

An aerial photograph showing a residential area with houses and trees on the left, and a commercial area with several large buildings and parking lots on the right. A road runs diagonally from the top left towards the bottom right, intersecting with another road that runs horizontally across the middle of the image. The sky is clear and blue.

Northcreek Traffic Impact Study

Sycamore Township, OH

Final Report Ver. 1.0
April 2019

TEC PN: 19086-001

TEC Engineering, Inc.

ENGINEERS
PLANNERS
SURVEYORS

Traffic Impact Study

**Northcreek Development
Sycamore Township, Ohio**

Prepared For:

Kubicki Real Estate Partners



Prepared By:

TEC Engineering, Inc.

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Executive Summary

Purpose and Objectives

TEC Engineering Inc. was retained by Kubicki Real Estate Partners to conduct a Traffic Impact Study for a proposed development along Northcreek Drive in Sycamore Township, Ohio. The development consists of office building land use. The objective of this report is to document existing traffic conditions and evaluate the potential impacts of the proposed development on the surrounding transportation network.

Existing Conditions

The project area is located on the east side of Northcreek Drive, north of Galbraith Road. There are four signalized intersections within the project area that intersect with Galbraith Road that will be analyzed as part of this study. The western Kenwood Collections signalized intersection will not be included. Included are Kenwood Road, Kenwood Collections, Northcreek Drive and Montgomery Road. Kenwood Road and Montgomery Road provide access to I-71 and SR-126.

The existing site contains a Tri-Health office building. A secondary office building is contained on the site but is planned to be removed and replaced with a parking garage.

Proposed Development

The proposed development includes a 4-story office building in the northern portion of the project site that will have an area of 122,000 sq ft. The existing Tri-Health office building will undergo an expansion of 13,000 sq ft. The existing 115,00 sq ft Tri-Health office building will remain. Parking will also be reconfigured as part of this development.

The proposed development was analyzed as “Land Use 710 - General Office Building.”

Traffic Analyses

TEC completed traffic counts in March of 2019 in order to establish background traffic for “No Build” analysis scenarios. The assumed opening year for the proposed development is 2021. A 1% growth was utilized. All proposed development trips were generated using the *Institute of Transportation Engineers (ITE) Trip Generation Manual, Volume 10*.

Using manual counts and ITE generated trips, capacity analysis for the surrounding road network was completed using the software program *Synchro*. Capacity analysis was used to determine intersection delay and level of service. The following scenarios were analyzed:

- 2021 AM/PM Peak No Build/Build
- 2031 AM/PM Peak No Build/Build

Conclusions and Recommendations

Based upon the analysis presented in this Traffic Impact Study, there are no recommended changes to be made to the existing transportation network as a result of the proposed Northcreek Expansion development.

Qualifications

TEC Engineering, Inc. is a Southwest Ohio-based consulting engineering firm established in 1992 specializing in the fields of Transportation Planning, Traffic Engineering, and Roadway and Highway Design, including all ancillary services. In its twenty-six-year history in the Tri-State, the firm has completed a variety of transportation improvement and enhancement projects across a wide spectrum, including: Traffic Signal Design, Intelligent Transportation Systems Planning, Design and Operations, Roadway/Highway Design, Engineering Studies, and Roadway/Highway and Parking Lighting Systems.

TEC has conducted a wide variety of Traffic Impact Studies throughout Ohio, Kentucky and Indiana. These studies include both retail and residential developments. The retail developments range in size from a single commercial building to multiuse sites covering several acres. Likewise, the residential developments range in size from small communities to large developments with several hundred single family homes.

"I certify that this TRAFFIC IMPACT STUDY has been prepared by me or under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering."

Andrea Harth, P.E., P.T.O.E.

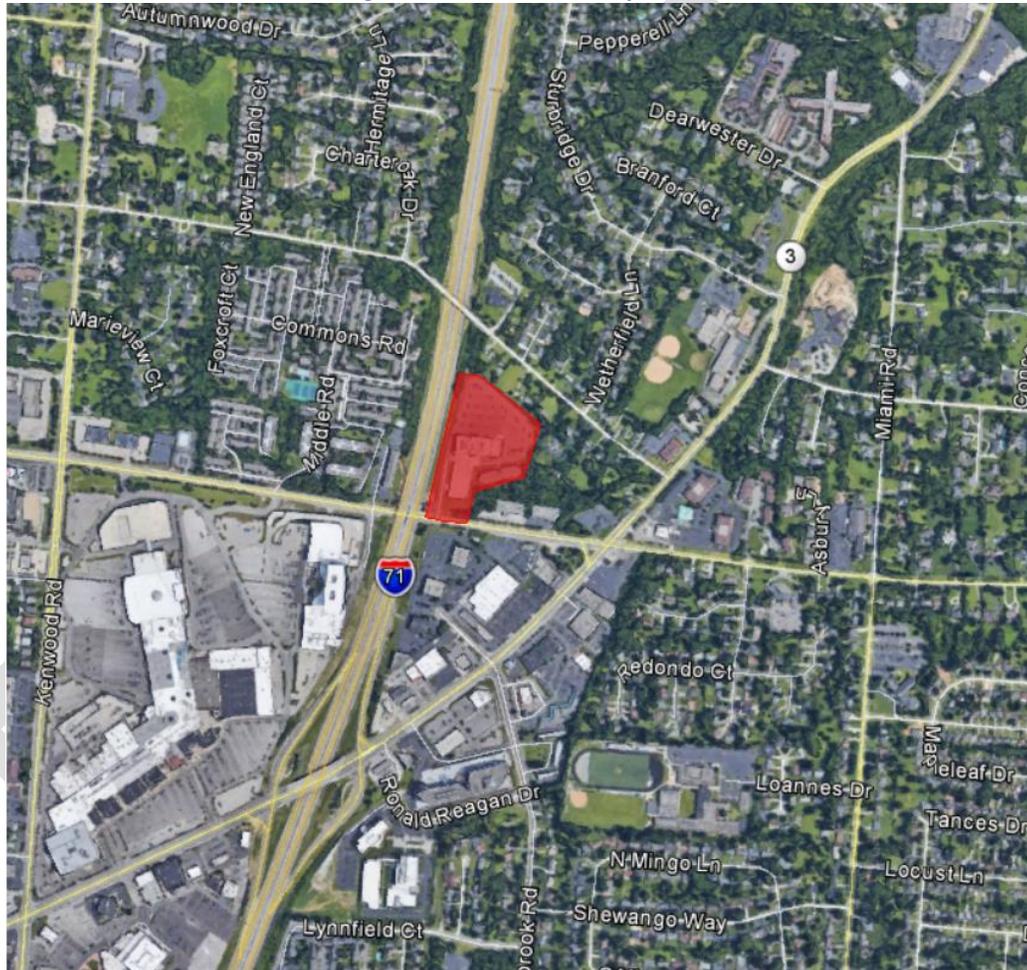
Ohio Registration #74335

TEC Engineering, Inc.

1. Introduction

TEC Engineering Inc. was retained by Kubicki Real Estate Partners to conduct a Traffic Impact Study for a proposed development on along Northcreek Drive in Sycamore Township, Ohio. The development will be located on the north side of the existing parking lot near the Tri-Health building, northeast of the Galbraith Road and Northcreek Drive intersection.

Figure 1.1: Location Map



General Layout

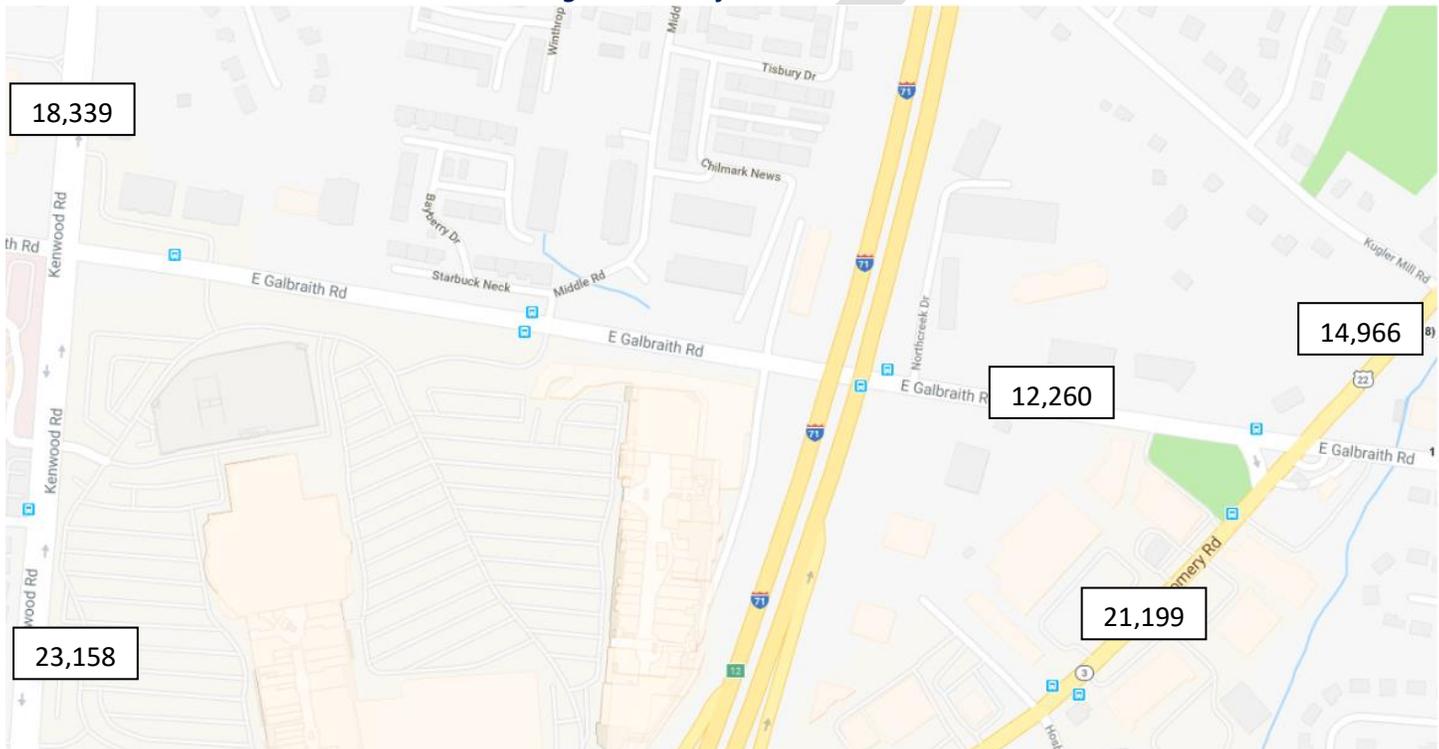
The proposed office building will be located in the northern portion of the existing Tri-Health office building site, east of Northcreek Drive in Sycamore Township, Ohio. Northcreek Road is a north-south road that intersects with Galbraith Road. Galbraith Road is a 2-lane road with a center two-way left-turn lane and classified as a minor arterial with a posted speed limit of 35 MPH within the study area. Northcreek Drive is a 2-lane local road.

Other prominent roadways within the project area are Montgomery Road to the east and Kenwood Road to the west. Montgomery Road (US 22) varies in width and is a principal arterial with a posted speed limit of 40 MPH within the study area. Kenwood is a 4-lane road with a center two-way left-turn lane that is classified as a minor arterial with a posted speed limit of 35 within the project area.

Kenwood Road provides access to I-71 and SR-126. Montgomery Road also provides access to I-71. There is a large scale commercial development to the west of the project site (Kenwood Towne Centre).

Below are results for Annual Average Daily Traffic (AADT).

Figure 2.2: Project Area AADT



In total, there are five signalized intersections in the Study Area:

- Kenwood Road at Galbraith Road
- Galbraith Road at Kenwood Collection (west) – Not Included in Analysis
- Galbraith Road at Kenwood Collection (east)
- Galbraith Road at Northcreek Drive
- Galbraith Road at Montgomery Road

Proposed Site

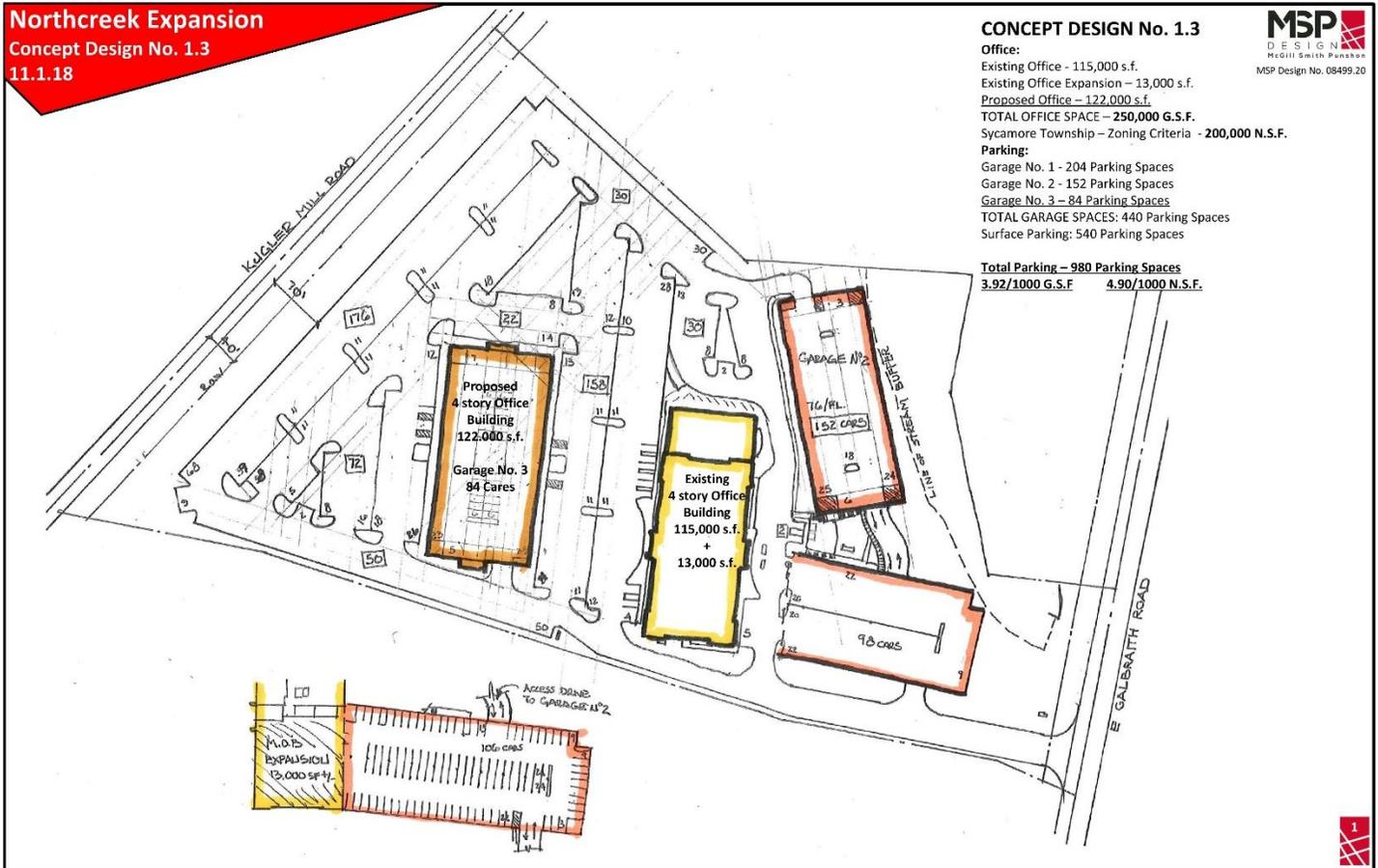
A proposed site plan can be seen in *Figure 1.3*. The existing Tri-Health building will consist of 13,000 sq ft of office expansion onto the already existing 115,000 sq ft area of office building. The existing office building (50,000 sf) on the south side of the property will be replaced with a parking garage. On the north

side of the property, a 4-story office building will be constructed consisting of 122,000 sf of area. Parking will also be reconfigured as part of this development.

The site can be accessed via Northcreek Drive which intersects Galbraith Road to form a signalized intersection.

A full size version of the site plan is provided in *Appendix A*.

Figure 1.3: Proposed Site



2. Background Traffic

TEC completed manual turning movement counts at 4 signalized intersections in the study area. Counts were completed on Wednesday, March 20, 2019. The peak hours were determined to be 7:30-8:30 AM and 4:30-5:30 PM.

Since the existing office building on the southern side of the project site will be removed as part of this development, trips to and from that site were removed for the “Build” scenario. To determine the trips to be removed, a 2013 study was used. This study was a Traffic Impact Study performed by TEC Engineering for the development of the Tri-Health medical office building, which is currently on the site. The development analyzed in the 2013 study included removing 2 of the 3 buildings on the site to construct the Tri-Health building. This included removing 50,000 sq ft (two buildings) of office building and having one office building (50,000 sq ft) remain. The remaining building is to be removed in this current development. Turning movement counts were performed at the original site in 2013. Since half of the office building area (50,000 sq ft of the original 100,000 sq ft) was removed during the original development, it is assumed half of the trips from the 2013 turning movement are associated with the office building that is to be removed in this 2019 study. Therefore, to account for the removal of this building, trips to and from the office building will be removed for “Build” scenarios. *Figure 2.1* provides an aerial image of the changes in the project site between 2013 and 2019. *Figure 2.2-3* displays volumes associated with the office building on the southern portion of the project site which are to be removed in the “Build” scenarios.

