0	4
Lights	0	0	0	3	0	232	6	109	3	5	481	240	2	89	413	1	1,584
Mediums	0	0	0	0	0	3	0	3	0	0	8	1	0	2	2	0	19
Total	0	0	0	3	0	235	6	112	3	5	490	241	2	92	417	1	1,607

TE Report

Appendix C

HCM Signalized Intersection Capacity Analysis
3: Buford Highway & Thompson Mill Road

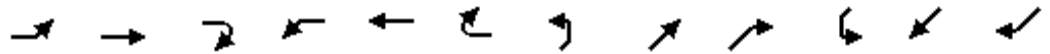
Existing Conditions
AM Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (vph)	1	1	0	450	28	253	41	462	168	126	570	42
Future Volume (vph)	1	1	0	450	28	253	41	462	168	126	570	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1			6.1	6.1	5.9	5.9	5.9	5.9	5.9	5.9
Lane Util. Factor		1.00			1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00			1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98			0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1774			1737	1546	1728	3455	1546	1728	3455	1546
Flt Permitted		0.80			0.74	1.00	0.37	1.00	1.00	0.43	1.00	1.00
Satd. Flow (perm)		1451			1341	1546	674	3455	1546	787	3455	1546
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	1	1	0	517	32	291	47	531	193	145	655	48
RTOR Reduction (vph)	0	0	0	0	0	206	0	0	71	0	0	18
Lane Group Flow (vph)	0	2	0	0	549	85	47	531	122	145	655	30
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		8			4			6			2	
Permitted Phases	8		8	4		4	6		6	2		2
Actuated Green, G (s)		46.9			46.9	46.9	101.1	101.1	101.1	101.1	101.1	101.1
Effective Green, g (s)		46.9			46.9	46.9	101.1	101.1	101.1	101.1	101.1	101.1
Actuated g/C Ratio		0.29			0.29	0.29	0.63	0.63	0.63	0.63	0.63	0.63
Clearance Time (s)		6.1			6.1	6.1	5.9	5.9	5.9	5.9	5.9	5.9
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		425			393	453	425	2183	976	497	2183	976
v/s Ratio Prot								0.15			c0.19	
v/s Ratio Perm		0.00			c0.41	0.06	0.07		0.08	0.18		0.02
v/c Ratio		0.00			1.40	0.19	0.11	0.24	0.12	0.29	0.30	0.03
Uniform Delay, d1		40.0			56.5	42.3	11.7	12.8	11.8	13.3	13.4	11.1
Progression Factor		1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.0			193.5	0.2	0.5	0.3	0.3	1.5	0.4	0.1
Delay (s)		40.0			250.1	42.5	12.2	13.1	12.0	14.8	13.7	11.1
Level of Service		D			F	D	B	B	B	B	B	B
Approach Delay (s)		40.0			178.2			12.8			13.8	
Approach LOS		D			F			B			B	
Intersection Summary												
HCM 2000 Control Delay			69.6		HCM 2000 Level of Service				E			
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			160.0		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			76.2%		ICU Level of Service				D			
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 3: Buford Highway & Thompson Mill Road

Existing Conditions
 PM Peak Hour



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations		↕	↕		↕	↕	↕	↕↕	↕	↕	↕↕	↕
Traffic Volume (vph)	15	10	16	330	0	249	4	781	508	145	488	0
Future Volume (vph)	15	10	16	330	0	249	4	781	508	145	488	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.1	6.1		6.1	6.1	5.9	5.9	5.9	5.9	5.9	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1765	1546		1728	1546	1728	3455	1546	1728	3455	
Flt Permitted		0.68	1.00		0.74	1.00	0.41	1.00	1.00	0.27	1.00	
Satd. Flow (perm)		1227	1546		1344	1546	752	3455	1546	484	3455	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Adj. Flow (vph)	17	11	18	379	0	286	5	898	584	167	561	0
RTOR Reduction (vph)	0	0	12	0	0	98	0	0	221	0	0	0
Lane Group Flow (vph)	0	28	6	0	379	188	5	898	363	167	561	0
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		8			4			6			2	
Permitted Phases	8		8	4		4	6		6	2		2
Actuated Green, G (s)		51.8	51.8		51.8	51.8	104.5	104.5	104.5	104.5	104.5	
Effective Green, g (s)		51.8	51.8		51.8	51.8	104.5	104.5	104.5	104.5	104.5	
Actuated g/C Ratio		0.31	0.31		0.31	0.31	0.62	0.62	0.62	0.62	0.62	
Clearance Time (s)		6.1	6.1		6.1	6.1	5.9	5.9	5.9	5.9	5.9	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		377	475		413	475	466	2145	959	300	2145	
v/s Ratio Prot								0.26			0.16	
v/s Ratio Perm		0.02	0.00		0.28	0.12	0.01		0.23	0.35		
v/c Ratio		0.07	0.01		0.92	0.40	0.01	0.42	0.38	0.56	0.26	
Uniform Delay, d1		41.3	40.5		56.2	45.9	12.2	16.3	15.8	18.5	14.4	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1	0.0		24.9	0.5	0.0	0.6	1.1	7.3	0.3	
Delay (s)		41.3	40.5		81.1	46.5	12.2	16.9	16.9	25.7	14.7	
Level of Service		D	D		F	D	B	B	B	C	B	
Approach Delay (s)		41.0			66.2			16.9			17.3	
Approach LOS		D			E			B			B	
Intersection Summary												
HCM 2000 Control Delay			28.6		HCM 2000 Level of Service				C			
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			168.3		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			74.0%		ICU Level of Service				D			
Analysis Period (min)			15									