Figure 2.1: 2013 and 2019 Existing Site

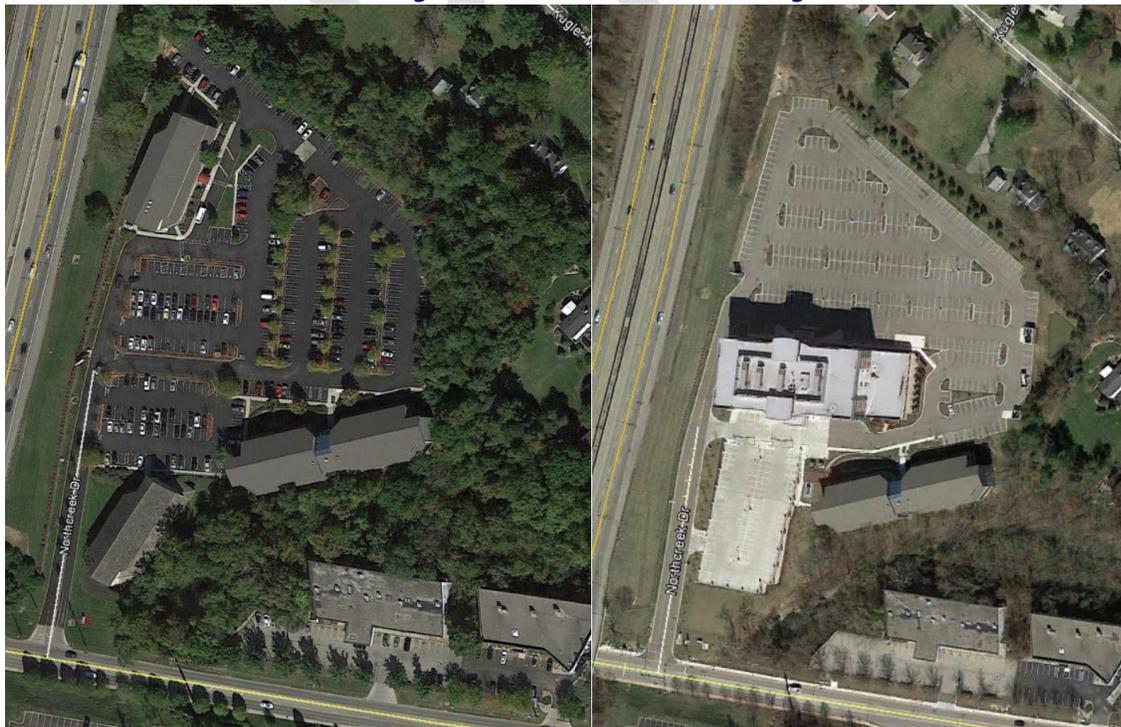


Figure 2.2: AM Office Building Volumes to be Removed

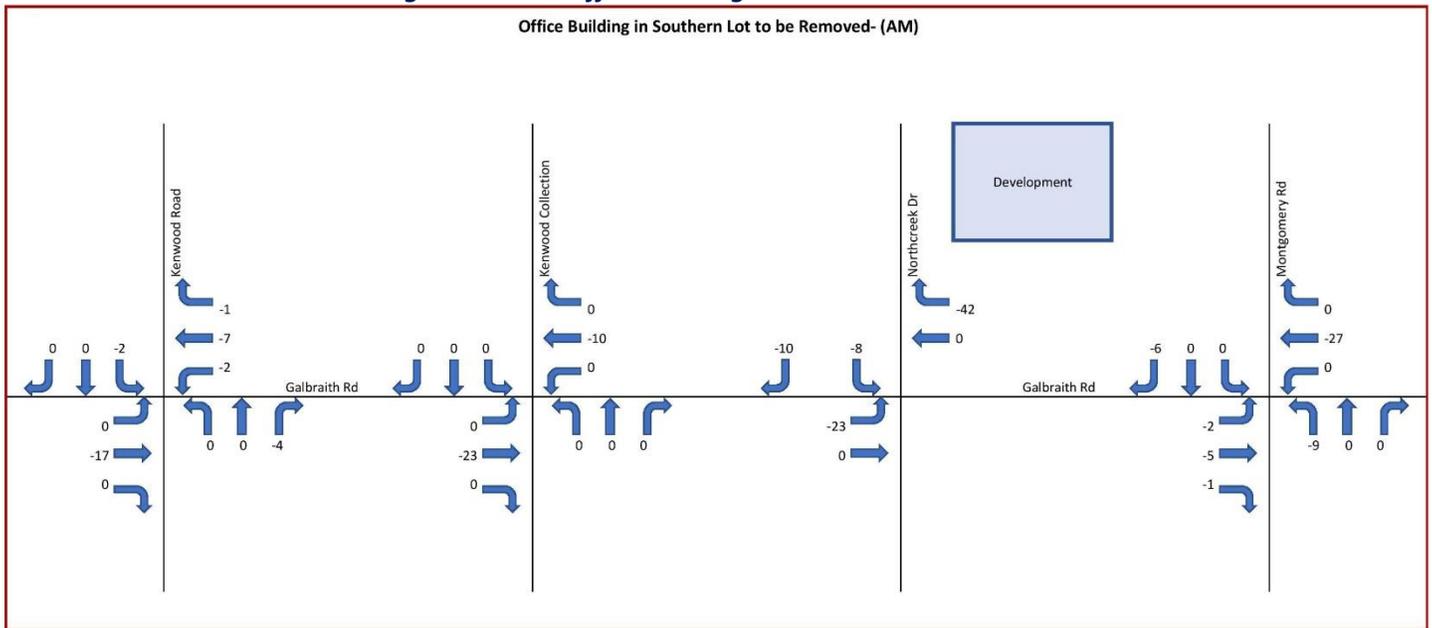
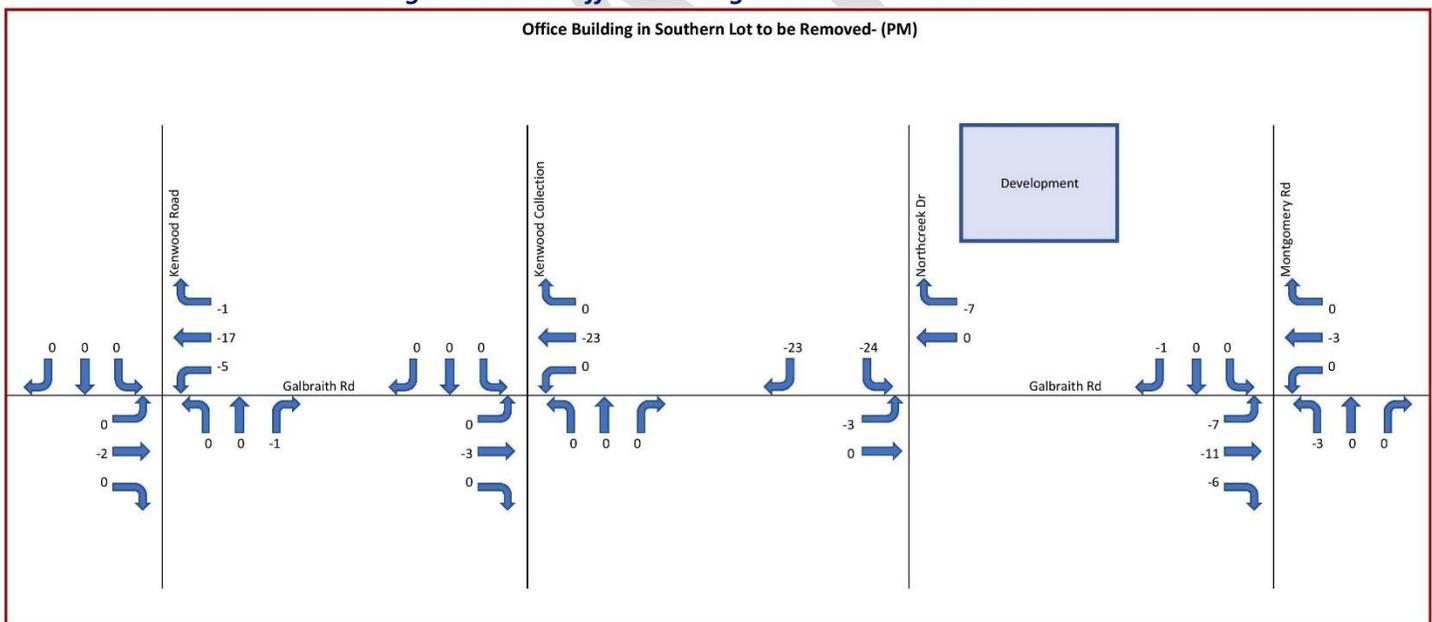


Figure 2.3: PM Office Building Volumes to be Removed



A 1% growth rate was applied to the existing volumes to produce the “No Build” 2021 and 2031 AM and PM volumes. The “No Build” volume diagrams can be found in this section and “Build” volumes are shown in *Section 4* of this report. Turning movement counts can be found in *Appendix B*.

Figure 2.4: AM No Build 2021

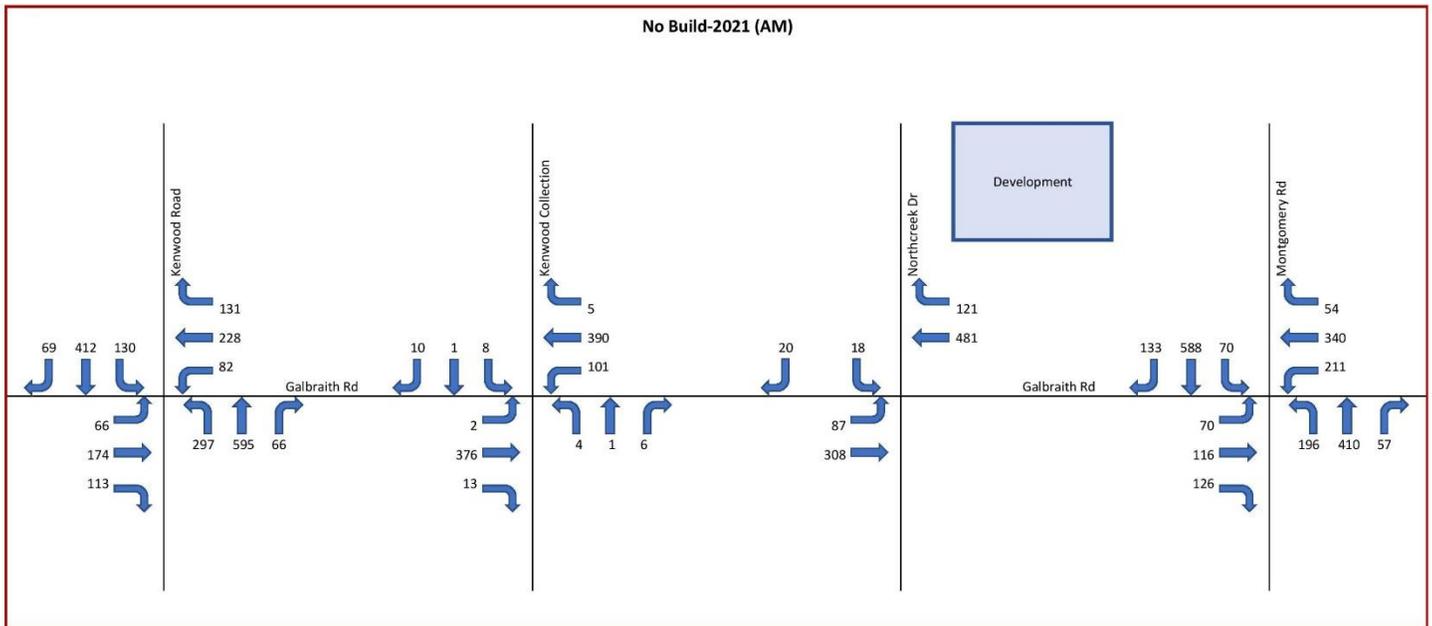


Figure 2.5: PM No Build 2021

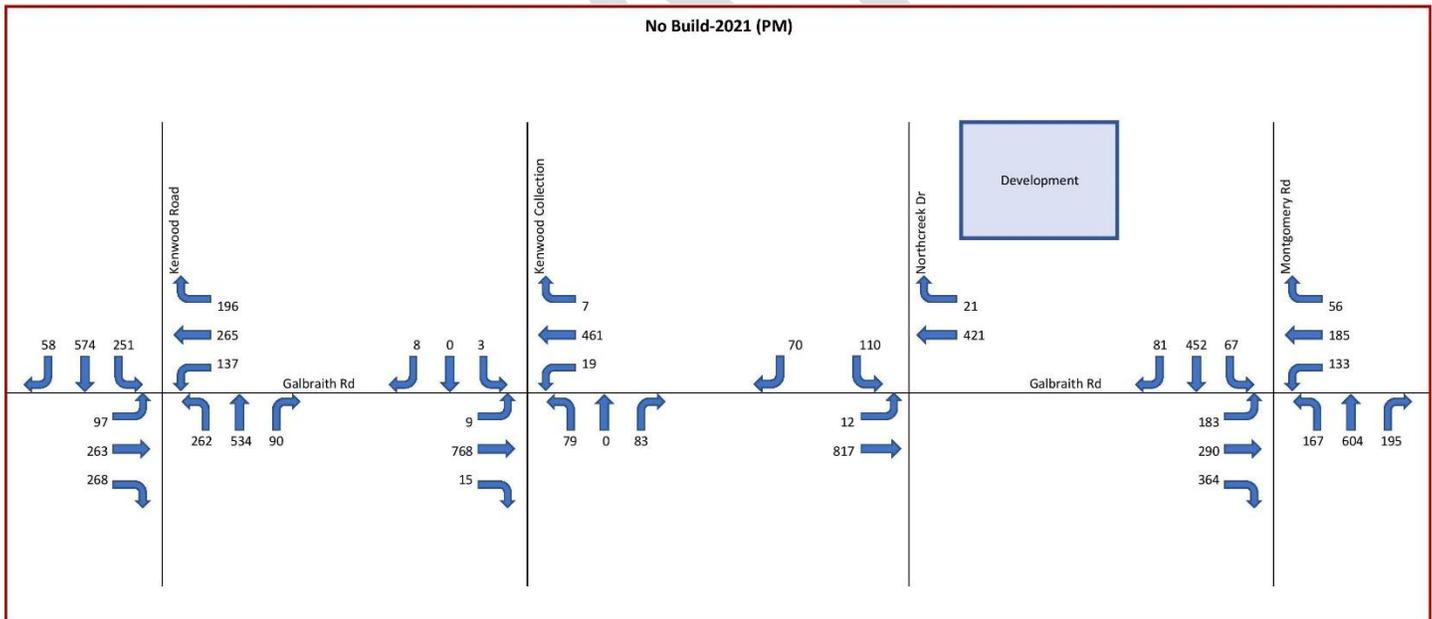


Figure 2.6: AM No Build 2031

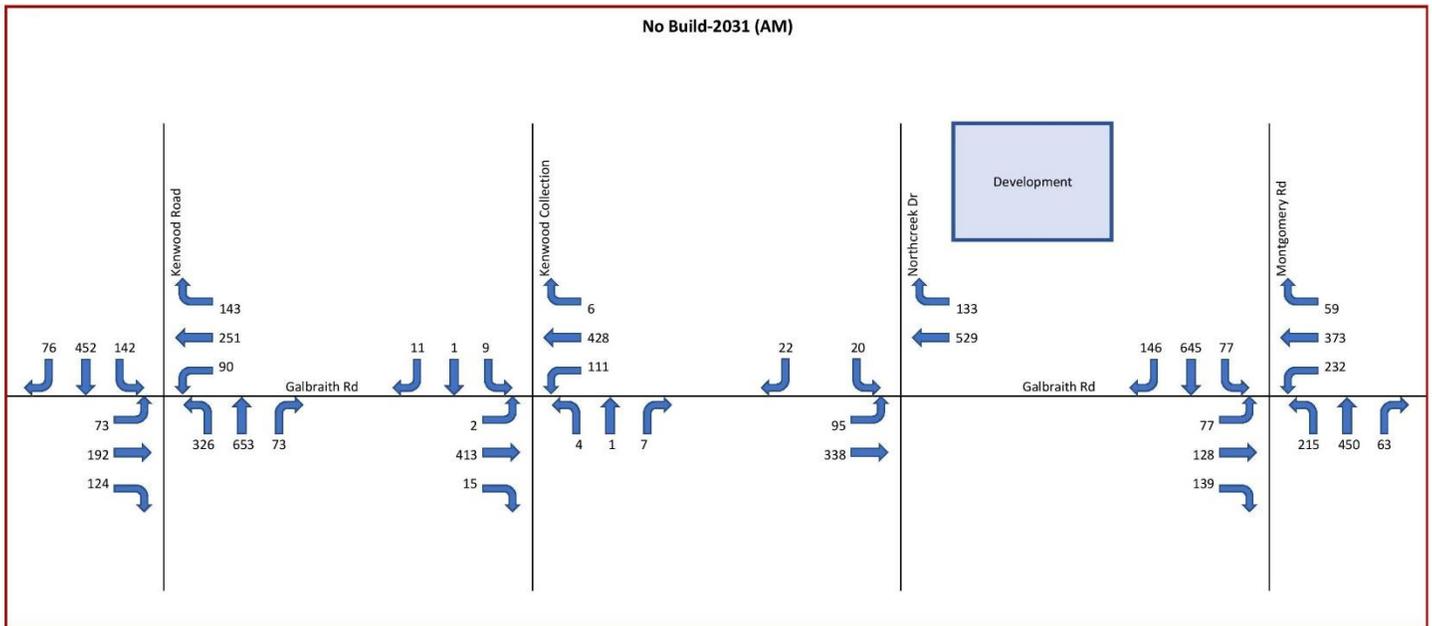
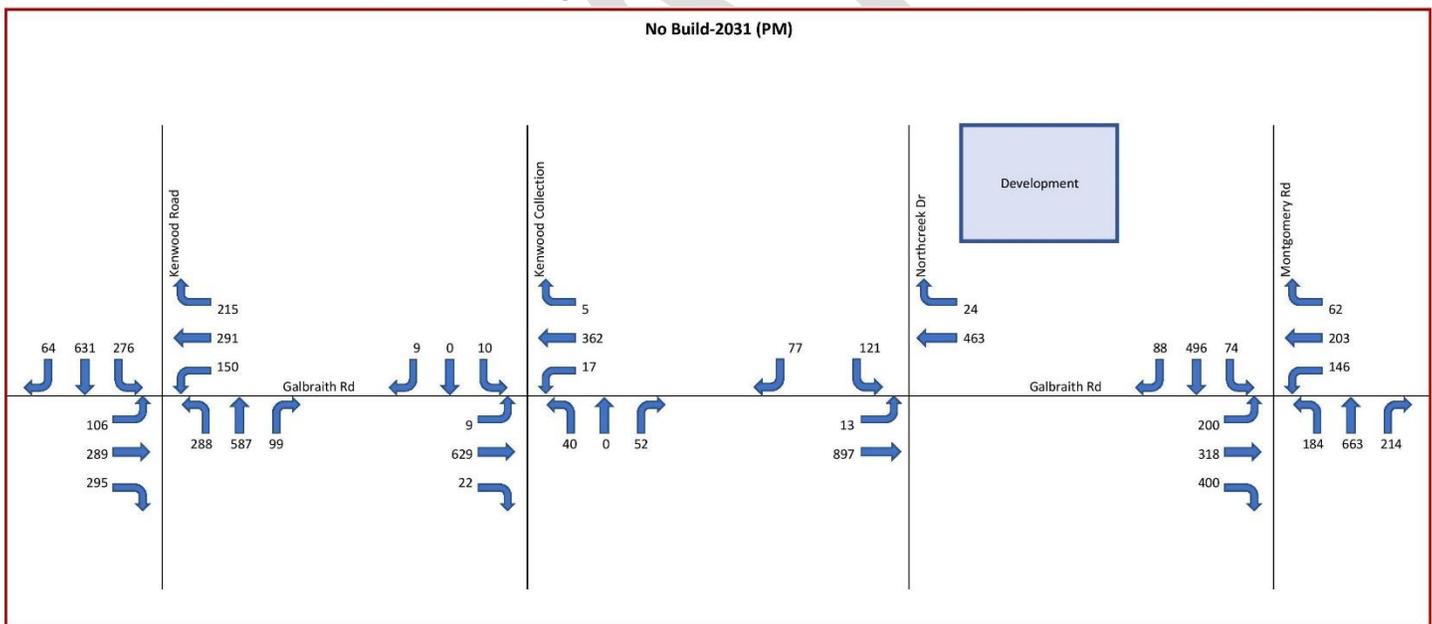


Figure 2.7: PM No Build 2031



3. Generated Traffic

Trips for the proposed development were generated based on details provided by the developer in conjunction with the *Institute of Transportation Engineers (ITE) Trip Generation Manual Volume 10*. This Handbook is the most widely accepted publication for projecting traffic volumes. Volume projections are based on specifics of the site usage. The trips generated by the proposed development site were projected using the trip generation rates and equations provided in the handbook. The land use that was used in this analysis was General Office Building (Land Use 710).

According to the *ITE Trip Generation Manual*, General Office Building (Land Use 710) is described as “a general office building that houses multiple tenants; it is a location where affairs of businesses, commercial or industrial organizations, or professional persons or firms are conducted. An office building or buildings may contain a mixture of tenants including professional services, insurance companies, investment brokers, and tenant services, such as a bank or savings and loan institution, a restaurant, or cafeteria and service retail facilities.”

The trip generation for each peak hour can be found in *Table 3.1*

Table 3.1: Peak Hour Trip Generation

Description	Land Use	SF	Unit	# of Units	AM Trips			PM Trips		
					Total	Enter	Exit	Total	Enter	Exit
Proposed Office Building	710 - General Office Building	122,000	1,000 Sq Ft	122	141	121	20	138	22	116
Existing Office Expansion	710 - General Office Building	13,000	1,000 Sq Ft	13	39	34	5	16	3	13
Total:		135,000	1,000 Sq Ft	135	180	155	25	154	25	129

4. Trip Distribution

Existing traffic volume distribution was utilized when determining distribution for the generation trips. TEC analyzed trips distributed along Galbraith Road to Kenwood Road to the west and Montgomery Road to the east. The AM and PM distribution percentages and volumes are presented in the following figures. These figures are also provided in *Appendix C*.

Figure 4.1: AM Generated Trip Distribution %

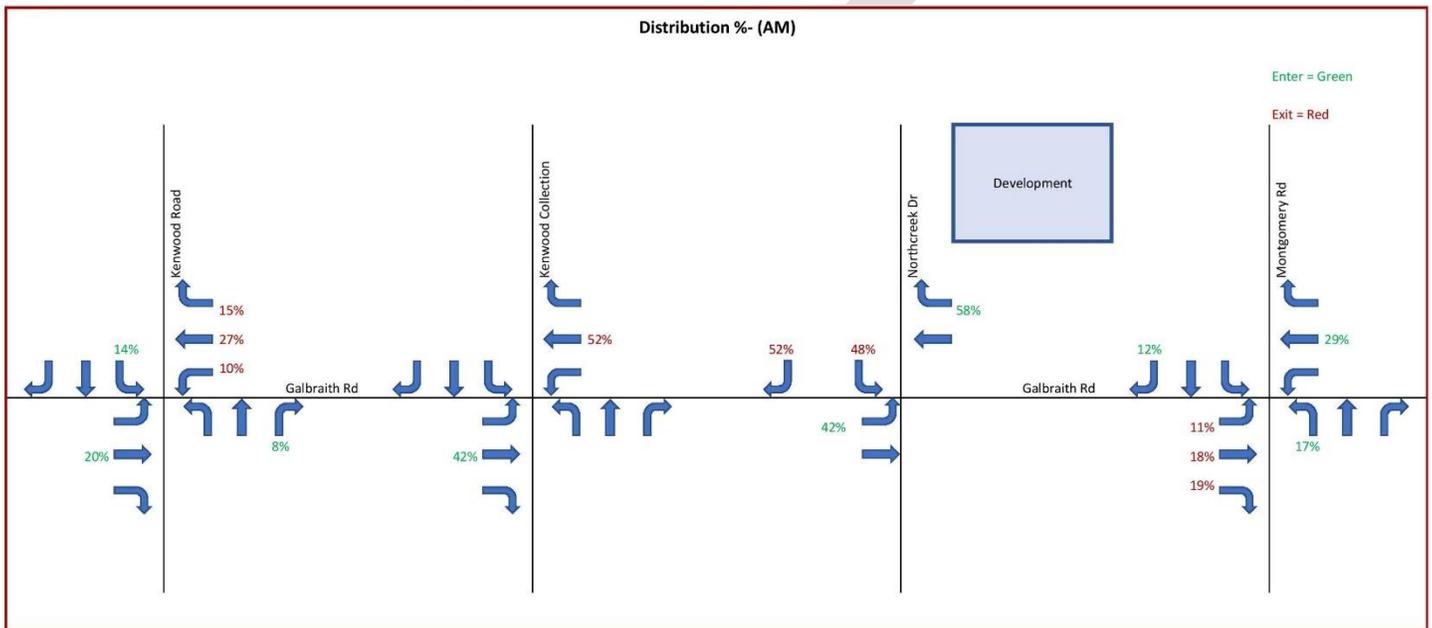


Figure 4.2: PM Generated Trip Distribution %

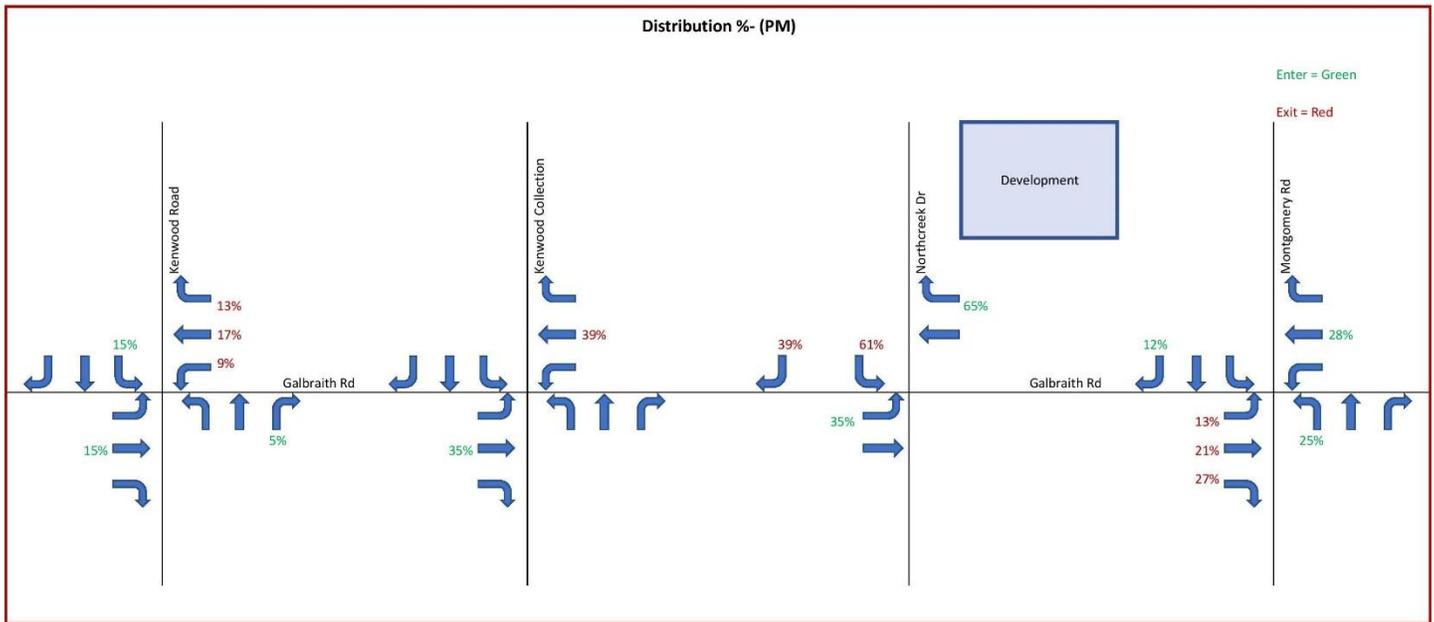


Figure 4.3: AM Generated Trip Distribution Volume

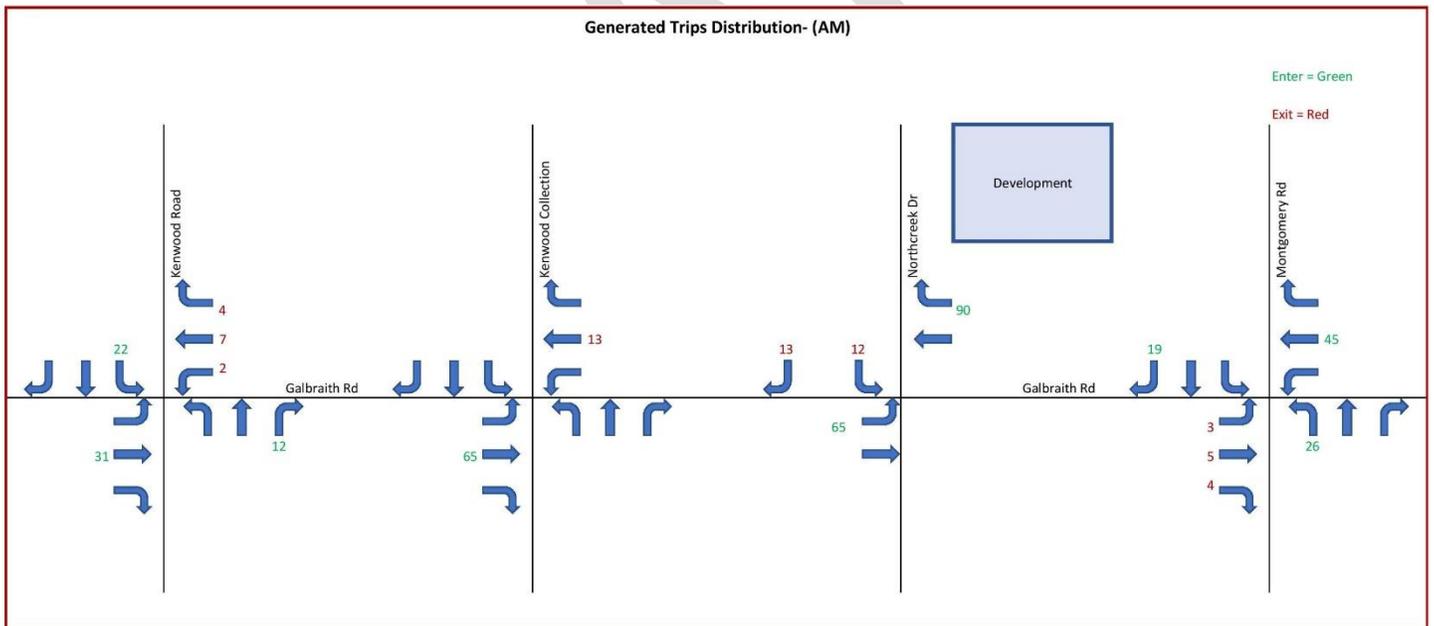
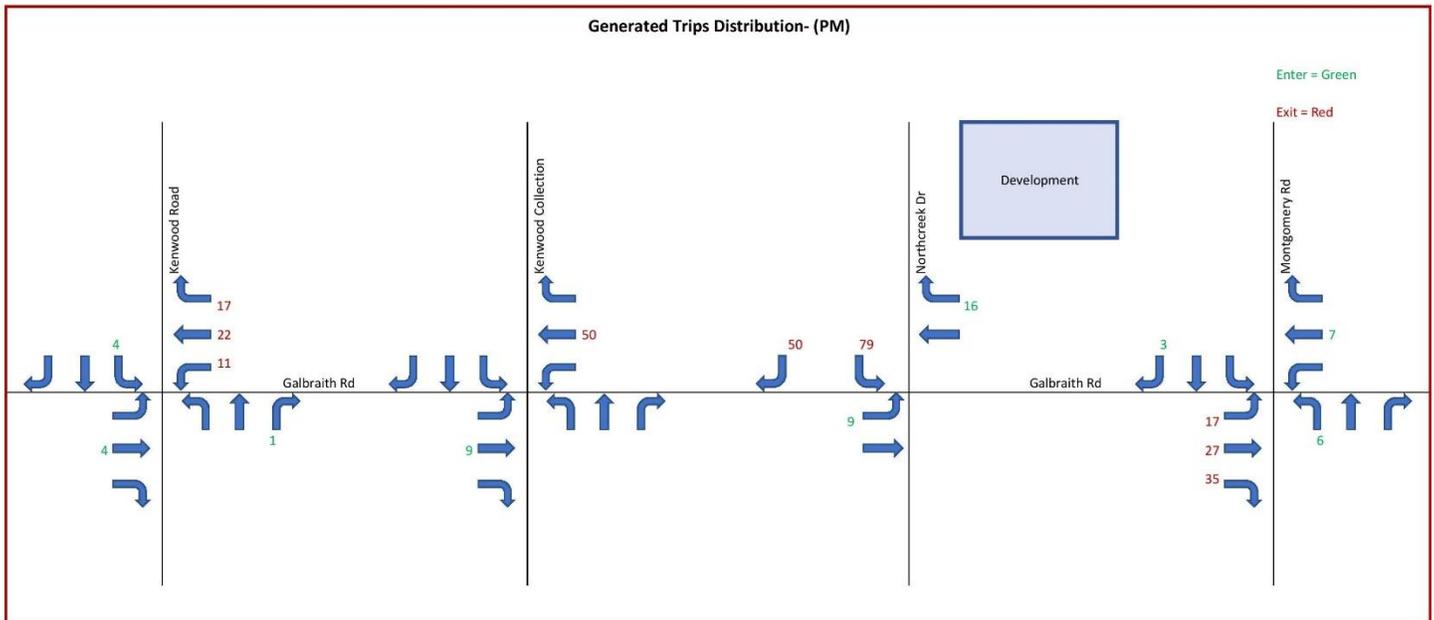


Figure 4.4: PM Generated Trip Distribution Volume



As shown in the previous figures, generated trips were distributed throughout the project areas. To determine the “Build” volumes for 2021 and 2031, the “Generated Trips” were combined with the “No Build” volumes. The trips to and from the office building that is to be removed were removed from the “Build” scenarios. The following figures present the 2021 and 2031 “Build” scenarios.

Figure 4.5: AM Build 2021

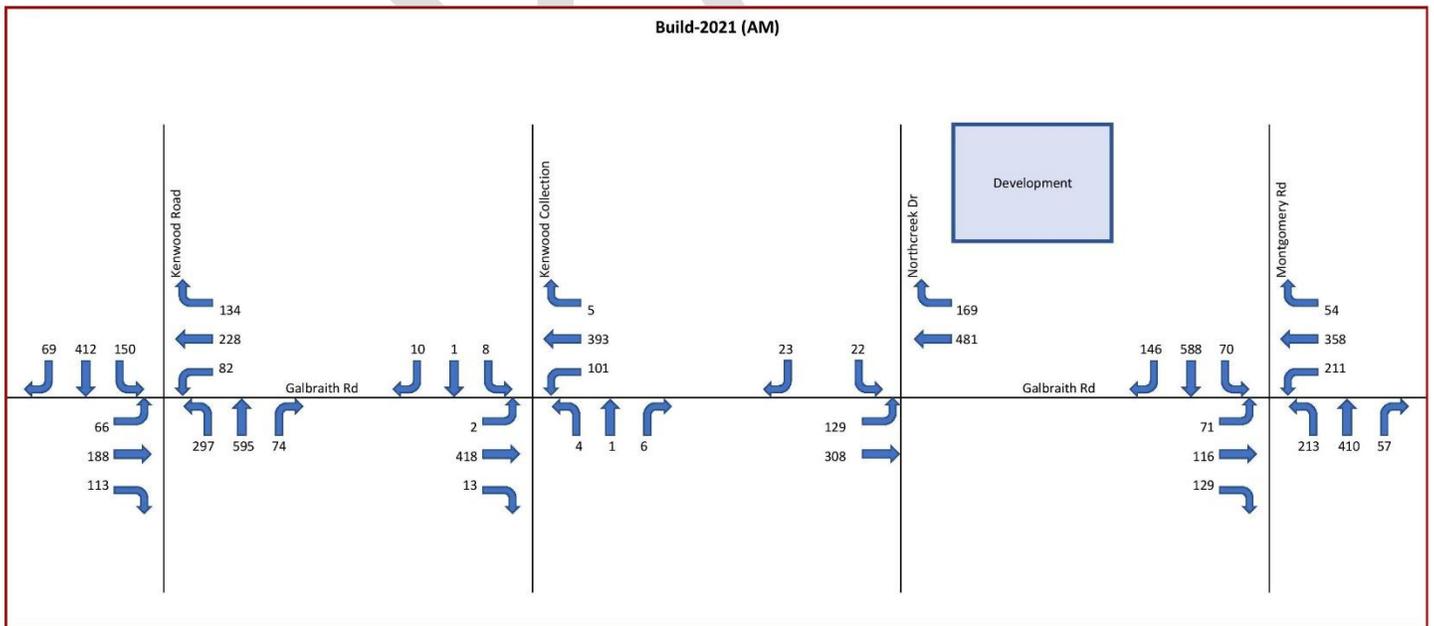


Figure 4.6: PM Build 2021

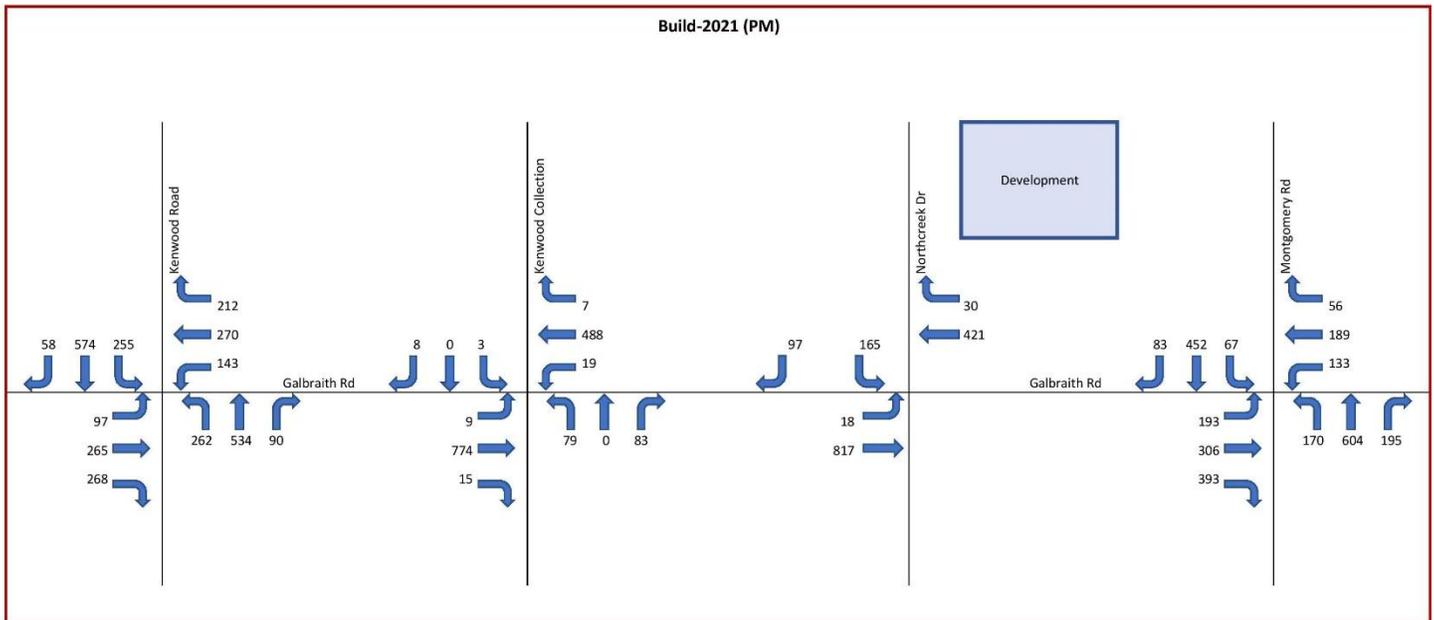


Figure 4.7: AM Build 2031

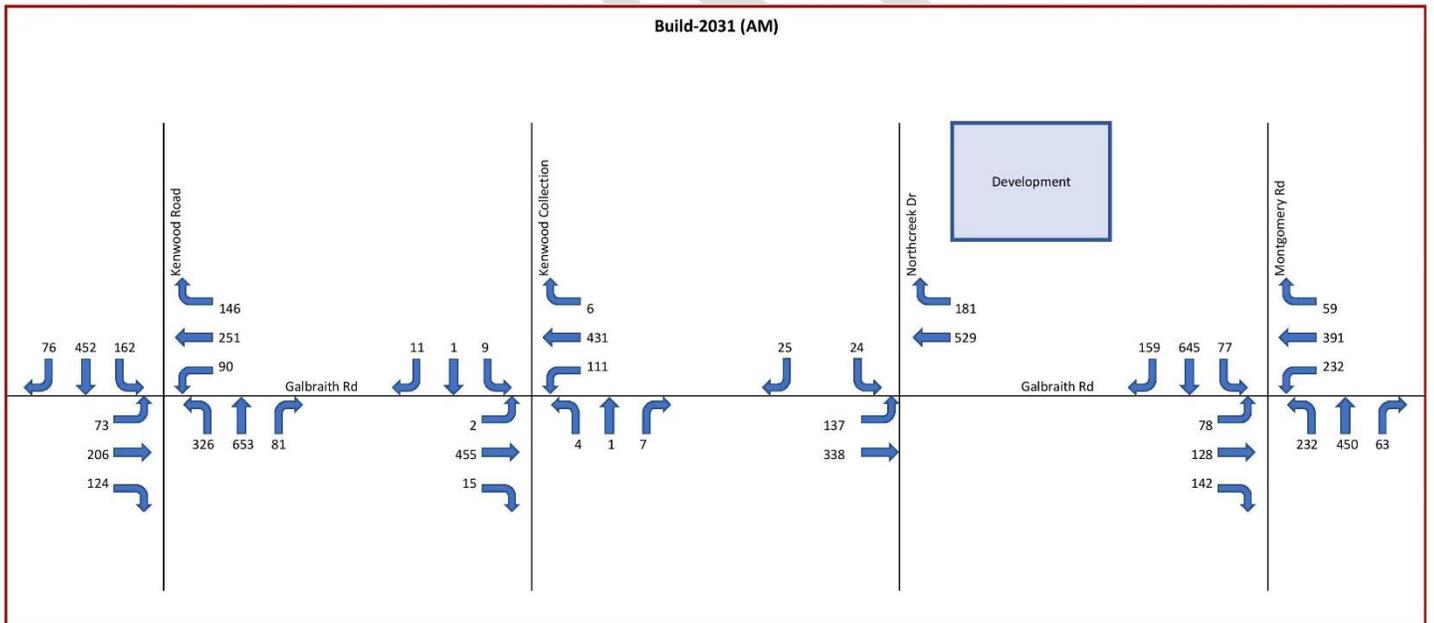
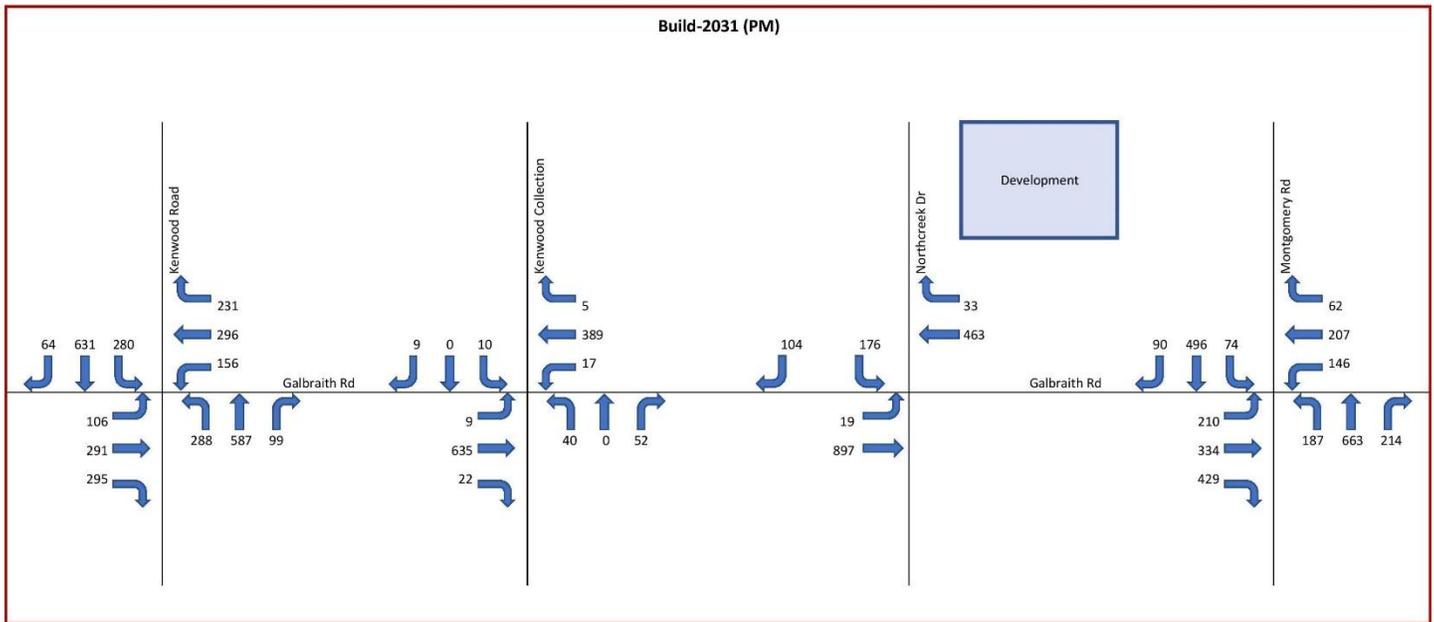


Figure 4.8: PM Build 2031



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5. Capacity Analysis

To determine any improvements necessary to accommodate the traffic generated by the proposed development, the following scenarios were compared and analyzed for all scenarios:

- 2021 AM/PM Peak No Build/Build
2031 AM/PM Peak No Build/Build

Capacity Analysis

TEC used the software program *Synchro* to evaluate each scenario individually. The capacity analysis was performed using the existing conditions for both the “Build” and “No Build” scenarios. The Level of Service (LOS) for the intersection is directly related to the average total delay per vehicle. The total delay is the sum of control delay and queue delay. Control delay is the component of delay caused by the downstream control device and is calculated using the Percentile Delay Method. Queue delay is an analysis of the effects of queues and blocking on short links and short turning bays. LOS is defined in terms of delay and is a measure of driver discomfort and intersection performance with respect to vehicular capacity and quality of service provided to road users. Delay refers to total average stopped delay experienced by motorists at the referenced intersection. The level of service is classified into six different levels, ranging from A to F, and is detailed in *Table 5.1* for signalized intersections. Capacity analysis reports from *Synchro* can be found in *Appendix D*.

Table 5.1: Signalized Intersection Level of Service Classifications

Level of Service	Description	Delay
A	Very low delay	<10 seconds per vehicle
B	Good progression	10-20 seconds per vehicle
C	Limit of acceptable delay	20-35 seconds per vehicle
D	Start of traffic breakdown	35-55 seconds per vehicle
E	High delay	55-80 seconds per vehicle
F	Congested conditions, unacceptable delay	>80 seconds per vehicle

All capacity analysis results can be found in *Table 5.2-3*. All intersections were analyzed using “No Build” conditions and “Build” traffic volumes with existing roadway geometries.