c Critical Lane Group

TE Report

Appendix D

HCM Signalized Intersection Capacity Analysis
3: Buford Highway & Thompson Mill Road

Split Phasing Build Alternative
AM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR	
Lane Configurations													
Traffic Volume (vph)	1	1	0	450	28	253	41	462	168	126	570	42	
Future Volume (vph)	1	1	0	450	28	253	41	462	168	126	570	42	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.0	6.0		6.0	6.0	6.0	5.9	5.9	5.9	6.0	5.9	5.9	
Lane Util. Factor	1.00	1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Fr _t	1.00	1.00		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	
Fl _t Protected	0.95	1.00		0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1728	1818		1641	1654	1546	1728	3455	1546	1728	3455	1546	
Fl _t Permitted	0.95	1.00		0.95	0.96	1.00	0.40	1.00	1.00	0.24	1.00	1.00	
Satd. Flow (perm)	1728	1818		1641	1654	1546	733	3455	1546	437	3455	1546	
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	
Adj. Flow (vph)	1	1	0	517	32	291	47	531	193	145	655	48	
RTOR Reduction (vph)	0	0	0	0	0	223	0	0	148	0	0	30	
Lane Group Flow (vph)	1	1	0	274	275	68	47	531	45	145	655	18	
Turn Type	Split	NA		Split	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	
Protected Phases	4	4		3	3			6		5	2		
Permitted Phases						3	6		6	2		2	
Actuated Green, G (s)	18.0	18.0		21.0	21.0	21.0	21.1	21.1	21.1	33.1	33.1	33.1	
Effective Green, g (s)	18.0	18.0		21.0	21.0	21.0	21.1	21.1	21.1	33.1	33.1	33.1	
Actuated g/C Ratio	0.20	0.20		0.23	0.23	0.23	0.23	0.23	0.23	0.37	0.37	0.37	
Clearance Time (s)	6.0	6.0		6.0	6.0	6.0	5.9	5.9	5.9	6.0	5.9	5.9	
Lane Grp Cap (vph)	345	363		382	385	360	171	810	362	246	1270	568	
v/s Ratio Prot	c0.00	0.00		c0.17	0.17			0.15		0.04	c0.19		
v/s Ratio Perm						0.04	0.06		0.03	c0.18		0.01	
v/c Ratio	0.00	0.00		0.72	0.71	0.19	0.27	0.66	0.12	0.59	0.52	0.03	
Uniform Delay, d ₁	28.8	28.8		31.8	31.7	27.7	28.2	31.2	27.2	20.7	22.2	18.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d ₂	0.0	0.0		11.0	10.8	1.2	3.9	4.1	0.7	10.0	1.5	0.1	
Delay (s)	28.8	28.8		42.8	42.5	28.8	32.1	35.3	27.9	30.7	23.7	18.3	
Level of Service	C	C		D	D	C	C	D	C	C	C	B	
Approach Delay (s)		28.8			37.9			33.2			24.6		
Approach LOS		C			D			C			C		
Intersection Summary													
HCM 2000 Control Delay			31.8		HCM 2000 Level of Service					C			
HCM 2000 Volume to Capacity ratio			0.51										
Actuated Cycle Length (s)			90.0		Sum of lost time (s)					23.9			
Intersection Capacity Utilization			63.0%		ICU Level of Service					B			
Analysis Period (min)			15										
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
3: Buford Highway & Thompson Mill Road