Table 5.2: AM Capacity Analysis Results

Intersection		AM Peak									
		2021					2031				
		No Build		Build		Δ Delay	No Build		Build		Δ Delay
		LOS	Delay	LOS	Delay		LOS	Delay	LOS	Delay	
Galbraith Rd & Kenwood Rd	EB	C	23.2	C	24.2	1.0	C	23.0	C	24.0	1.0
	WB	C	26.6	C	26.5	-0.1	C	26.7	C	26.6	-0.1
	NB	C	20.7	C	20.8	0.1	C	24.3	C	24.4	0.1
	SB	B	18.7	B	18.6	-0.1	C	20.1	C	20.2	0.1
	OVERALL	C	21.7	C	21.8	0.1	C	23.5	C	23.6	0.1
Galbraith Rd & Kenwood Collections	EB	B	11.2	B	11.1	-0.1	B	11.1	B	10.9	-0.2
	WB	A	2.4	A	2.4	0.0	A	2.4	A	2.3	-0.1
	NB	A	9.1	A	9.8	0.7	A	9.0	A	9.7	0.7
	SB	B	16.6	B	17.8	1.2	B	17.6	B	18.8	1.2
	OVERALL	A	6.5	A	6.7	0.2	A	6.5	A	6.6	0.1
Galbraith Rd & Northcreek Dr	EB	A	5.1	A	4.5	-0.6	A	4.3	A	4.3	0.0
	WB	A	5.0	A	5.1	0.1	A	5.3	A	5.3	0.0
	SB	B	16.5	B	17.6	1.1	B	17.5	B	18.6	1.1
	OVERALL	A	5.2	A	5.3	0.1	A	5.4	A	5.5	0.1
Galbraith Rd & Montgomery Rd	EB	B	17.9	B	17.8	-0.1	B	19.1	B	18.8	-0.3
	WB	D	44.6	D	48.1	3.5	D	52.7	D	54.2	1.5
	NB	C	26.5	C	28.5	2.0	C	31.4	D	36.7	5.3
	SB	C	29.6	C	29.8	0.2	C	31.4	C	33.4	2.0
	OVERALL	C	31.0	C	32.6	1.6	D	35.2	D	37.8	2.6

Table 5.3: PM Capacity Analysis Results

Intersection		PM Peak									
		2021					2031				
		No Build		Build		Δ Delay	No Build		Build		Δ Delay
		LOS	Delay	LOS	Delay		LOS	Delay	LOS	Delay	
Galbraith Rd & Kenwood Rd	EB	C	23.1	C	23.0	-0.1	C	22.7	C	22.7	0.0
	WB	C	23.1	C	22.9	-0.2	C	23.0	C	23.0	0.0
	NB	C	24.3	C	24.5	0.2	C	32.7	C	33.0	0.3
	SB	C	25.1	C	25.5	0.4	C	29.5	C	29.9	0.4
	OVERALL	C	24.1	C	24.2	0.1	C	27.7	C	27.9	0.2
Galbraith Rd & Kenwood Collections	EB	B	14.3	B	17.5	3.2	A	8.3	A	9.5	1.2
	WB	A	3.0	A	3.7	0.7	A	2.7	A	3.2	0.5
	NB	B	19.0	C	20.2	1.2	B	14.8	B	15.1	0.3
	SB	A	0.2	A	0.2	0.0	A	0.4	A	0.4	0.0
	OVERALL	B	10.9	B	12.9	2.0	A	6.8	A	7.6	0.8
Galbraith Rd & Northcreek Dr	EB	A	9.3	B	12.1	2.8	A	9.4	B	12.3	2.9
	WB	A	4.4	A	5.1	0.7	A	4.6	A	5.3	0.7
	SB	C	22.5	C	28.3	5.8	C	24.1	C	30.7	6.6
	OVERALL	A	9.4	B	12.8	3.4	A	9.8	B	13.3	3.5
Galbraith Rd & Montgomery Rd	EB	C	29.5	C	30.5	1.0	C	32.2	C	33.2	1.0
	WB	D	38.4	D	37.8	-0.6	D	39.4	D	39.0	-0.4
	NB	C	26.0	C	26.6	0.6	C	29.1	C	29.7	0.6
	SB	C	25.0	C	25.4	0.4	C	26.6	C	27.0	0.4
	OVERALL	C	28.5	C	29.1	0.6	C	30.9	C	31.5	0.6

As shown in the previous table, the “Build” scenarios result in minimal delay increase. The overall intersection LOS does not change between the “No Build” and “Build” scenarios.

Queue Analysis

In reviewing the capacity analysis and possible impacts of the development, it is important to look at the intersection queues to determine if any intersections or movement will be blocked by an adjacent queue. Queue analysis can also be used to determine if existing storage lanes are sufficient. The 95th percentile queue lengths were used for analysis. This length the queue length that has only a 5% chance of being exceeded during the peak hour analyzed.

For this study, *SimTraffic* was used to simulate the traffic flows and determine the expected queue length during the analysis periods. The queue analysis below looks at the queues directly affected by the development. Table 5.4. shows the results of the traffic queue analysis. The *SimTraffic* queue reports are provided in Appendix E.

Table 5.4: AM Queue Analysis (in feet)

Intersection		AM Peak					
		2021			2031		
		No Build	Build	Δ Queue	No Build	Build	Δ Queue
Galbraith Rd & Kenwood Rd	EBL	76	72	-4.0	81	89	8.0
	EBT	152	157	5.0	167	155	-12.0
	EBR	55	62	7.0	61	66	5.0
	WBL	93	88	-5.0	94	90	-4.0
	WBT	176	176	0.0	208	191	-17.0
	WBR	69	71.0	2.0	74	80.0	6.0
	NBL	185	184	-1.0	284	244	-40.0
	NBT	186	184	-2.0	287	215	-72.0
	NBTR	178	185	7.0	245	217	-28.0
	SBL	92	110	18.0	111	113	2.0
	SBT	161	166	5.0	192	184	-8.0
	SBTR	147	140	-7.0	154	158	4.0
Galbraith Rd & Montgomery Rd	EBL	78	73	-5.0	92	86	-6.0
	EBT	122	142	20.0	151	145	-6.0
	WBL	197	199	2.0	190	196	6.0
	WBTR	497	529	32.0	562	568	6.0
	NBL	147	152	5.0	195	232	37.0
	NBT	192	212	20.0	173	292	119.0
	NBTR	135	161	26.0	159	227	68.0
	SBL	83	76	-7.0	86	88	2.0
	SBT	259	264	5.0	297	321	24.0
	SBTR	225	218	-7.0	245	266	21.0
Galbraith Rd & Northcreek Dr	EBL	81	98	17.0	81	111	30.0
	EBT	58	77	19.0	79	68	-11.0
	WBTR	131	156	25.0	145	162	17.0
	SBL	45	44	-1.0	47	51	4.0
	SBR	40	42	2.0	43	42	-1.0
Galbraith Rd & Kenwood Collections	EBL	9	12	3.0	11	11	0.0
	EBT	123	147	24.0	154	172	18.0
	EBR	17	18	1.0	20	17	-3.0
	WBL	45	54	9.0	60	62	2.0
	WBTR	51	60	9.0	68	59	-9.0
	NBL	16	17	1.0	17	17	0.0
	NBTR	15	15	0.0	18	18	0.0
	SBLTR	38	46	8.0	41	40	-1.0

Table 5.5: PM Queue Analysis (in feet)

Intersection		PM Peak					
		2021			2031		
		No Build	Build	Δ Queue	No Build	Build	Δ Queue
Galbraith Rd & Kenwood Rd	EBL	111	99	-12.0	124	106	-18.0
	EBT	209	220	11.0	231	238	7.0
	EBR	118	112	-6.0	130	124	-6.0
	WBL	156	148	-8.0	154	150	-4.0
	WBT	201	213	12.0	229	222	-7.0
	WBR	99	85.0	-14.0	103	106.0	3.0
	NBL	208	185	-23.0	291	321	30.0
	NBT	208	205	-3.0	343	447	104.0
	NBTR	198	203	5.0	302	401	99.0
	SBL	220	238	18.0	230	227	-3.0
	SBT	205	219	14.0	242	246	4.0
SBTR	190	215	25.0	221	240	19.0	
Galbraith Rd & Montgomery Rd	EBL	205	214	9.0	308	218	-90.0
	EBT	285	294	9.0	345	306	-39.0
	WBL	125	156	31.0	170	166	-4.0
	WBTR	221	284	63.0	292	315	23.0
	NBL	154	164	10.0	174	178	4.0
	NBT	260	270	10.0	303	300	-3.0
	NBTR	254	262	8.0	293	297	4.0
	SBL	73	84	11.0	85	86	1.0
	SBT	202	210	8.0	225	228	3.0
	SBTR	148	159	11.0	169	175	6.0
Galbraith Rd & Northcreek Dr	EBL	30	34	4.0	41	45	4.0
	EBT	171	163	-8.0	190	197	7.0
	WBTR	141	127	-14.0	135	137	2.0
	SBL	107	149	42.0	107	137	30.0
	SBR	60	66	6.0	62	64	2.0
Galbraith Rd & Kenwood Collections	EBL	21	25	4.0	22	26	4.0
	EBT	248	262	14.0	180	177	-3.0
	EBR	18	18	0.0	24	22	-2.0
	WBL	34	37	3.0	28	28	0.0
	WBTR	87	93	6.0	68	79	11.0
	NBL	80	88	8.0	50	51	1.0
	NBTR	62	69	7.0	41	43	2.0
	SBLTR	29	30	1.0	43	36	-7.0

As shown in the previous queue tables, most scenarios result in a change less than a car length (25 feet). The greatest change in queue length occurs in the AM peak at the northbound approach for Galbraith

Road and Montgomery Road in the 2031 scenario. Considering the “Build” scenario only adds 17 trips (generated trips minus the office trips to be removed) to the northbound left movement throughout the entire peak hour, the increase is likely due to simulation variations.

Due to the assumption described in the previous paragraph, the queues are not an issue in any scenario.

Turn Lane Warrants

As part of this study, turn lanes at the access point were analyzed. The access to the project site is the signalized intersection of Galbraith Road and Northcreek Drive. Turn lanes are warranted for signalized intersection based upon capacity analysis. The southbound approach has existing turn lanes as well as the eastbound left turn movement. As a result of the capacity analysis, it is determined that a westbound right turn lane is *not warranted*.

The existing turn lanes were analyzed to ensure there is adequate storage length. The eastbound left turn lane is limited by a westbound left turn lane at the Kenwood Collection. However, based on analysis results, the existing turn lanes are sufficient. The following table presents those findings.

Table 5.6: Turn Lane Storage Analysis Results (Galbraith Rd & Northcreek Drive)

Approach	Existing Length	Max 95 th % Queue	Adequate Length?
EBL	150'	98'	Yes
SBL	185'	149'	Yes

6. Conclusion and Recommendations

The purpose of this study was to review existing conditions within the project area of the proposed Northcreek Expansion development and determine any adverse effects to the surrounding transportation network. Trips to and from the proposed development were generated according to the *ITE Trip Generation Manual*. These trips were distributed throughout the project area based on existing volume distribution. Trips were removed from the network to account for the removal of the 50,000 sq ft office building that is currently located on the project site.

The capacity analysis resulted in negligible changes to approach and overall intersection delay. The queue analysis resulted in changes within a car length for most scenarios. The greatest increase in queue length was approximately 4-5 car lengths, which was determined to likely be a variation in simulation results. The proposed development adds approximately 0.5 cars/cycle to each intersection, which is a negligible.

Based upon the analysis presented in this Traffic Impact Study, there are no recommended changes to be made to the existing transportation network as a result of the proposed Northcreek Expansion development.

Appendix A – Site Plan

Northcreek Expansion

Concept Design No. 1.3

11.1.18

CONCEPT DESIGN No. 1.3

Office:

Existing Office - 115,000 s.f.

Existing Office Expansion - 13,000 s.f.

Proposed Office - 122,000 s.f.

TOTAL OFFICE SPACE - 250,000 G.S.F.

Sycamore Township - Zoning Criteria - 200,000 N.S.F.

Parking:

Garage No. 1 - 204 Parking Spaces

Garage No. 2 - 152 Parking Spaces

Garage No. 3 - 84 Parking Spaces

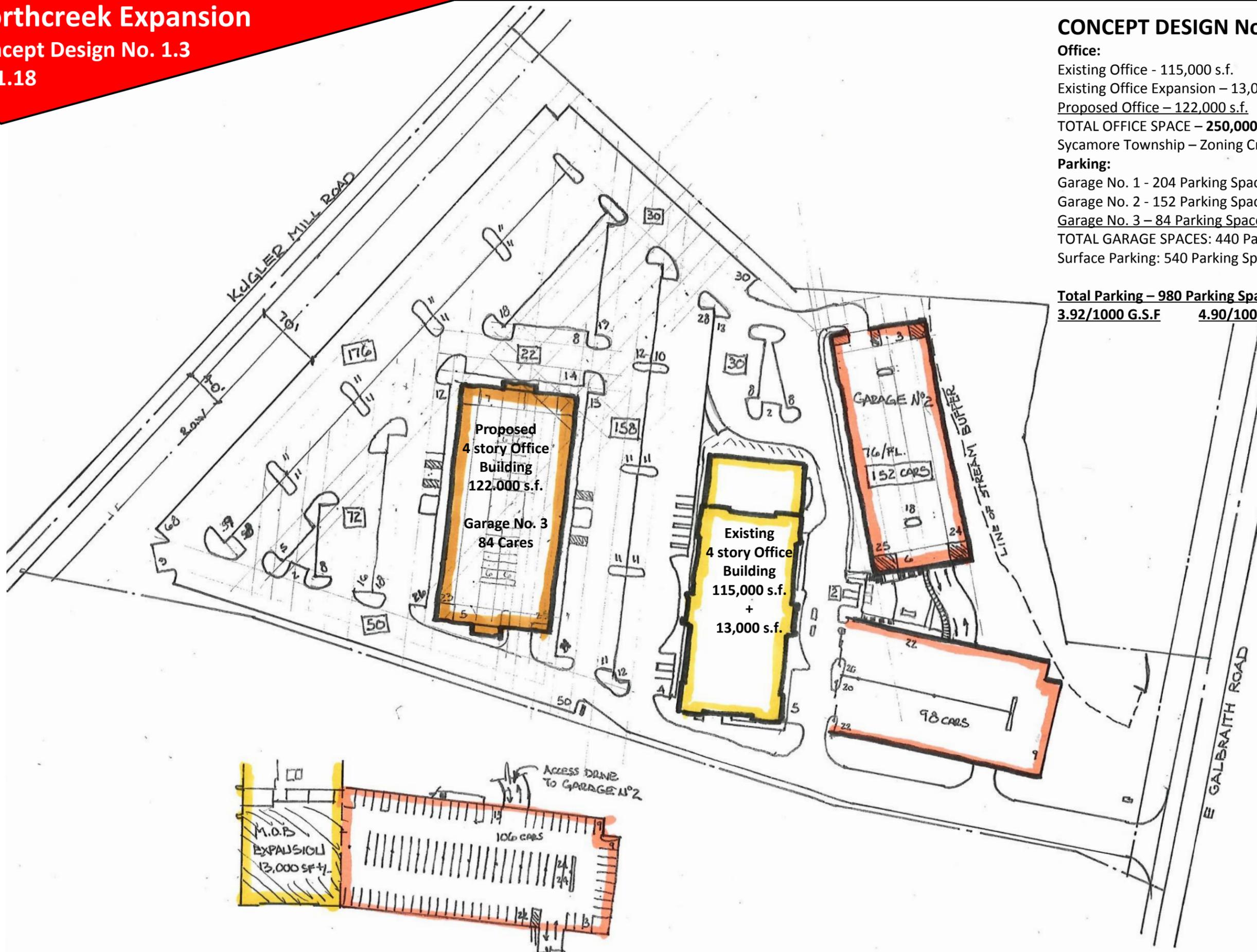
TOTAL GARAGE SPACES: 440 Parking Spaces

Surface Parking: 540 Parking Spaces

Total Parking - 980 Parking Spaces

3.92/1000 G.S.F

4.90/1000 N.S.F.



Appendix B – Turning Movement Counts

E Galbraith Rd & Kenwood Collection
Specific Hour Data

TEC Engineering, Inc.
Turning Movement Counts
7288 Central Parke Blvd
Mason, OH 45040
513-771-8828

Wednesday
3/20/2019

Peak Hour Start 1

		E Galbraith RdEastbound				E Galbraith RdWestbound				Kenwood CollectionNorthbound				Kenwood CollectionSouthbound				
		Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Int Total
7:30 AM	7:30 AM	0	79	1	80	11	94	0	105	0	0	0	0	3	0	2	5	190
	7:45 AM	0	114	2	116	27	110	3	140	2	0	2	4	4	0	2	6	266
	8:00 AM	1	87	6	94	28	81	1	110	1	0	3	4	0	0	1	1	209
	8:15 AM	1	89	4	94	33	97	1	131	1	1	1	3	1	1	5	7	235
Total		2	369	13	384	99	382	5	486	4	1	6	11	8	1	10	19	900
PHF		0.5	0.8092105	0.5416667	0.8275862	0.75	0.8681818	0.4166667	0.8678571	0.5	0.25	0.5	0.6875	0.5	0.25	0.5	0.6785714	0.8458647
HV%		0.0%	0.8%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%

Peak Hour Start 2

		E Galbraith RdEastbound				E Galbraith RdWestbound				Kenwood CollectionNorthbound				Kenwood CollectionSouthbound				
		Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Int Total
4:30 PM	4:30 PM	1	171	6	178	6	110	2	118	16	0	14	30	0	0	0	0	326
	4:45 PM	1	153	3	157	4	119	2	125	8	0	9	17	0	0	3	3	302
	5:00 PM	2	243	1	246	5	127	1	133	34	0	45	79	0	0	2	2	460
	5:15 PM	5	186	5	196	4	96	2	102	19	0	13	32	3	0	3	6	336
Total		9	753	15	777	19	452	7	478	77	0	81	158	3	0	8	11	1424
PHF		0.45	0.7746914	0.625	0.7896341	0.7916667	0.8897638	0.875	0.8984962	0.5661765	#DIV/0!	0.45	0.5	0.25	#DIV/0!	0.6666667	0.4583333	0.773913
HV%		0.0%	1.1%	6.7%	1.2%	0.0%	0.2%	0.0%	0.2%	1.3%	#DIV/0!	0.0%	0.6%	0.0%	#DIV/0!	0.0%	0.0%	0.8%

Galbraith & Kenwood
Specific Hour Data

TEC Engineering, Inc.
Turning Movement Counts
7288 Central Parke Blvd
Mason, OH 45040
513-771-8828

Wednesday
3/20/2019

Peak Hour Start 1

		E Galbraith RdEastbound				E Galbraith RdWestbound				Kenwood RdNorthbound				Kenwood RdSouthbound				
		Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Int Total
7:30 AM	7:30 AM	12	38	31	81	26	46	29	101	61	146	16	223	33	84	7	124	529
	7:45 AM	18	56	29	103	16	68	43	127	75	167	9	251	30	133	11	174	655
	8:00 AM	17	43	25	85	20	53	29	102	88	131	18	237	38	93	18	149	573
	8:15 AM	18	34	26	78	18	57	27	102	67	139	22	228	26	94	32	152	560
Total		65	171	111	347	80	224	128	432	291	583	65	939	127	404	68	599	2317
PHF		0.9027778	0.7633929	0.8951613	0.842233	0.7692308	0.8235294	0.744186	0.8503937	0.8267045	0.8727545	0.7386364	0.935259	0.8355263	0.7593985	0.53125	0.8606322	0.8843511
HV%		3.1%	6.4%	1.8%	4.3%	3.8%	3.1%	6.3%	4.2%	1.0%	0.7%	9.2%	1.4%	1.6%	1.0%	1.5%	1.2%	2.3%

Peak Hour Start 2

		E Galbraith RdEastbound				E Galbraith RdWestbound				Kenwood RdNorthbound				Kenwood RdSouthbound				
		Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Int Total
4:30 PM	4:30 PM	21	65	72	158	37	66	53	156	58	115	22	195	57	126	11	194	703
	4:45 PM	20	61	66	147	32	70	47	149	55	121	19	195	51	170	11	232	723
	5:00 PM	35	74	69	178	43	76	46	165	71	154	29	254	68	131	20	219	816
	5:15 PM	19	58	56	133	22	48	46	116	73	134	18	225	70	136	15	221	695
Total		95	258	263	616	134	260	192	586	257	524	88	869	246	563	57	866	2937
PHF		0.6785714	0.8716216	0.9131944	0.8651685	0.7790698	0.8552632	0.9056604	0.8878788	0.880137	0.8506494	0.7586207	0.855315	0.8785714	0.8279412	0.7125	0.9331897	0.8998162
HV%		1.1%	0.0%	0.0%	0.2%	2.2%	2.7%	2.1%	2.4%	0.0%	1.1%	0.0%	0.7%	0.0%	0.4%	0.0%	0.2%	0.8%

Galbraith & Montgomery
Specific Hour Data

TEC Engineering, Inc.
Turning Movement Counts
77 West Elmwood Drive
Mason, OH 45040
513-771-8828

Tuesday
1/29/2019

Peak Hour Start 1

		E Galbraith RdEastbound				E Galbraith RdWestbound				MontgomeryNorthbound				MontgomerySouthbound				
		Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Int Total
7:30 AM	7:30 AM	20	29	29	78	62	77	16	155	42	110	6	158	18	143	36	197	588
	7:45 AM	21	23	30	74	48	92	15	155	45	97	12	154	16	144	33	193	576
	8:00 AM	18	19	40	77	56	92	12	160	50	105	13	168	17	160	27	204	609
	8:15 AM	10	43	25	78	41	72	10	123	55	90	25	170	18	129	34	181	552
Total		69	114	124	307	207	333	53	593	192	402	56	650	69	576	130	775	2325
PHF		0.8214286	0.6627907	0.775	0.9839744	0.8346774	0.9048913	0.828125	0.9265625	0.8727273	0.9136364	0.56	0.9558824	0.9583333	0.9	0.9027778	0.9497549	0.9544335
HV%		1.4%	0.0%	0.8%	0.7%	0.5%	0.6%	1.9%	0.7%	1.0%	1.5%	8.9%	2.0%	0.0%	0.2%	4.6%	0.9%	1.1%

Peak Hour Start 2

		E Galbraith RdEastbound				E Galbraith RdWestbound				MontgomeryNorthbound				MontgomerySouthbound				
		Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Int Total
4:30 PM	4:30 PM	47	68	78	193	30	47	13	90	39	134	42	215	13	117	17	147	645
	4:45 PM	36	59	59	154	29	47	11	87	42	151	59	252	20	98	20	138	631
	5:00 PM	47	81	119	247	37	51	14	102	47	166	55	268	14	110	21	145	762
	5:15 PM	49	76	101	226	34	36	17	87	36	141	35	212	19	118	21	158	683
Total		179	284	357	820	130	181	55	366	164	592	191	947	66	443	79	588	2721
PHF		0.9132653	0.8765432	0.75	0.8299595	0.8783784	0.8872549	0.8088235	0.8970588	0.8723404	0.8915663	0.809322	0.8833955	0.825	0.9385593	0.9404762	0.9303797	0.8927165
HV%		2.8%	0.0%	1.1%	1.1%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.4%

Galbraith & Northcreek
Specific Hour Data

TEC Engineering, Inc.
Turning Movement Counts
77 West Elmwood Drive
Mason, OH 45040
513-771-8828