Split Phasing Build Alternative
PM Peak Hour

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NEL	NET	NER	SWL	SWT	SWR	
Lane Configurations													
Traffic Volume (vph)	15	10	16	330	0	249	4	781	508	145	488	0	
Future Volume (vph)	15	10	16	330	0	249	4	781	508	145	488	0	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.1	6.1		6.1	6.1	6.1	5.9	5.9	5.9	6.0	5.9		
Lane Util. Factor	1.00	1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95		
Fr _t	1.00	0.91		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00		
Fl _t Protected	0.95	1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00		
Satd. Flow (prot)	1728	1649		1641	1641	1546	1728	3455	1546	1728	3455		
Fl _t Permitted	0.95	1.00		0.95	0.95	1.00	0.44	1.00	1.00	0.13	1.00		
Satd. Flow (perm)	1728	1649		1641	1641	1546	803	3455	1546	235	3455		
Peak-hour factor, PHF	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	
Adj. Flow (vph)	17	11	18	379	0	286	5	898	584	167	561	0	
RTOR Reduction (vph)	0	14	0	0	0	229	0	0	422	0	0	0	
Lane Group Flow (vph)	17	15	0	189	190	57	5	898	162	167	561	0	
Turn Type	Split	NA		Split	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm	
Protected Phases	4	4		3	3			6		5	2		
Permitted Phases						3	6		6	2		2	
Actuated Green, G (s)	18.0	18.0		18.0	18.0	18.0	24.9	24.9	24.9	35.9	35.9		
Effective Green, g (s)	18.0	18.0		18.0	18.0	18.0	24.9	24.9	24.9	35.9	35.9		
Actuated g/C Ratio	0.20	0.20		0.20	0.20	0.20	0.28	0.28	0.28	0.40	0.40		
Clearance Time (s)	6.1	6.1		6.1	6.1	6.1	5.9	5.9	5.9	6.0	5.9		
Lane Grp Cap (vph)	345	329		328	328	309	222	955	427	176	1378		
v/s Ratio Prot	c0.01	0.01		0.12	c0.12			0.26		c0.05	0.16		
v/s Ratio Perm						0.04	0.01		0.10	c0.32			
v/c Ratio	0.05	0.04		0.58	0.58	0.19	0.02	0.94	0.38	0.95	0.41		
Uniform Delay, d ₁	29.1	29.1		32.6	32.6	29.9	23.7	31.8	26.3	24.0	19.4		
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d ₂	0.3	0.3		7.2	7.3	1.3	0.2	17.8	2.5	55.6	0.9		
Delay (s)	29.4	29.3		39.7	39.8	31.2	23.9	49.7	28.8	79.6	20.3		
Level of Service	C	C		D	D	C	C	D	C	E	C		
Approach Delay (s)		29.3			36.1			41.4			33.9		
Approach LOS		C			D			D			C		
Intersection Summary													
HCM 2000 Control Delay			38.1									HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio			0.64										
Actuated Cycle Length (s)			90.0									Sum of lost time (s)	24.1
Intersection Capacity Utilization			67.0%									ICU Level of Service	C
Analysis Period (min)			15										
c	Critical Lane Group												

TE Report

Appendix E



GDOT INTERSECTION CONTROL EVALUATION (ICE) TOOL

ICE Version 2.13 |
Revised 03/12/2018

GDOT PI # (or N/A): n/a Request By: Gwinnett DOT
 County: Gwinnett GDOT District: 1 - Gainesville
 Major (State) Road: Buford Highway Speed Limit: 45 mph
 Minor (Crossing) ST: Thompson Mill Speed Limit: 45 mph
 Major ST Direction: North/South Area Type: Suburb/Transition
 Intersection Control: Signal (turn lanes on mainline)
 Prepared By: Pond & Company Analyst: Antweiler
 Date: 9/14/2018 Project ID:
 Proj Purpose: Thompson Mill Rd Improvements

Note: Enter current year traffic data in blue boxes

2018 Existing (current) Yr	[16100 / 16100]				Annual Growth Rate: 1.0%		
2020 Project Opening Yr	(3)	(0)	(488)	(145)	K Factor: 10%		
2020 Project Design Yr	0	42	570	126			
		EB Thompson Mill		2020 / 2020 Intersection Daily Entering Volume: 48000 / 48000			
[800 / 800] 2 (41)	(15)	1			0	(0)	[11700 / 11700] 731 (609)
	(10)	1			253	(279)	
	(16)	0			28	(0)	
	(0)	0			450	(330)	
Peak Hour % Trucks		NB Buford Highway		WB Thompson Mill		Legend:	
NB	SB	EB	WB	41	462	168	000 = AM Peak Hr Volume
				(0)	(781)	(508)	(000) = PM Peak Hr Volume
1%	1%	1%	1%	671 (1289)		[000/000] = 2020 / 2020 ADT (est)	
		NB Buford Highway		[19500 / 19500]		Approach Splits: Buford Highway - 0.71 / Thompson Mill - 0.29	