Tuesday
1/29/2019

Peak Hour Start 1

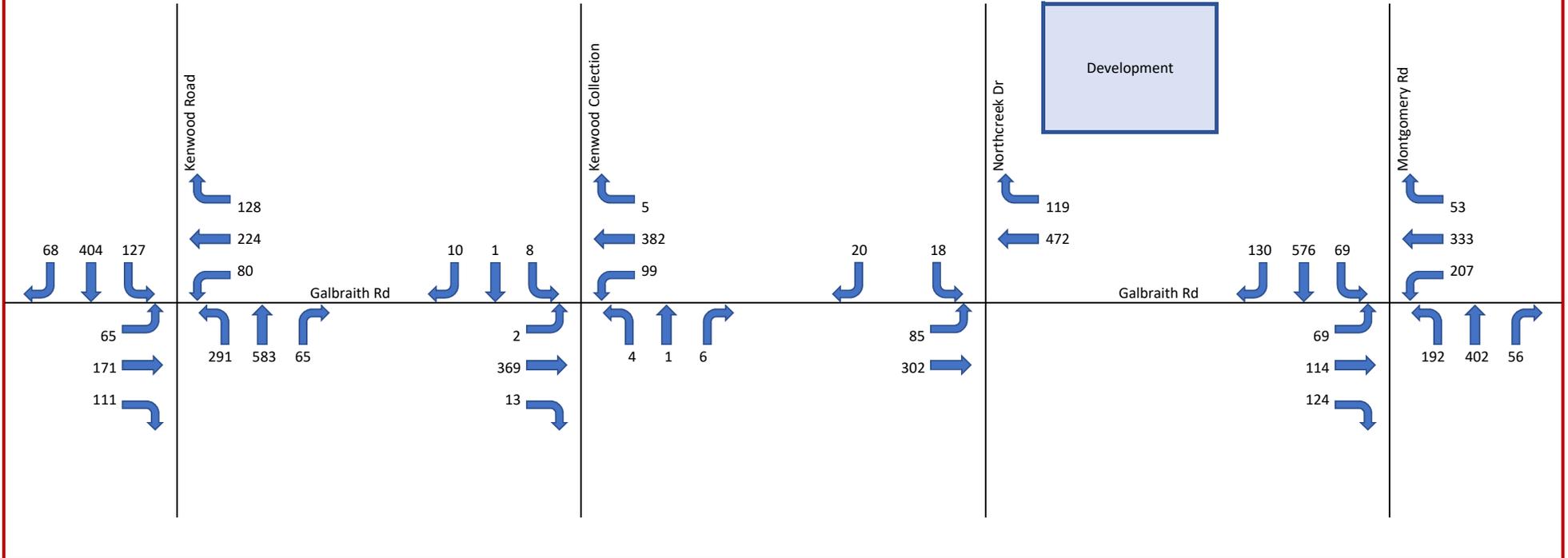
		E Galbraith RdEastbound				E Galbraith RdWestbound				N/ANorthbound				Northcreek RdSouthbound				
		Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Int Total
7:30 AM	7:30 AM	8	72	0	80	0	103	33	136	0	0	0	0	1	0	4	5	221
	7:45 AM	29	90	0	119	0	121	35	156	0	0	0	0	1	0	9	10	285
	8:00 AM	26	73	0	99	0	123	29	152	0	0	0	0	5	0	3	8	259
	8:15 AM	22	67	0	89	0	125	22	147	0	0	0	0	11	0	4	15	251
Total		85	302	0	387	0	472	119	591	0	0	0	0	18	0	20	38	1016
PHF		0.7327586	0.8388889	#DIV/0!	0.8130252	#DIV/0!	0.944	0.85	0.9471154	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.4090909	#DIV/0!	0.5555556	0.6333333	0.8912281
HV%		0.0%	3.6%	#DIV/0!	2.8%	#DIV/0!	1.7%	0.0%	1.4%	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0%	#DIV/0!	0.0%	0.0%	1.9%

Peak Hour Start 2

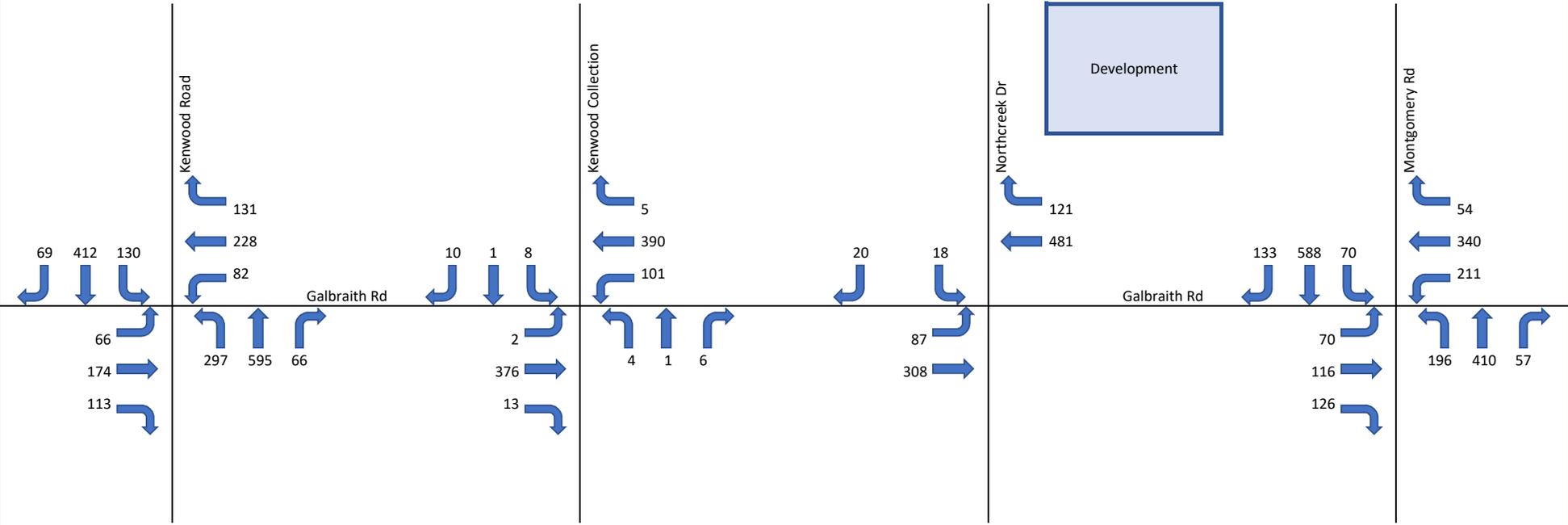
		E Galbraith RdEastbound				E Galbraith RdWestbound				N/ANorthbound				Northcreek RdSouthbound				
		Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Left	Thru	Right	App Total	Int Total
4:30 PM	4:30 PM	7	184	0	191	0	93	9	102	0	0	0	0	37	0	23	60	353
	4:45 PM	1	164	0	165	0	110	4	114	0	0	0	0	22	0	14	36	315
	5:00 PM	2	252	0	254	0	116	6	122	0	0	0	0	30	0	21	51	427
	5:15 PM	2	201	0	203	0	94	2	96	0	0	0	0	19	0	11	30	329

Appendix C – Volume Diagrams

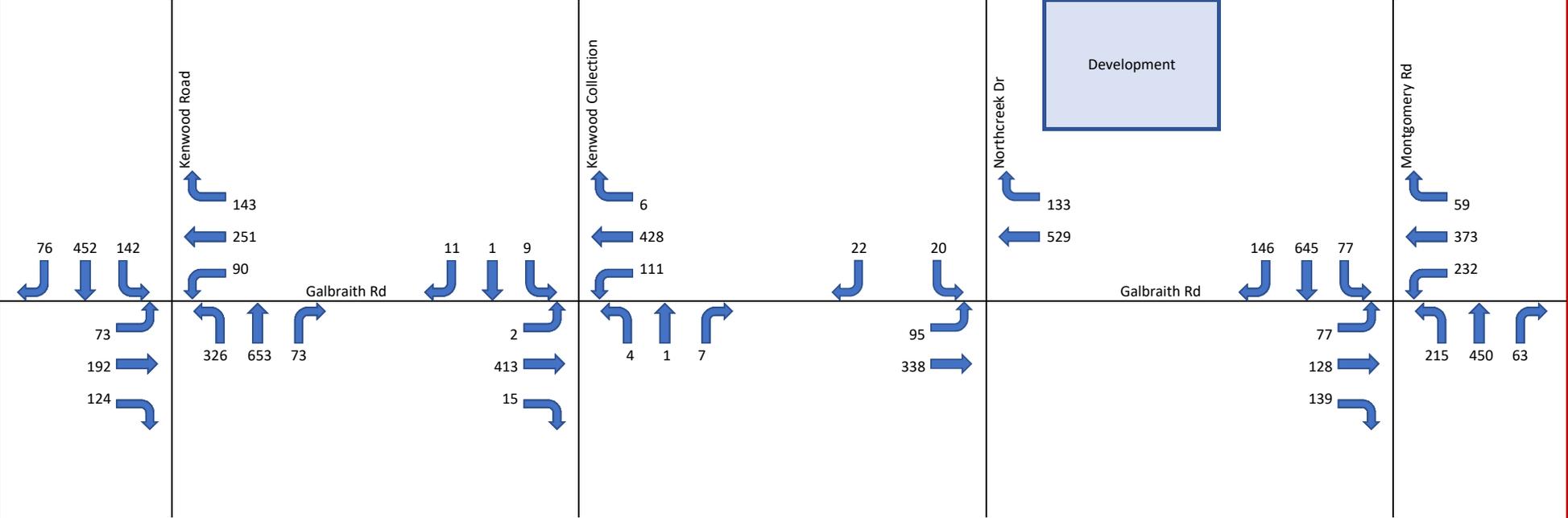
Existing-2019 (AM)



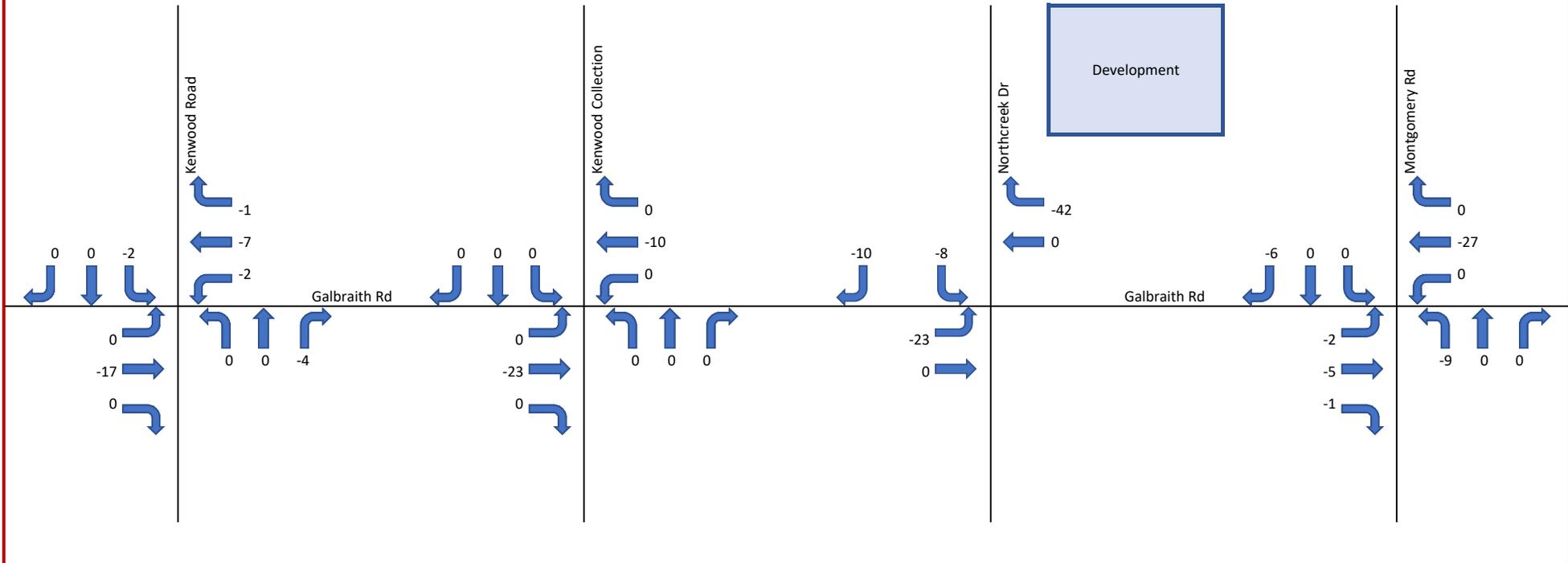
No Build-2021 (AM)



No Build-2031 (AM)



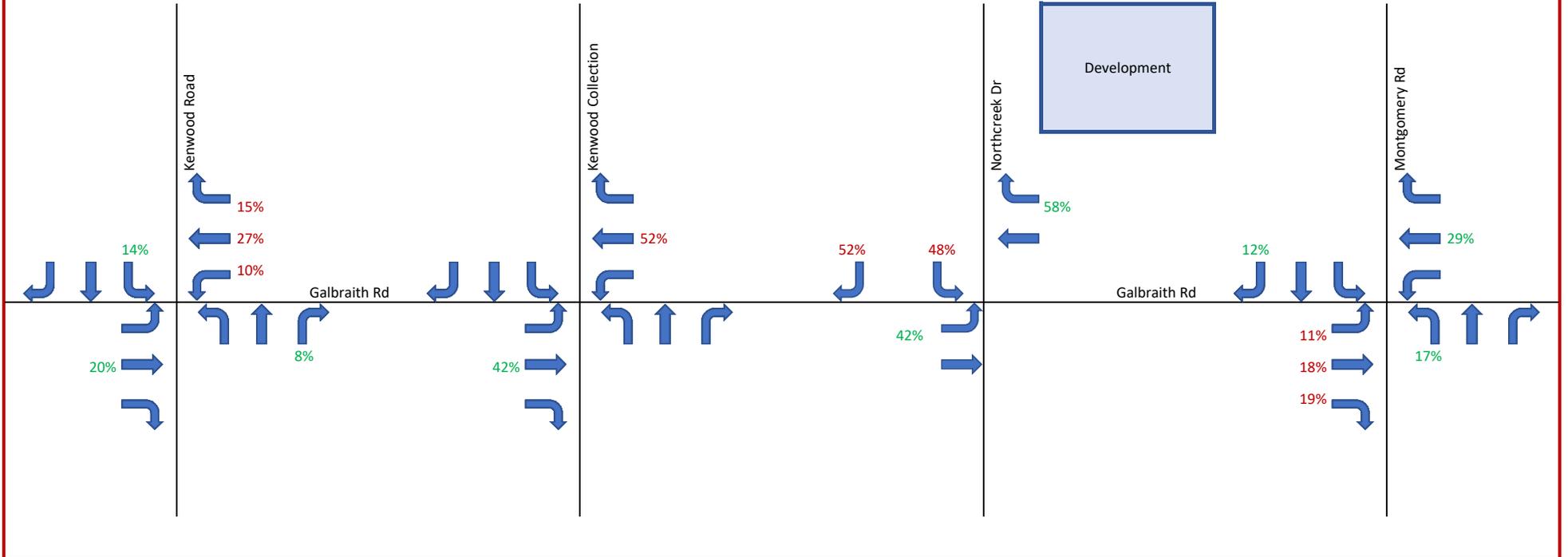
Office Building in Southern Lot to be Removed- (AM)



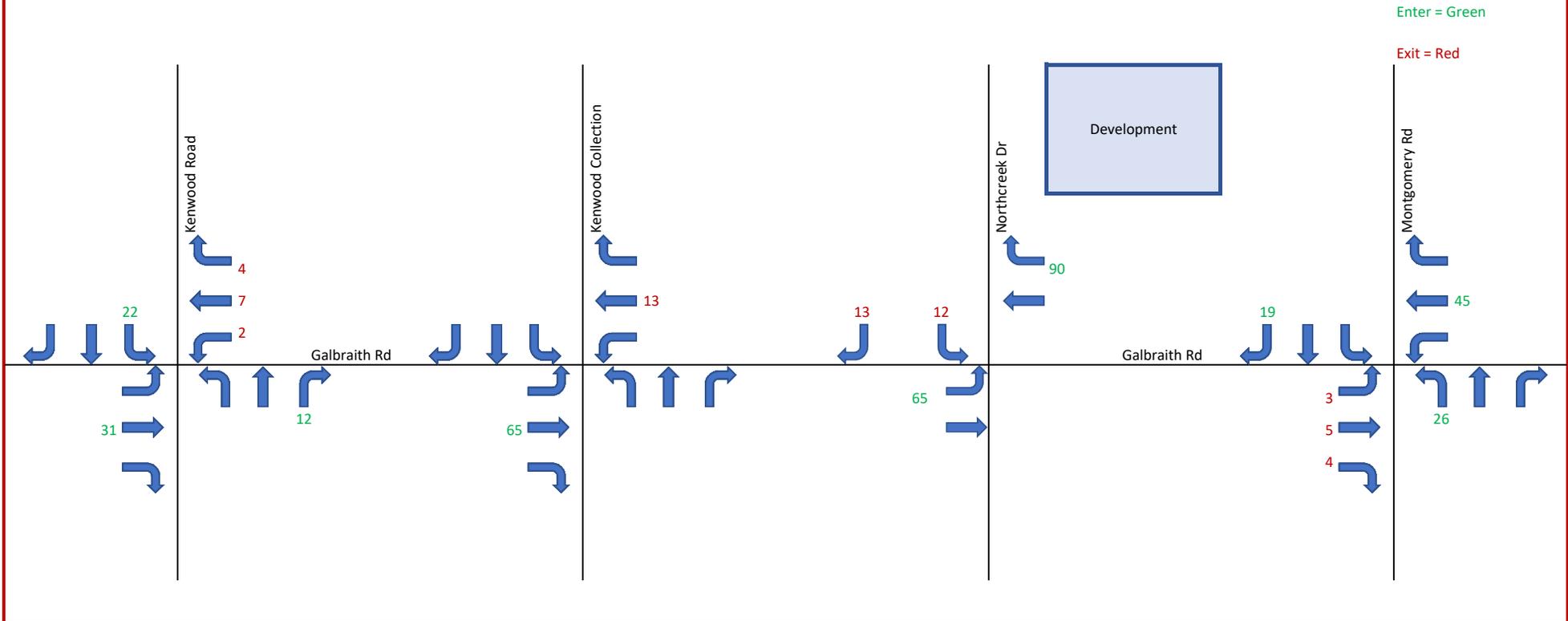
Distribution %- (AM)

Enter = Green

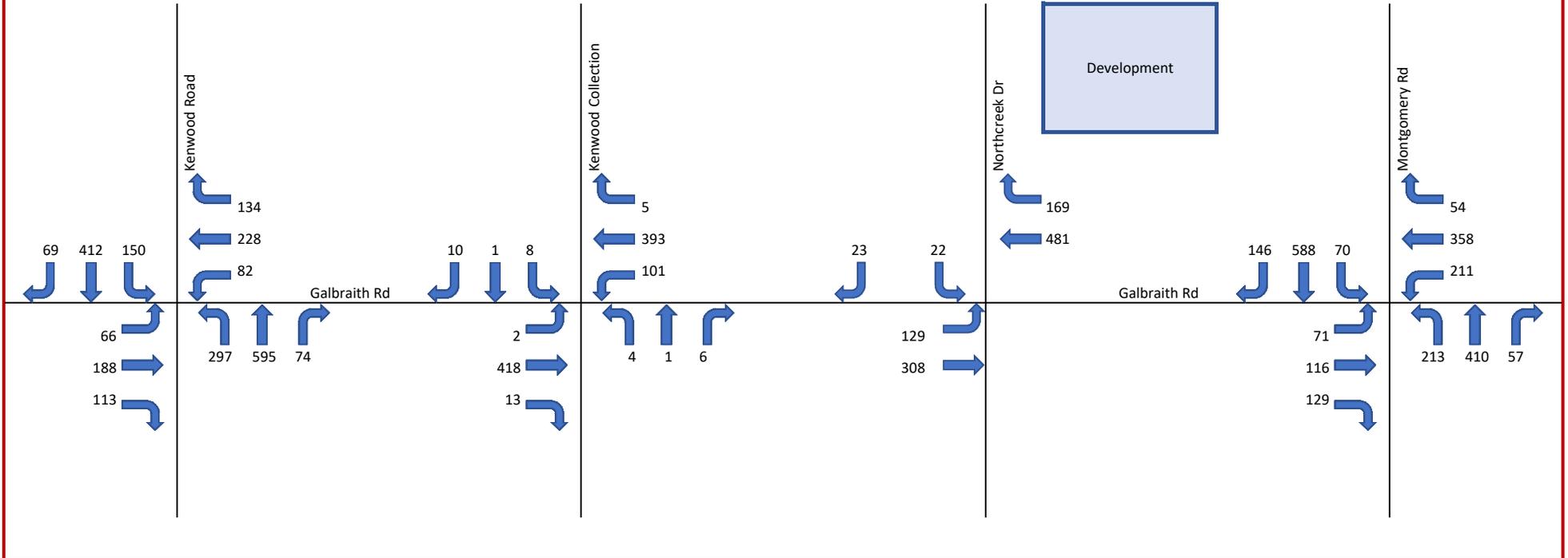
Exit = Red



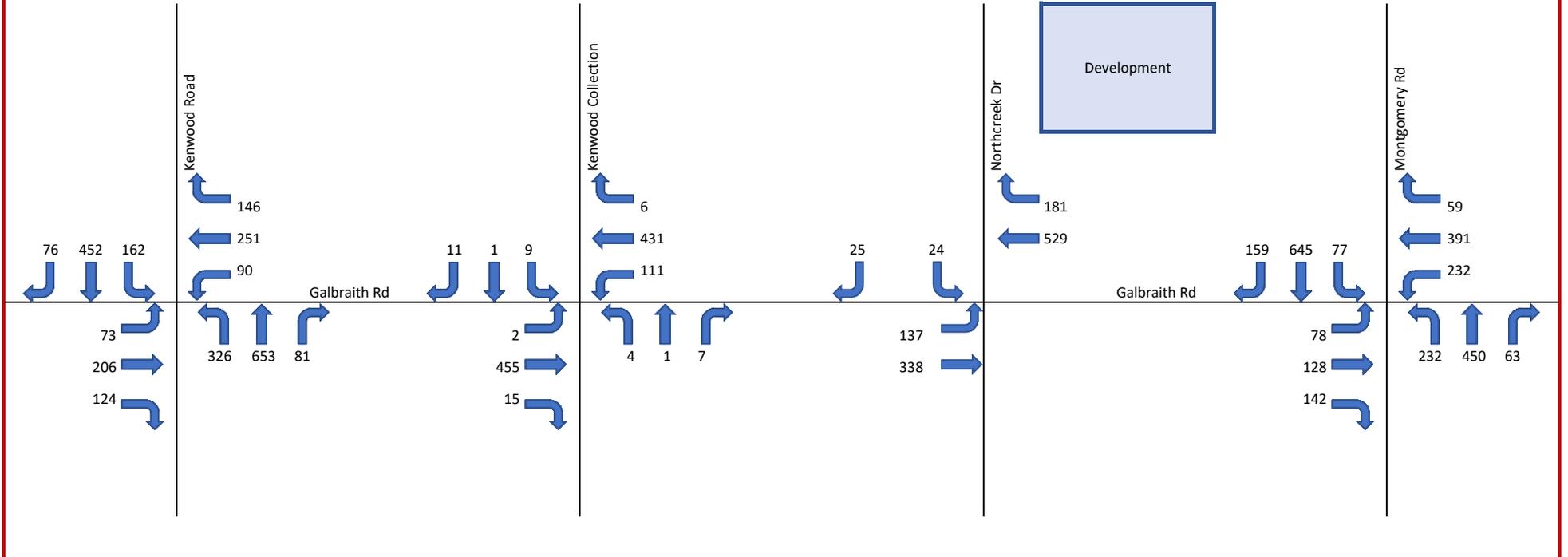
Generated Trips Distribution- (AM)



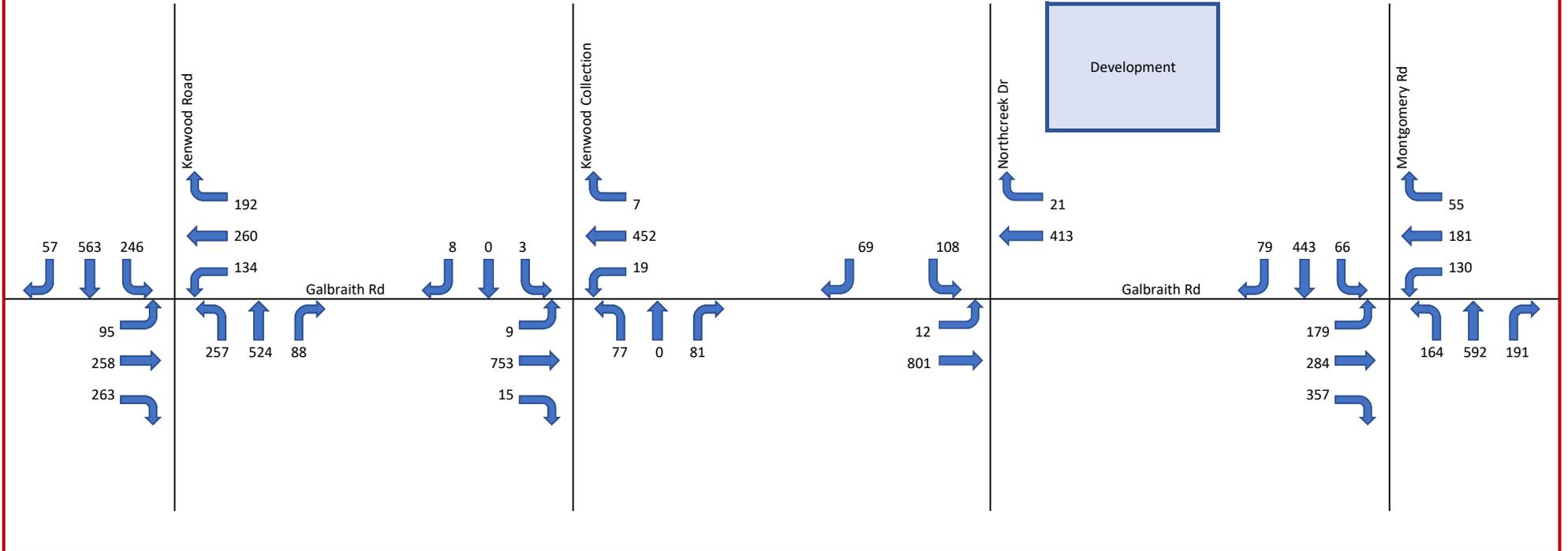
Build-2021 (AM)



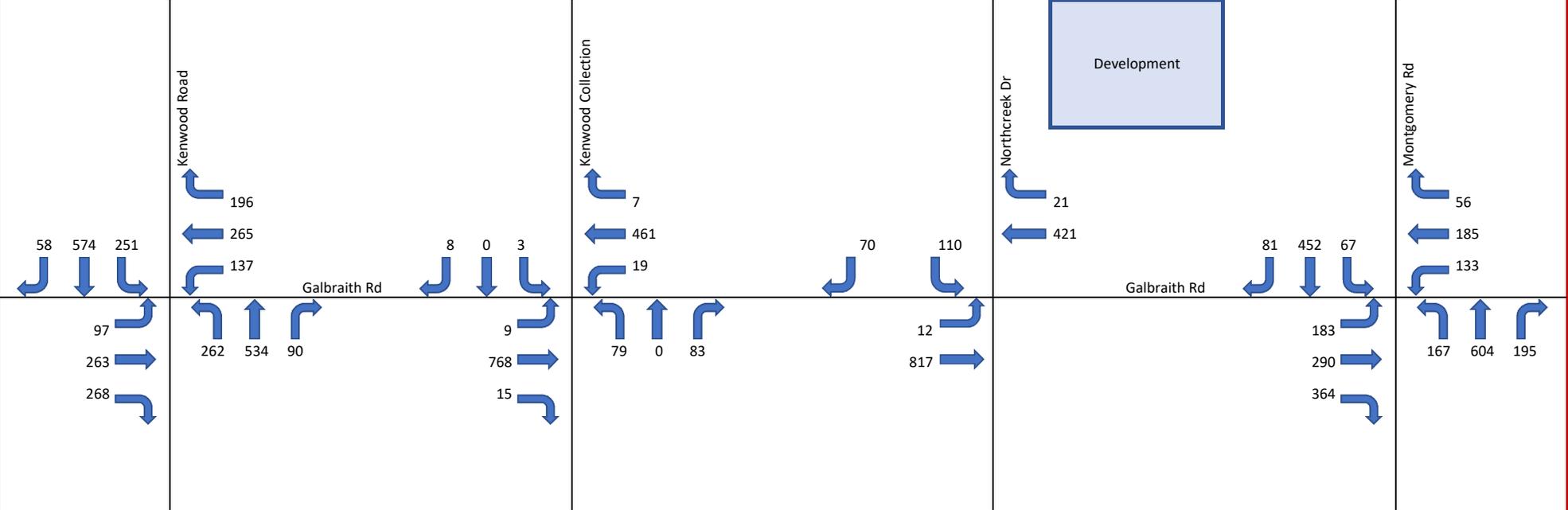
Build-2031 (AM)



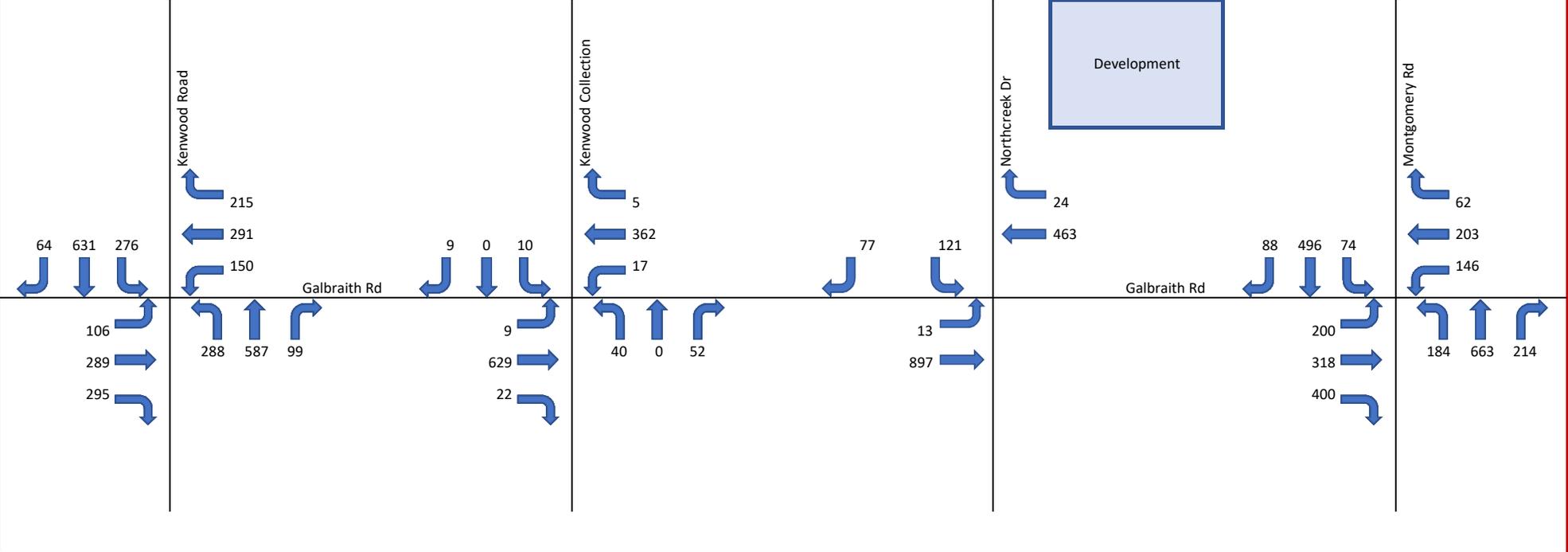
Existing-2019 (PM)



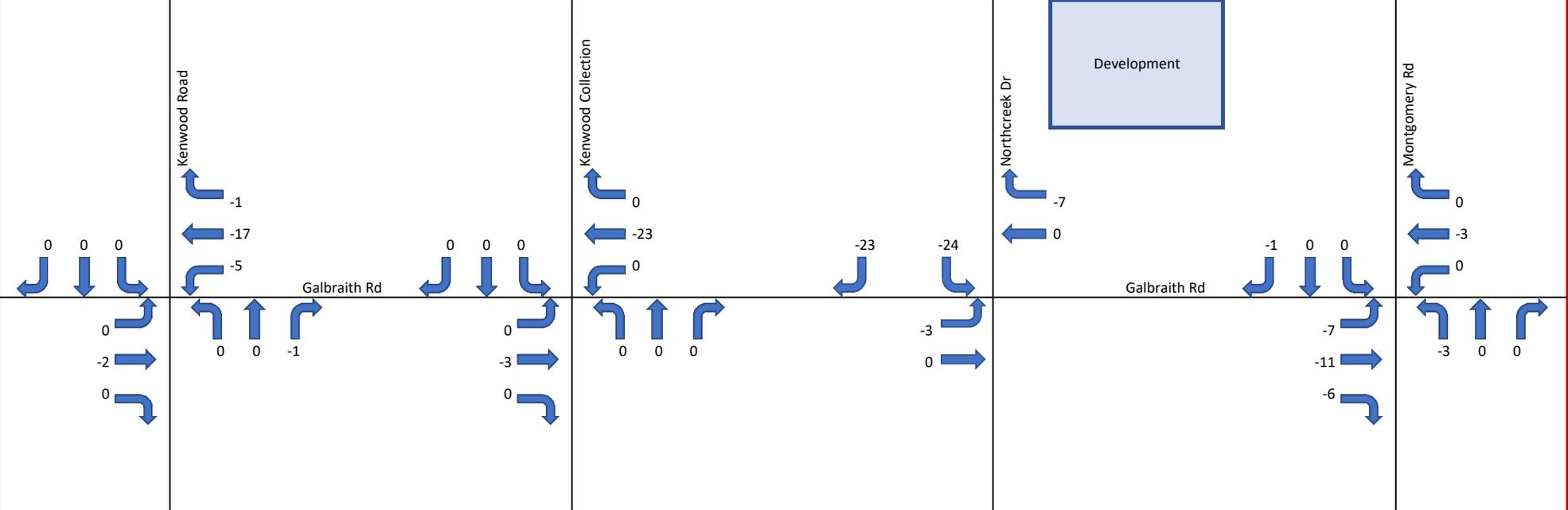
No Build-2021 (PM)



No Build-2031 (PM)



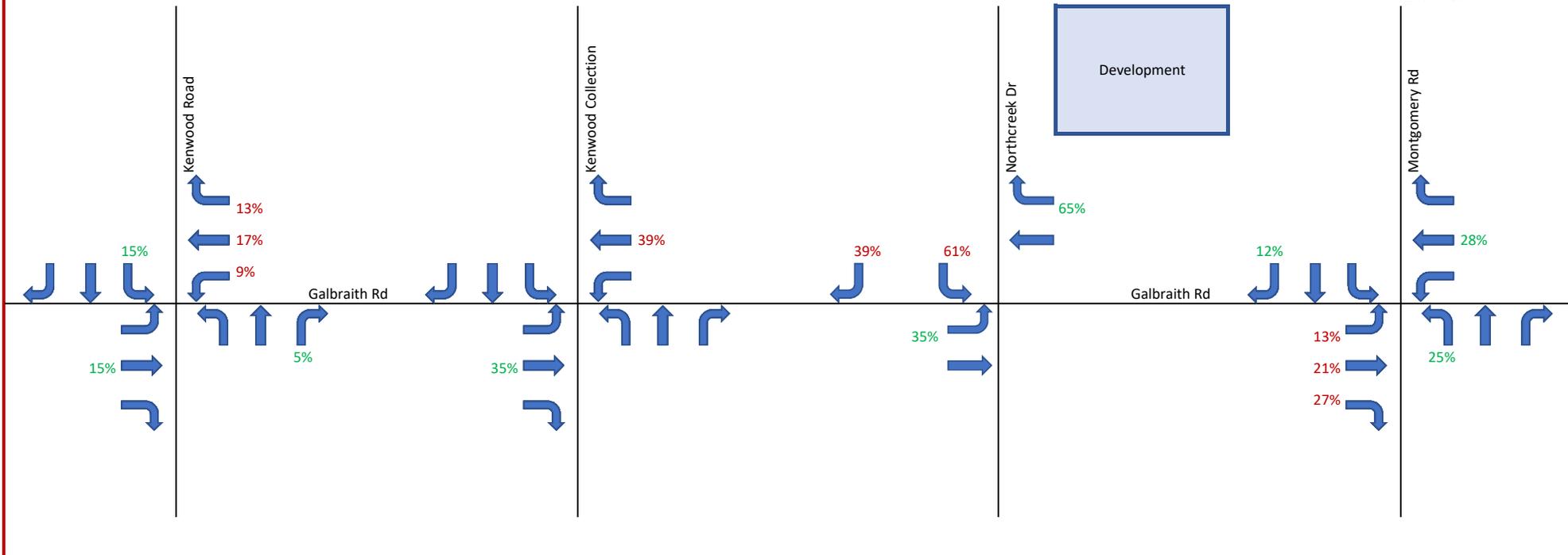
Office Building in Southern Lot to be Removed- (PM)



Distribution %- (PM)

Enter = Green

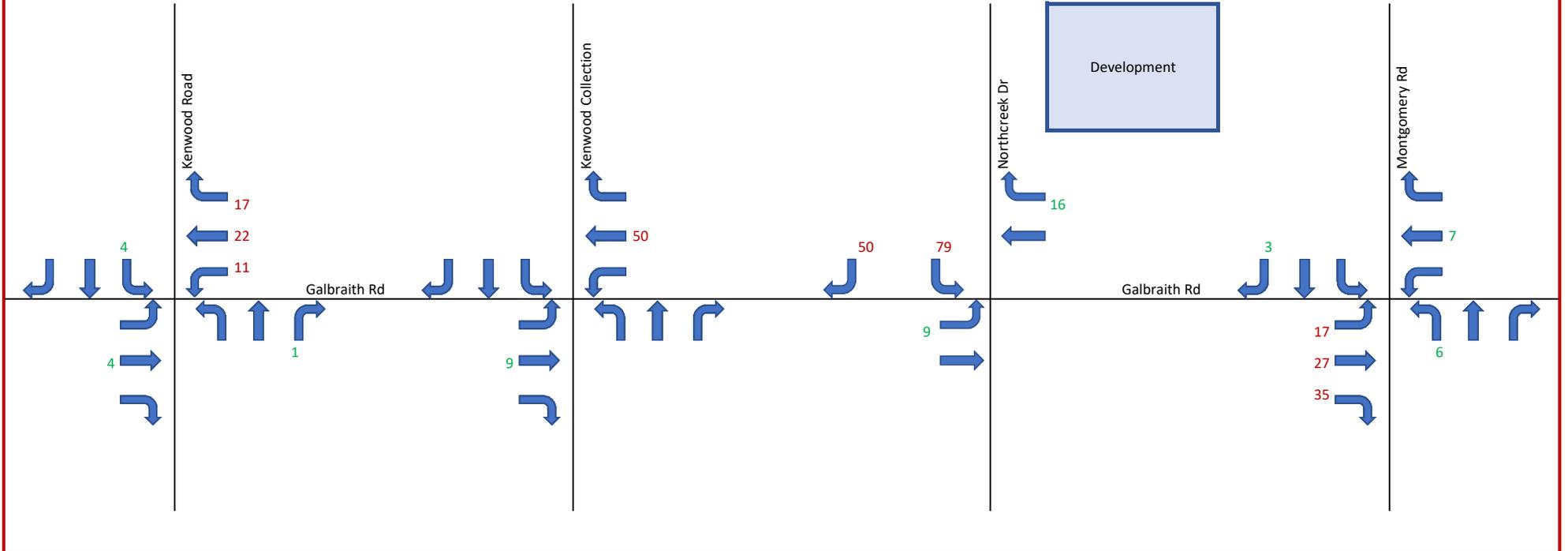
Exit = Red



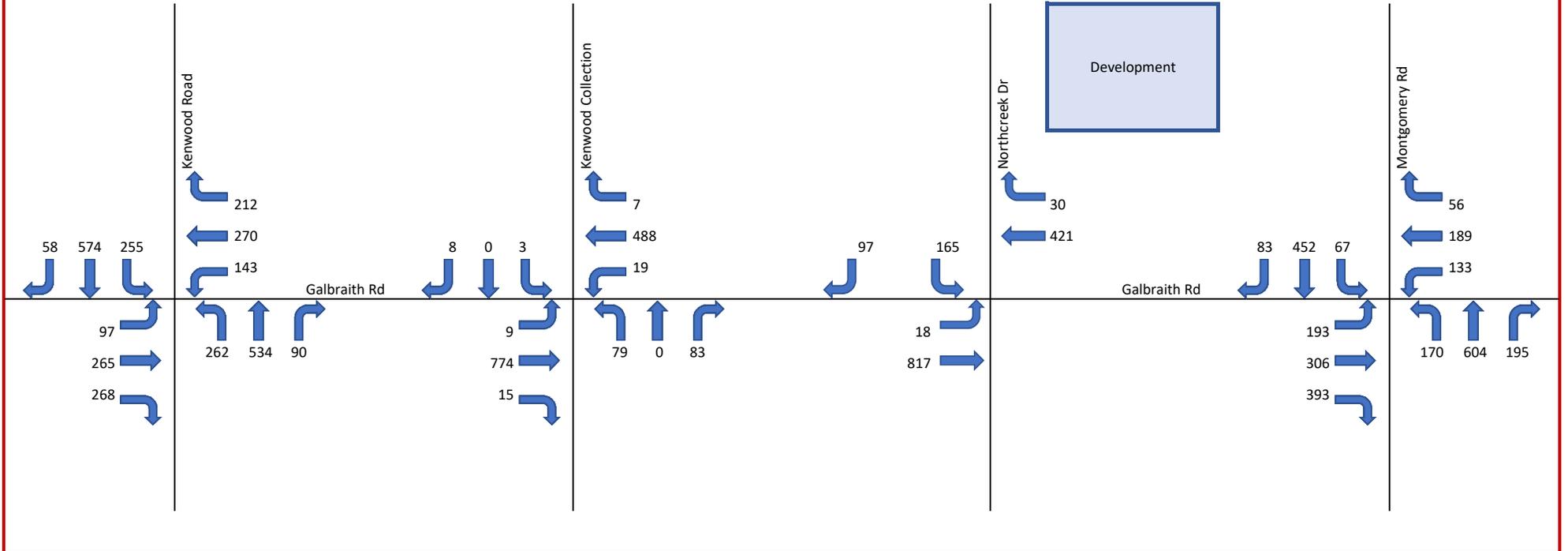
Generated Trips Distribution- (PM)

Enter = Green

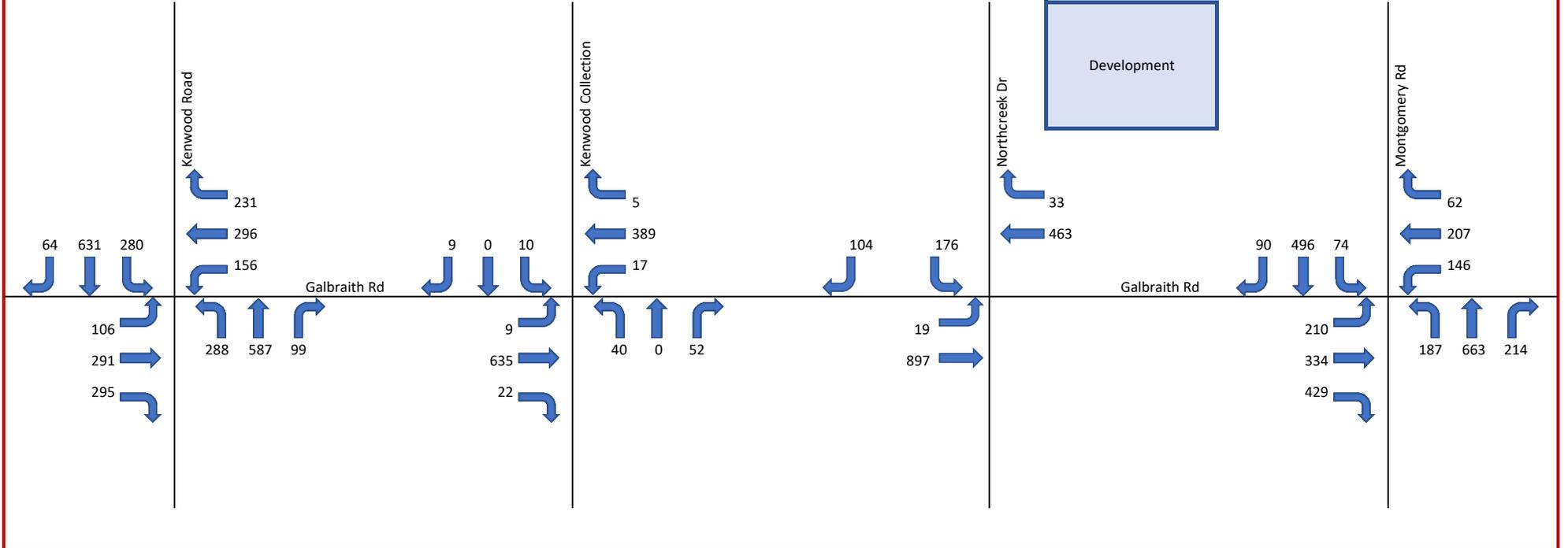
Exit = Red



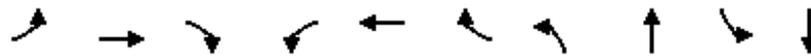
Build-2021 (PM)