* K Factor = proportion of annual average daily traffic occurring in the peak hour

Introduction: In 2005, SAFETEA-LU established the Highway Safety Improvement Program (HSIP) and mandated that each state prepare a Strategic Highway Safety Plan (SHSP) to prioritize safety funding investments. Intersections quickly became a common component of most states' SHSP emphasis areas and HSIP project lists, including Georgia's SHSP. Intersection Control Evaluation (ICE) policies and procedures represent a traceable and transparent procedure to streamline the evaluation of intersection control alternatives, and further leverage safety advancements for intersection improvements beyond just the safety program. Approximately one-third of all traffic fatalities and roughly seventy five percent of all traffic crashes in Georgia occur at or adjacent to intersections. Accordingly, the Georgia SHSP includes an emphasis on enhancing intersection safety to advance the *Toward Zero Deaths* vision embraced by the Georgia Governor's Office of Highway Safety (GOHS). This ICE tool was developed to support the ICE policy, developed and adopted to help ensure that intersection investments across the entire Georgia highway system are selected, prioritized and implemented with defensible benefits for safety towards those ends.

Tool Goal: The goal of this ICE tool is to provide a simplified and consistent way of importing traffic, safety, cost, environmental impact and stakeholder posture data to assess and quantify intersection control improvement benefits. The tool supports the ICE policy and procedures to provide traceability, transparency, consistency and accountability when identifying and selecting an intersection control solution that both meets project purpose and reflects overall best value in terms of specific performance-based criteria.

Requirements: An ICE is required for any intersection improvement (e.g. new or modified intersection, widening/reconstruction or corridor project, or work accomplished through a driveway or encroachment permit that affects an intersection) where: 1) the intersection includes at least one roadway designated as a State Route (State Highway System) or as part of the National Highway System; or 2) the intersection will be designed or constructed using State or Federal funding. In certain circumstances where an ICE would otherwise be required, the requirement may be waived based on appropriate evidence presented with a written request. (See the "Waiver" tab to review criteria that may make a project waiver eligible and for instructions to submit a waiver request to the Department). An ICE is not required when the proposed work does not include any changes to the intersection design, involves only routine traffic signal timing and equipment maintenance, or for driveway permits where the driveway is not a new leg to an already existing intersection on either 1) a divided, multi-lane highway with a closed median and only right-in/right-out access or 2) an undivided roadway where the development is not required to construct left and/or right turn lanes (as per the Driveway Manual and District Traffic Engineer).

Two-Stage Process: A complete ICE process consists of two (2) distinct stages, and it is expected that the respective level of effort for completing both stages of ICE will correspond to the magnitude and complexity of the intersection. Prior to starting an ICE, the District Traffic Engineer and/or State Traffic Engineer should be consulted for advice on an appropriate level of effort. The Stage 1 and Stage 2 ICE forms are designed minimize required data inputs using drop-down menu choices and limiting text entry. All fields shaded grey include drop down menu choices and all fields shaded blue require data entry. All other cells in the worksheet are locked.

Stage 1: Screening Decision Record Stage 1 should be conducted as early in the project development process as possible and is intended to inform which alternatives are worthy of further evaluation in Stage 2. Stage 1 serves as a screening effort meant to eliminate non-competitive options and identify which alternatives merit further considerations based on their practical feasibility. Users should use good engineering judgement in responding to the seven policy questions by selecting "Yes" or "No" in the drop-down boxes. Alternatives should not be summarily eliminated without due consideration, and reasons for eliminating or advancing an alternative should be documented in the "Screening Decision Justification" column.

Stage 2: Alternative Selection Decision Record Stage 2 involves a more detailed and familiar evaluation of the alternatives identified in Stage 1 in order to support the selection of a preferred alternative that may be advanced to detailed design. Stage 2 data entry may require the use of external analysis tools to determine costs, operations and/or safety data that, combined with environmental and stakeholder posture data, form the basis of the ICE evaluation. A separate "CostEst" worksheet tab helps users develop pre-planning-level cost estimates for each Stage 2 alternative evaluated, and a separate Users Guide has been prepared to give guidance on Stage 1 and Stage 2 data entry. Once all data is entered, each alternative is scored and ranked, with the results reported at the bottom of the Stage 2 worksheet to inform on the best of the intersection controls evaluated for project recommendation.