Build-2031 (PM)



Appendix D – Synchro Capacity Analysis Reports

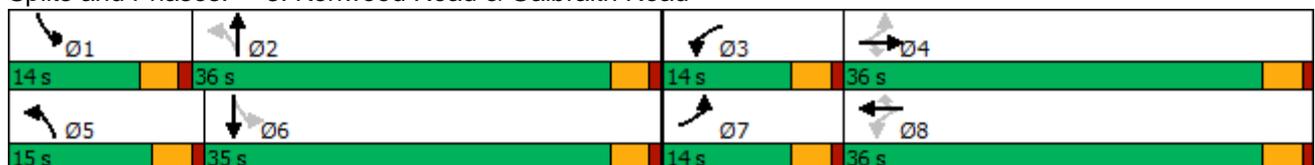


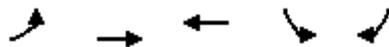
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	66	174	113	82	228	131	297	595	130	412
Future Volume (vph)	66	174	113	82	228	131	297	595	130	412
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	20.0	10.0	20.0
Minimum Split (s)	14.0	36.0	36.0	14.0	30.0	30.0	14.0	31.0	14.0	35.0
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	15.0	36.0	14.0	35.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	15.0%	36.0%	14.0%	35.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes									
Recall Mode	None	Max	None	Max						
Act Effct Green (s)	23.9	16.3	16.3	23.9	16.3	16.3	43.4	32.5	41.9	31.8
Actuated g/C Ratio	0.29	0.20	0.20	0.29	0.20	0.20	0.53	0.40	0.51	0.39
v/c Ratio	0.22	0.51	0.30	0.24	0.67	0.33	0.63	0.52	0.34	0.39
Control Delay	19.3	34.8	7.5	19.5	40.2	7.4	18.5	21.7	13.0	20.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	34.8	7.5	19.5	40.2	7.4	18.5	21.7	13.0	20.2
LOS	B	C	A	B	D	A	B	C	B	C
Approach Delay		23.2			26.6			20.7		18.7
Approach LOS		C			C			C		B

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 81.8
 Natural Cycle: 100
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.67
 Intersection Signal Delay: 21.7 Intersection LOS: C
 Intersection Capacity Utilization 66.8% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 3: Kenwood Road & Galbraith Road



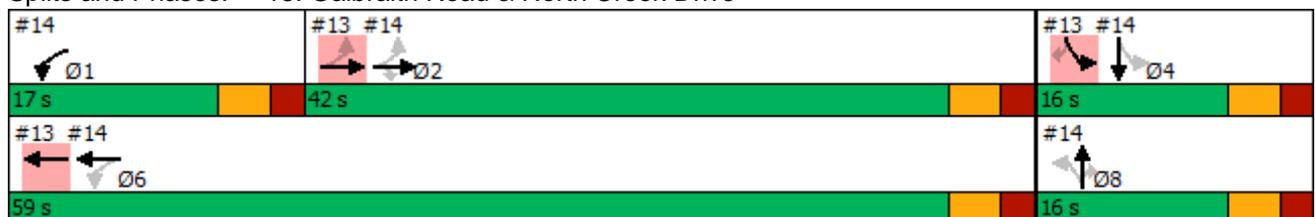


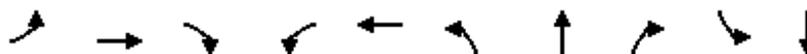
Lane Group	EBL	EBT	WBT	SBL	SBR	Ø1	Ø8
Lane Configurations							
Traffic Volume (vph)	87	308	481	18	20		
Future Volume (vph)	87	308	481	18	20		
Turn Type	Perm	NA	NA	Prot	Perm		
Protected Phases		2	6	4		1	8
Permitted Phases	2				4		
Detector Phase	2	2	6	4	4		
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	15.0	15.0	15.0
Total Split (s)	42.0	42.0	59.0	16.0	16.0	17.0	16.0
Total Split (%)	56.0%	56.0%	78.7%	21.3%	21.3%	23%	21%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		
Lead/Lag	Lag	Lag				Lead	
Lead-Lag Optimize?	Yes	Yes				Yes	
Recall Mode	None	None	None	None	None	None	None
Act Effct Green (s)	29.3	29.3	36.2	11.9	11.9		
Actuated g/C Ratio	0.64	0.64	0.80	0.26	0.26		
v/c Ratio	0.19	0.28	0.45	0.04	0.05		
Control Delay	5.1	4.3	5.0	22.1	11.4		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	5.1	4.3	5.0	22.1	11.4		
LOS	A	A	A	C	B		
Approach Delay		4.5	5.0	16.5			
Approach LOS		A	A	B			

Intersection Summary

Cycle Length: 75	
Actuated Cycle Length: 45.5	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.45	
Intersection Signal Delay: 5.2	Intersection LOS: A
Intersection Capacity Utilization 70.2%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 13: Galbraith Road & North Creek Drive





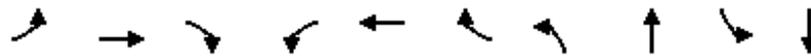
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	2	376	13	101	390	4	1	6	8	1
Future Volume (vph)	2	376	13	101	390	4	1	6	8	1
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	NA	Perm	Perm	NA
Protected Phases		2		1	6		8			4
Permitted Phases	2		2	6		8		8	4	
Detector Phase	2	2	2	1	6	8	8	8	4	4
Switch Phase										
Minimum Initial (s)	20.0	20.0	20.0	10.0	20.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	25.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	42.0	42.0	42.0	17.0	59.0	16.0	16.0	16.0	16.0	16.0
Total Split (%)	56.0%	56.0%	56.0%	22.7%	78.7%	21.3%	21.3%	21.3%	21.3%	21.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0
Lead/Lag	Lag	Lag	Lag	Lead						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None									
Act Effct Green (s)	29.3	29.3	29.3	32.6	36.2		11.9	11.9		11.9
Actuated g/C Ratio	0.64	0.64	0.64	0.72	0.80		0.26	0.26		0.26
v/c Ratio	0.00	0.34	0.01	0.14	0.29		0.01	0.01		0.05
Control Delay	10.0	11.6	0.0	2.5	2.4		21.8	0.0		16.6
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	10.0	11.6	0.0	2.5	2.4		21.8	0.0		16.6
LOS	A	B	A	A	A		C	A		B
Approach Delay		11.2			2.4		9.1			16.6
Approach LOS		B			A		A			B

Intersection Summary

Cycle Length: 75
 Actuated Cycle Length: 45.5
 Natural Cycle: 55
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.45
 Intersection Signal Delay: 6.5 Intersection LOS: A
 Intersection Capacity Utilization 58.3% ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road



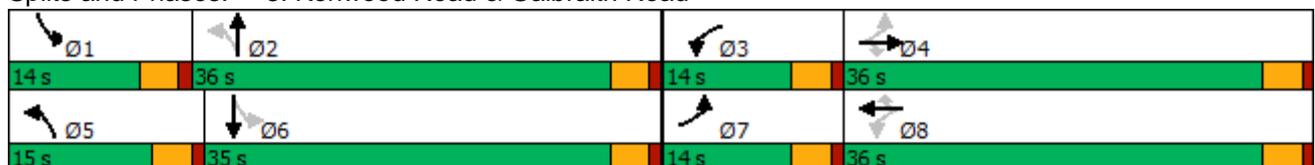


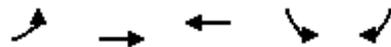
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	97	263	268	137	265	196	262	534	251	574
Future Volume (vph)	97	263	268	137	265	196	262	534	251	574
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	20.0	10.0	20.0
Minimum Split (s)	14.0	36.0	36.0	14.0	30.0	30.0	14.0	31.0	14.0	35.0
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	15.0	36.0	14.0	35.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	15.0%	36.0%	14.0%	35.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes									
Recall Mode	None	Max	None	Max						
Act Effct Green (s)	29.1	19.1	19.1	30.0	22.2	22.2	43.2	32.1	41.2	31.1
Actuated g/C Ratio	0.33	0.22	0.22	0.34	0.25	0.25	0.49	0.37	0.47	0.36
v/c Ratio	0.29	0.70	0.51	0.45	0.61	0.38	0.72	0.53	0.70	0.55
Control Delay	19.6	41.1	6.8	22.6	36.0	6.0	25.9	23.7	25.3	25.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.6	41.1	6.8	22.6	36.0	6.0	25.9	23.7	25.3	25.0
LOS	B	D	A	C	D	A	C	C	C	C
Approach Delay		23.1			23.1			24.3		25.1
Approach LOS		C			C			C		C

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 87.4
 Natural Cycle: 100
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.72
 Intersection Signal Delay: 24.1 Intersection LOS: C
 Intersection Capacity Utilization 67.8% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 3: Kenwood Road & Galbraith Road



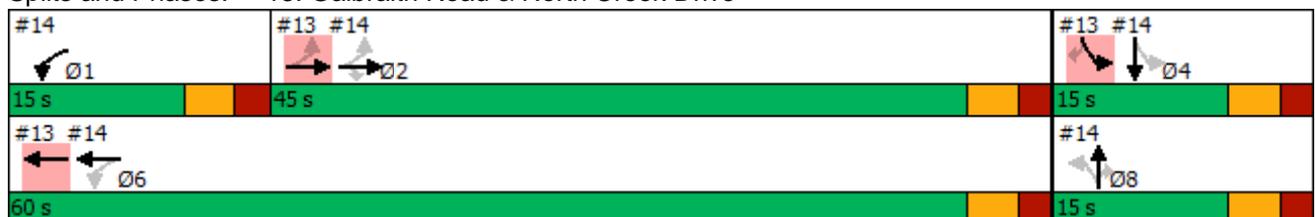


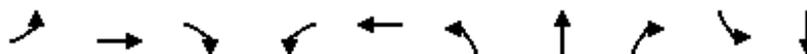
Lane Group	EBL	EBT	WBT	SBL	SBR	Ø1	Ø8
Lane Configurations							
Traffic Volume (vph)	12	817	421	110	70		
Future Volume (vph)	12	817	421	110	70		
Turn Type	Perm	NA	NA	Prot	Perm		
Protected Phases		2	6	4		1	8
Permitted Phases	2				4		
Detector Phase	2	2	6	4	4		
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	15.0	15.0	15.0
Total Split (s)	45.0	45.0	60.0	15.0	15.0	15.0	15.0
Total Split (%)	60.0%	60.0%	80.0%	20.0%	20.0%	20%	20%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		
Lead/Lag	Lag	Lag				Lead	
Lead-Lag Optimize?	Yes	Yes				Yes	
Recall Mode	None	None	None	None	None	None	None
Act Effct Green (s)	39.2	39.2	43.8	11.8	11.8		
Actuated g/C Ratio	0.67	0.67	0.75	0.20	0.20		
v/c Ratio	0.02	0.71	0.34	0.33	0.20		
Control Delay	5.9	9.3	4.4	30.6	9.7		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	5.9	9.3	4.4	30.6	9.7		
LOS	A	A	A	C	A		
Approach Delay		9.3	4.4	22.5			
Approach LOS		A	A	C			

Intersection Summary

Cycle Length: 75	
Actuated Cycle Length: 58.1	
Natural Cycle: 75	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.71	
Intersection Signal Delay: 9.4	Intersection LOS: A
Intersection Capacity Utilization 59.7%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 13: Galbraith Road & North Creek Drive



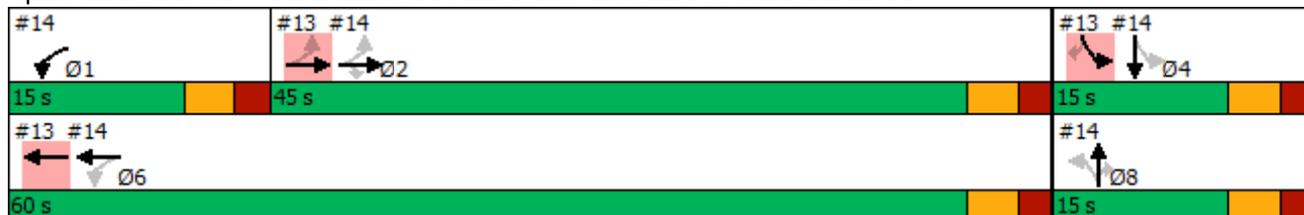


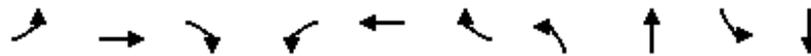
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	9	768	15	19	461	79	0	83	3	0
Future Volume (vph)	9	768	15	19	461	79	0	83	3	0
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	NA	Perm	Perm	NA
Protected Phases		2		1	6		8			4
Permitted Phases	2		2	6		8		8	4	
Detector Phase	2	2	2	1	6	8	8	8	4	4
Switch Phase										
Minimum Initial (s)	20.0	20.0	20.0	10.0	20.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	25.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	45.0	45.0	45.0	15.0	60.0	15.0	15.0	15.0	15.0	15.0
Total Split (%)	60.0%	60.0%	60.0%	20.0%	80.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0
Lead/Lag	Lag	Lag	Lag	Lead						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None									
Act Effect Green (s)	39.2	39.2	39.2	41.5	43.8		11.8	11.8		11.8
Actuated g/C Ratio	0.67	0.67	0.67	0.71	0.75		0.20	0.20		0.20
v/c Ratio	0.02	0.66	0.01	0.04	0.36		0.30	0.22		0.03
Control Delay	7.8	14.6	0.0	2.3	2.9		31.0	7.6		0.2
Queue Delay	0.0	0.1	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	7.8	14.7	0.0	2.3	3.0		31.0	7.6		0.2
LOS	A	B	A	A	A		C	A		A
Approach Delay		14.3			3.0		19.0			0.2
Approach LOS		B			A		B			A

Intersection Summary

Cycle Length: 75
 Actuated Cycle Length: 58.1
 Natural Cycle: 75
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.71
 Intersection Signal Delay: 10.9 Intersection LOS: B
 Intersection Capacity Utilization 69.6% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road



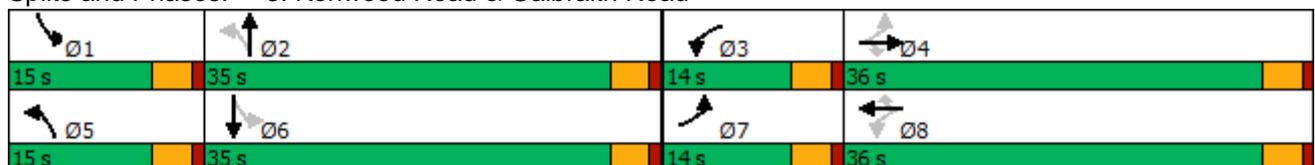


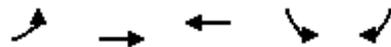
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	↘	↗	↖	↘	↗	↖	↘	↗↖	↘	↗↖
Traffic Volume (vph)	73	192	124	90	251	143	326	653	142	452
Future Volume (vph)	73	192	124	90	251	143	326	653	142	452
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	20.0	10.0	20.0
Minimum Split (s)	14.0	36.0	36.0	14.0	30.0	30.0	14.0	31.0	14.0	35.0
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	15.0	35.0	15.0	35.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	15.0%	35.0%	15.0%	35.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes									
Recall Mode	None	Max	None	Max						
Act Effct Green (s)	25.2	17.6	17.6	25.2	17.6	17.6	43.5	32.3	42.0	31.6
Actuated g/C Ratio	0.30	0.21	0.21	0.30	0.21	0.21	0.52	0.39	0.50	0.38
v/c Ratio	0.24	0.53	0.31	0.26	0.69	0.34	0.73	0.58	0.40	0.43
Control Delay	19.3	34.7	7.1	19.5	40.5	7.0	25.1	23.9	14.6	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	34.7	7.1	19.5	40.5	7.0	25.1	23.9	14.6	21.6
LOS	B	C	A	B	D	A	C	C	B	C
Approach Delay		23.0			26.7			24.3		20.1
Approach LOS		C			C			C		C

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 83.2
 Natural Cycle: 100
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 23.5 Intersection LOS: C
 Intersection Capacity Utilization 69.6% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 3: Kenwood Road & Galbraith Road



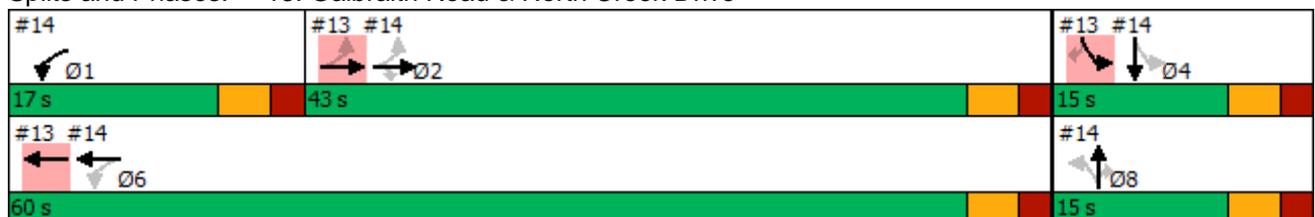


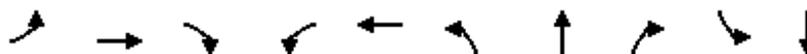
Lane Group	EBL	EBT	WBT	SBL	SBR	Ø1	Ø8
Lane Configurations							
Traffic Volume (vph)	95	338	529	20	22		
Future Volume (vph)	95	338	529	20	22		
Turn Type	Perm	NA	NA	Prot	Perm		
Protected Phases		2	6	4		1	8
Permitted Phases	2				4		
Detector Phase	2	2	6	4	4		
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	15.0	15.0	15.0
Total Split (s)	43.0	43.0	60.0	15.0	15.0	17.0	15.0
Total Split (%)	57.3%	57.3%	80.0%	20.0%	20.0%	23%	20%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		
Lead/Lag	Lag	Lag				Lead	
Lead-Lag Optimize?	Yes	Yes				Yes	
Recall Mode	None	None	None	None	None	None	None
Act Effct Green (s)	30.8	30.8	37.7	12.1	12.1		
Actuated g/C Ratio	0.66	0.66	0.80	0.26	0.26		
v/c Ratio	0.22	0.30	0.49	0.05	0.06		
Control Delay	5.0	4.1	5.3	23.6	11.9		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	5.0	4.1	5.3	23.6	11.9		
LOS	A	A	A	C	B		
Approach Delay		4.3	5.3	17.5			
Approach LOS		A	A	B			

Intersection Summary

Cycle Length: 75	
Actuated Cycle Length: 46.9	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 5.4	Intersection LOS: A
Intersection Capacity Utilization 73.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 13: Galbraith Road & North Creek Drive



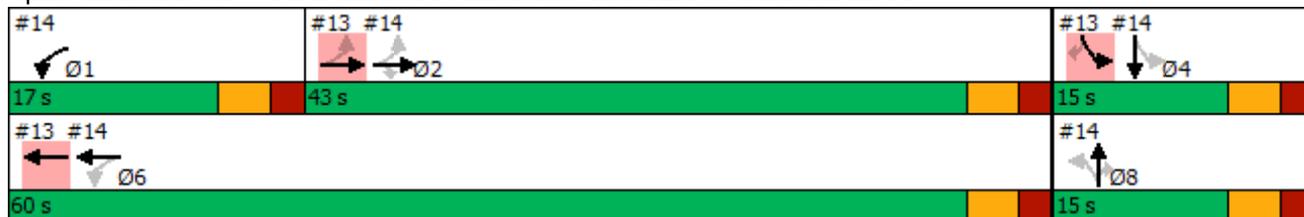


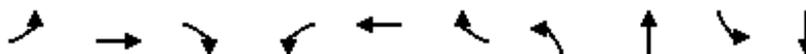
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	2	413	15	111	428	4	1	7	9	1
Future Volume (vph)	2	413	15	111	428	4	1	7	9	1
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	NA	Perm	Perm	NA
Protected Phases		2		1	6		8			4
Permitted Phases	2		2	6		8		8	4	
Detector Phase	2	2	2	1	6	8	8	8	4	4
Switch Phase										
Minimum Initial (s)	20.0	20.0	20.0	10.0	20.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	25.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	43.0	43.0	43.0	17.0	60.0	15.0	15.0	15.0	15.0	15.0
Total Split (%)	57.3%	57.3%	57.3%	22.7%	80.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0
Lead/Lag	Lag	Lag	Lag	Lead						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None									
Act Effct Green (s)	30.8	30.8	30.8	33.9	37.7		12.1	12.1		12.1
Actuated g/C Ratio	0.66	0.66	0.66	0.72	0.80		0.26	0.26		0.26
v/c Ratio	0.00	0.37	0.01	0.15	0.32		0.01	0.02		0.06
Control Delay	9.5	11.5	0.0	2.5	2.3		23.4	0.0		17.6
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	9.5	11.5	0.0	2.5	2.4		23.4	0.0		17.6
LOS	A	B	A	A	A		C	A		B
Approach Delay		11.1			2.4		9.0			17.6
Approach LOS		B			A		A			B

Intersection Summary

Cycle Length: 75
 Actuated Cycle Length: 46.9
 Natural Cycle: 55
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.49
 Intersection Signal Delay: 6.5 Intersection LOS: A
 Intersection Capacity Utilization 60.4% ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road