Documentation: A complete ICE document consists of the combination of the outputs from either a completed and signed waiver form or both Stage 1 and Stage 2 worksheets (along with supporting costing and/or environmental documentation), to be included in the approved project Concept Report (or equivalent) or as a stand-alone document.



GDOT INTERSECTION CONTROL EVALUATION (ICE) WAIVER FORM

ICE Version 2.13 | Revised 03/12/2018

Waiver Request - Level 1

In certain circumstances where an ICE would otherwise be required, an ICE may be waived based on appropriate evidence presented with a written request. Scenarios in which an ICE waiver request may be considered include:

- Proposed improvements do not substantially alter the character of the intersection, and are considered minor in nature, such as extending existing turn lane(s) or modifying signal phasing at an existing traffic signal
- The intersection consists of a public roadway intersecting a divided, multilane roadway where the access will be limited to a closed median with only right-in/right-out access that will operate acceptably; or
- The intersection is along an undivided, two-lane roadway that will not be widened and meets the following criteria:
 - Low risk in terms of exposure (total intersection entering volume less than 1,000 vehicles /day)
 - Latest 5 years of crash history is not indicative of a crash problem (no discernible crash patterns coupled with low crash frequency and severity)
 - Layout has no unusual or undesirable geometric features (such as restricted sight distance)
 - The proposed changes are not expected to adversely affect safety

If only one alternative is determined to be feasible from the ICE Stage 1, then a waiver may be submitted in lieu of completing ICE Stage 2. The waiver must clearly explain why there is no other feasible alternative. A Waiver Form should also be submitted to document an agreed upon decision to select a preferred alternative other than the highest scoring alternative in Stage 2.

ICE waiver forms with supporting documentation should be submitted for approval to the Office of Traffic Operations or District Engineer (depending on Waiver level). Questions regarding the waiver process should be routed to the State Traffic Engineer.

Project Information:	Location: <u>Burda Highway @ Thompson Mill</u>	GDOT PI # (or N/A): <u>n/a</u>
	County: <u>Gwinnett</u>	Requested By: <u>Gwinnett DOT</u>
	GDOT District: <u>1 - Gainesville</u>	Prepared By: <u>Pond & Company</u>
	Area Type: <u>Suburb/Transition</u>	Analyst: <u>Antweiler</u>
	Existing Intersection Control: <u>Signal (turn lanes on mainline)</u>	Date: <u>9/14/2018</u>
		Waiver Request Type: <u>New or Revised Signal Permit</u>

Traffic and Operations Data:¹

Intersection meets signal/AWS warrants?	None	
Traffic Analysis Type:	Intersection Delay	
Existing Avg Daily Traffic (Major Street):	23,382	
Existing Avg Daily Traffic (Minor Street):	8,295	
Analysis Period:	AM Peak	PM Peak
2020 Opening Yr Peak Hour Intersection Delay:	31.8 sec	38.1 sec
2020 Opening Yr Peak Hour Intersection V/C:	0.51	0.64
2020 Design Yr Peak Hour Intersection Delay:	31.8 sec	38.1 sec
2020 Design Yr Peak Hour Intersection V/C:	0.51	0.64

Crash Data (Required): ¹			
Crash Type	Crash Data :Enter 5 most recent years of intersection crash data	Crash Severity	
		PDO	Injury Crash* Fatal Crash*
Angle	29	29	0
Head-On	0	0	0
Rear End	21	2	0
Sideswipe - same	0	0	0
Sideswipe - opposite	3	0	0
Not Collision w/Motor Veh	1	0	0
TOTALS:	54	31	0

¹Crash data required for all existing intersections. ADT's required if available (from data collected or nearest GDOT count station site). Capacity data is optional unless needed to justify basis of the waiver request.

* Number of crashes resulting in injuries / fatalities, not number of persons

Description of Work / Traffic Signal Revision associated with Thompson Mill Road Improvement Project (Gwinnett County DOT Justification for Waiver project); the intersection modifications include 1) add second WB left-turn lane 2) split-phase side-streets and 3) (Required): add southbound protected/permitted left-turn signal phase

Proposed Intersection Control: Traffic Signal

REQUESTED BY: Date: 9/14/2018

Title: ANDREW ANTWEILER - CONSULTANT ENGINEER

APPROVED BY: _____ Date: _____

Name: _____

Chief Engineer or (Approved Delegate)