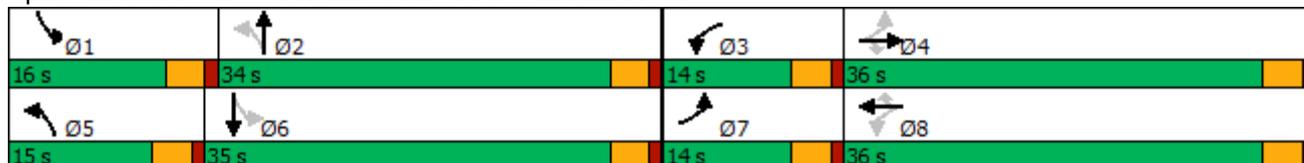


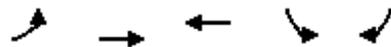
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	106	289	295	150	291	215	288	587	276	631
Future Volume (vph)	106	289	295	150	291	215	288	587	276	631
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	20.0	10.0	20.0
Minimum Split (s)	14.0	36.0	36.0	14.0	30.0	30.0	14.0	31.0	14.0	35.0
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	15.0	34.0	16.0	35.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	15.0%	34.0%	16.0%	35.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes									
Recall Mode	None	Max	None	Max						
Act Effct Green (s)	31.2	21.2	21.2	32.1	24.3	24.3	41.2	30.1	43.2	31.2
Actuated g/C Ratio	0.35	0.24	0.24	0.36	0.27	0.27	0.46	0.34	0.48	0.35
v/c Ratio	0.32	0.71	0.52	0.50	0.63	0.39	0.87	0.63	0.81	0.62
Control Delay	19.6	40.6	6.4	23.4	35.7	5.6	43.4	28.2	34.3	27.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.6	40.6	6.4	23.4	35.7	5.6	43.4	28.2	34.3	27.5
LOS	B	D	A	C	D	A	D	C	C	C
Approach Delay		22.7			23.0			32.7		29.5
Approach LOS		C			C			C		C

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 89.5
 Natural Cycle: 100
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 27.7 Intersection LOS: C
 Intersection Capacity Utilization 72.4% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 3: Kenwood Road & Galbraith Road



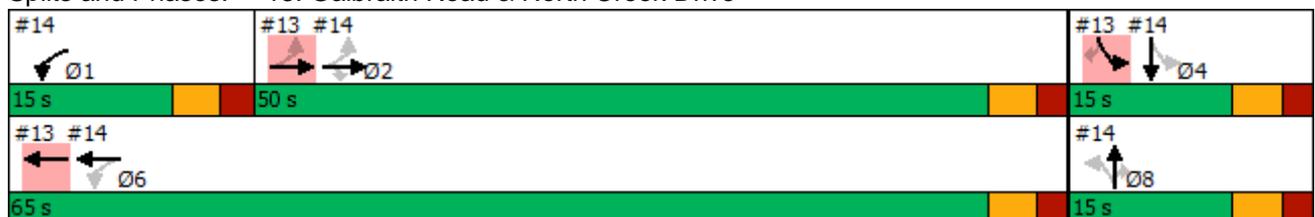


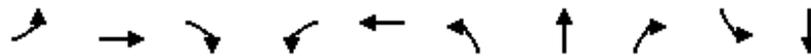
Lane Group	EBL	EBT	WBT	SBL	SBR	Ø1	Ø8
Lane Configurations							
Traffic Volume (vph)	13	897	463	121	77		
Future Volume (vph)	13	897	463	121	77		
Turn Type	Perm	NA	NA	Prot	Perm		
Protected Phases		2	6	4		1	8
Permitted Phases	2				4		
Detector Phase	2	2	6	4	4		
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	15.0	15.0	15.0
Total Split (s)	50.0	50.0	65.0	15.0	15.0	15.0	15.0
Total Split (%)	62.5%	62.5%	81.3%	18.8%	18.8%	19%	19%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		
Lead/Lag	Lag	Lag				Lead	
Lead-Lag Optimize?	Yes	Yes				Yes	
Recall Mode	None	None	None	None	None	None	None
Act Effct Green (s)	44.2	44.2	46.5	10.8	10.8		
Actuated g/C Ratio	0.72	0.72	0.76	0.18	0.18		
v/c Ratio	0.02	0.72	0.38	0.42	0.24		
Control Delay	3.7	9.5	4.6	33.1	9.9		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	3.7	9.5	4.6	33.1	9.9		
LOS	A	A	A	C	A		
Approach Delay		9.4	4.6	24.1			
Approach LOS		A	A	C			

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 61.1	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.72	
Intersection Signal Delay: 9.8	Intersection LOS: A
Intersection Capacity Utilization 63.9%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 13: Galbraith Road & North Creek Drive





Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	9	629	22	17	362	40	0	52	10	0
Future Volume (vph)	9	629	22	17	362	40	0	52	10	0
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	NA	Perm	Perm	NA
Protected Phases		2		1	6		8			4
Permitted Phases	2		2	6		8		8	4	
Detector Phase	2	2	2	1	6	8	8	8	4	4
Switch Phase										
Minimum Initial (s)	20.0	20.0	20.0	10.0	20.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	25.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	50.0	50.0	50.0	15.0	65.0	15.0	15.0	15.0	15.0	15.0
Total Split (%)	62.5%	62.5%	62.5%	18.8%	81.3%	18.8%	18.8%	18.8%	18.8%	18.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0
Lead/Lag	Lag	Lag	Lag	Lead						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None									
Act Effect Green (s)	44.2	44.2	44.2	44.7	46.5		10.8	10.8		10.8
Actuated g/C Ratio	0.72	0.72	0.72	0.73	0.76		0.18	0.18		0.18
v/c Ratio	0.01	0.51	0.02	0.03	0.28		0.18	0.16		0.06
Control Delay	5.8	8.5	0.0	2.2	2.6		29.4	3.8		0.4
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	5.8	8.6	0.0	2.2	2.7		29.4	3.8		0.4
LOS	A	A	A	A	A		C	A		A
Approach Delay		8.3			2.7		14.8			0.4
Approach LOS		A			A		B			A

Intersection Summary

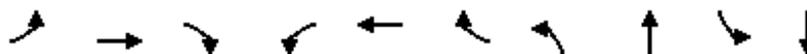
Cycle Length: 80
 Actuated Cycle Length: 61.1
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.72
 Intersection Signal Delay: 6.8
 Intersection LOS: A
 Intersection Capacity Utilization 62.3%
 ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road



Timings
3: Kenwood Road & Galbraith Road

2021 Build
Timing Plan: AM Peak

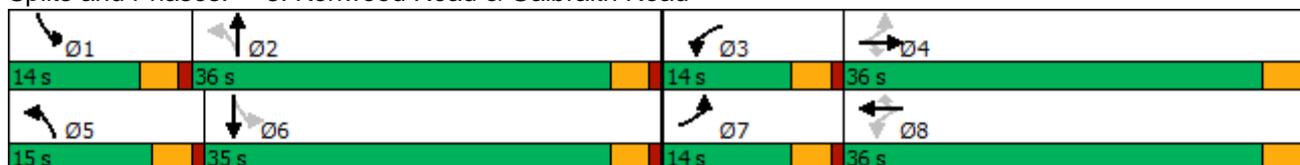


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	66	188	113	82	228	134	297	595	150	412
Future Volume (vph)	66	188	113	82	228	134	297	595	150	412
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	20.0	10.0	20.0
Minimum Split (s)	14.0	36.0	36.0	14.0	30.0	30.0	14.0	31.0	14.0	35.0
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	15.0	36.0	14.0	35.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	15.0%	36.0%	14.0%	35.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes									
Recall Mode	None	Max	None	Max						
Act Effct Green (s)	23.9	16.3	16.3	23.9	16.3	16.3	43.4	32.5	41.9	31.8
Actuated g/C Ratio	0.29	0.20	0.20	0.29	0.20	0.20	0.53	0.40	0.51	0.39
v/c Ratio	0.22	0.55	0.30	0.25	0.67	0.34	0.63	0.52	0.39	0.39
Control Delay	19.3	35.9	7.5	19.6	40.2	7.4	18.5	21.8	13.7	20.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	35.9	7.5	19.6	40.2	7.4	18.5	21.8	13.7	20.2
LOS	B	D	A	B	D	A	B	C	B	C
Approach Delay		24.2			26.5			20.8		18.6
Approach LOS		C			C			C		B

Intersection Summary

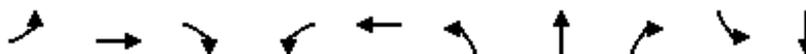
Cycle Length: 100
 Actuated Cycle Length: 81.8
 Natural Cycle: 100
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.67
 Intersection Signal Delay: 21.8 Intersection LOS: C
 Intersection Capacity Utilization 66.8% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 3: Kenwood Road & Galbraith Road



Timings
14: Kenwood Towne Place/Hotel Ent & Galbraith Road

2021 Build
Timing Plan: AM Peak

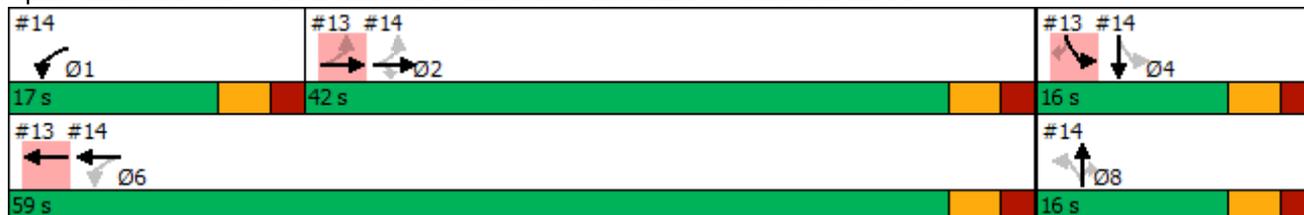


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↘	↗	↖	↖	↗		↖	↗		↕
Traffic Volume (vph)	2	418	13	101	393	4	1	6	8	1
Future Volume (vph)	2	418	13	101	393	4	1	6	8	1
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	NA	Perm	Perm	NA
Protected Phases		2		1	6		8			4
Permitted Phases	2		2	6		8		8	4	
Detector Phase	2	2	2	1	6	8	8	8	4	4
Switch Phase										
Minimum Initial (s)	20.0	20.0	20.0	10.0	20.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	25.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	42.0	42.0	42.0	17.0	59.0	16.0	16.0	16.0	16.0	16.0
Total Split (%)	56.0%	56.0%	56.0%	22.7%	78.7%	21.3%	21.3%	21.3%	21.3%	21.3%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0
Lead/Lag	Lag	Lag	Lag	Lead						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None									
Act Effct Green (s)	30.9	30.9	30.9	34.0	37.8		12.1	12.1		12.1
Actuated g/C Ratio	0.66	0.66	0.66	0.72	0.80		0.26	0.26		0.26
v/c Ratio	0.00	0.37	0.01	0.14	0.29		0.01	0.01		0.05
Control Delay	9.5	11.4	0.0	2.4	2.3		23.6	0.0		17.8
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	9.5	11.4	0.0	2.4	2.3		23.6	0.0		17.8
LOS	A	B	A	A	A		C	A		B
Approach Delay		11.1			2.4		9.8			17.8
Approach LOS		B			A		A			B

Intersection Summary

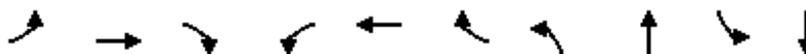
Cycle Length: 75
 Actuated Cycle Length: 47
 Natural Cycle: 55
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.49
 Intersection Signal Delay: 6.7 Intersection LOS: A
 Intersection Capacity Utilization 58.5% ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road



Timings
3: Kenwood Road & Galbraith Road

2021 Build
Timing Plan: PM Peak

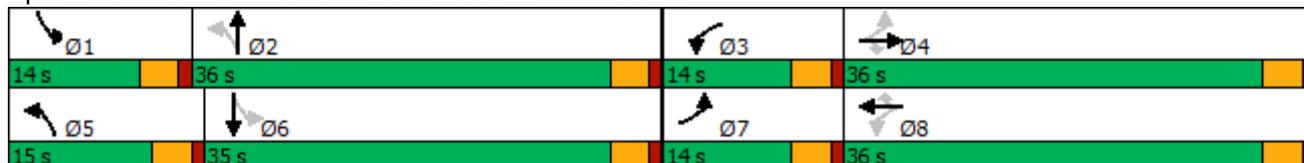


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	97	265	268	143	270	212	262	534	255	574
Future Volume (vph)	97	265	268	143	270	212	262	534	255	574
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	20.0	10.0	20.0
Minimum Split (s)	14.0	36.0	36.0	14.0	30.0	30.0	14.0	31.0	14.0	35.0
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	15.0	36.0	14.0	35.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	15.0%	36.0%	14.0%	35.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes									
Recall Mode	None	Max	None	Max						
Act Effct Green (s)	29.4	19.4	19.4	30.3	22.4	22.4	43.2	32.1	41.1	31.1
Actuated g/C Ratio	0.34	0.22	0.22	0.35	0.26	0.26	0.49	0.37	0.47	0.36
v/c Ratio	0.29	0.70	0.51	0.47	0.62	0.40	0.72	0.53	0.71	0.55
Control Delay	19.5	40.8	6.7	23.0	36.0	6.0	26.2	23.8	26.3	25.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.5	40.8	6.7	23.0	36.0	6.0	26.2	23.8	26.3	25.2
LOS	B	D	A	C	D	A	C	C	C	C
Approach Delay		23.0			22.9			24.5		25.5
Approach LOS		C			C			C		C

Intersection Summary

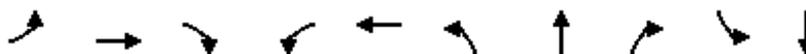
Cycle Length: 100
 Actuated Cycle Length: 87.6
 Natural Cycle: 100
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.72
 Intersection Signal Delay: 24.2 Intersection LOS: C
 Intersection Capacity Utilization 68.1% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 3: Kenwood Road & Galbraith Road



Timings
14: Kenwood Towne Place/Hotel Ent & Galbraith Road

2021 Build
Timing Plan: PM Peak

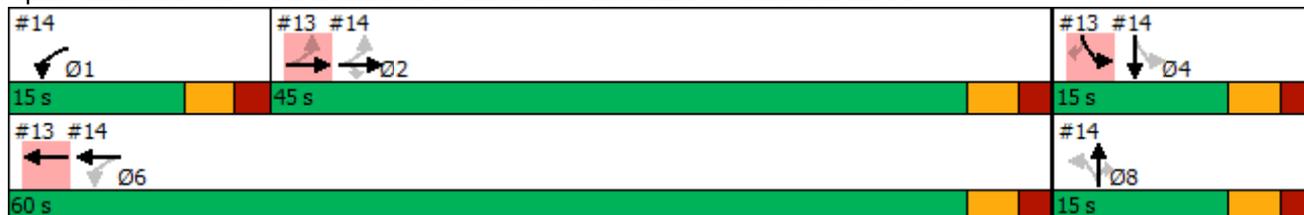


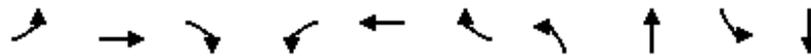
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	9	774	15	19	488	79	0	83	3	0
Future Volume (vph)	9	774	15	19	488	79	0	83	3	0
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	NA	Perm	Perm	NA
Protected Phases		2		1	6		8			4
Permitted Phases	2		2	6		8		8	4	
Detector Phase	2	2	2	1	6	8	8	8	4	4
Switch Phase										
Minimum Initial (s)	20.0	20.0	20.0	10.0	20.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	25.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	45.0	45.0	45.0	15.0	60.0	15.0	15.0	15.0	15.0	15.0
Total Split (%)	60.0%	60.0%	60.0%	20.0%	80.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0
Lead/Lag	Lag	Lag	Lag	Lead						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None									
Act Effct Green (s)	36.6	36.6	36.6	41.6	41.6		10.4	10.4		10.4
Actuated g/C Ratio	0.59	0.59	0.59	0.67	0.67		0.17	0.17		0.17
v/c Ratio	0.02	0.77	0.02	0.05	0.43		0.37	0.26		0.03
Control Delay	7.8	17.8	0.0	2.4	3.8		32.7	8.2		0.2
Queue Delay	0.0	0.1	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	7.8	17.9	0.0	2.4	3.8		32.7	8.2		0.2
LOS	A	B	A	A	A		C	A		A
Approach Delay		17.5			3.7		20.2			0.2
Approach LOS		B			A		C			A

Intersection Summary

Cycle Length: 75
 Actuated Cycle Length: 62.3
 Natural Cycle: 75
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.81
 Intersection Signal Delay: 12.9 Intersection LOS: B
 Intersection Capacity Utilization 69.9% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road



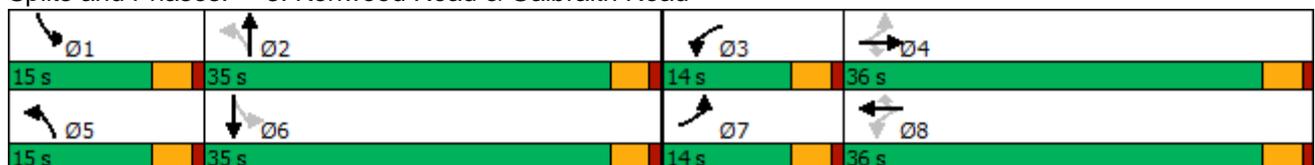


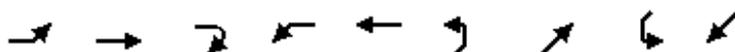
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	73	206	124	90	251	146	326	653	162	452
Future Volume (vph)	73	206	124	90	251	146	326	653	162	452
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	20.0	10.0	20.0
Minimum Split (s)	14.0	36.0	36.0	14.0	30.0	30.0	14.0	31.0	14.0	35.0
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	15.0	35.0	15.0	35.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	15.0%	35.0%	15.0%	35.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes									
Recall Mode	None	Max	None	Max						
Act Effct Green (s)	25.2	17.6	17.6	25.2	17.6	17.6	43.4	32.2	42.1	31.6
Actuated g/C Ratio	0.30	0.21	0.21	0.30	0.21	0.21	0.52	0.39	0.51	0.38
v/c Ratio	0.24	0.57	0.31	0.27	0.69	0.35	0.73	0.59	0.46	0.43
Control Delay	19.3	35.8	7.1	19.7	40.5	6.9	25.2	24.1	15.5	21.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	35.8	7.1	19.7	40.5	6.9	25.2	24.1	15.5	21.6
LOS	B	D	A	B	D	A	C	C	B	C
Approach Delay		24.0			26.6			24.4		20.2
Approach LOS		C			C			C		C

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 83.2
 Natural Cycle: 100
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.73
 Intersection Signal Delay: 23.6 Intersection LOS: C
 Intersection Capacity Utilization 69.6% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 3: Kenwood Road & Galbraith Road



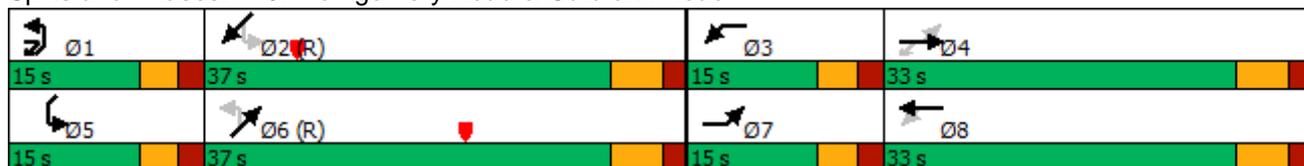


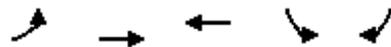
Lane Group	EBL	EBT	EBR	WBL	WBT	NEL	NET	SWL	SWT
Lane Configurations									
Traffic Volume (vph)	78	128	142	232	391	232	450	77	645
Future Volume (vph)	78	128	142	232	391	232	450	77	645
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	1	3	8	1	6	5	2
Permitted Phases	4		4	8		6		2	
Detector Phase	7	4	1	3	8	1	6	5	2
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	20.0	10.0	20.0
Minimum Split (s)	15.0	33.0	15.0	15.0	16.0	15.0	26.0	15.0	37.0
Total Split (s)	15.0	33.0	15.0	15.0	33.0	15.0	37.0	15.0	37.0
Total Split (%)	15.0%	33.0%	15.0%	15.0%	33.0%	15.0%	37.0%	15.0%	37.0%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.0	6.0	5.0	5.0	6.0	5.0	6.0	5.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes								
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effct Green (s)	35.5	24.5	41.4	36.5	27.5	45.5	36.5	43.6	32.6
Actuated g/C Ratio	0.36	0.24	0.41	0.36	0.28	0.46	0.36	0.44	0.33
v/c Ratio	0.34	0.30	0.21	0.53	0.96	0.91	0.44	0.20	0.77
Control Delay	21.5	31.7	5.8	25.1	69.1	59.1	26.6	16.0	35.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.5	31.7	5.8	25.1	69.1	59.1	26.6	16.0	35.1
LOS	C	C	A	C	E	E	C	B	D
Approach Delay		18.8			54.2		36.7		33.4
Approach LOS		B			D		D		C

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 100
 Offset: 0 (0%), Referenced to phase 2:SWTL and 6:NETL, Start of FDW or yellow
 Natural Cycle: 100
 Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.96
 Intersection Signal Delay: 37.8
 Intersection LOS: D
 Intersection Capacity Utilization 86.6%
 ICU Level of Service E
 Analysis Period (min) 15

Splits and Phases: 9: Montgomery Road & Galbraith Road



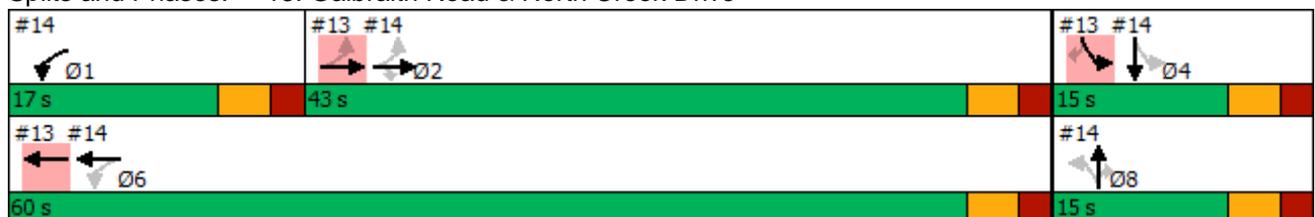


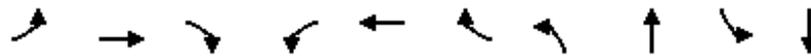
Lane Group	EBL	EBT	WBT	SBL	SBR	Ø1	Ø8
Lane Configurations							
Traffic Volume (vph)	137	338	529	24	25		
Future Volume (vph)	137	338	529	24	25		
Turn Type	Perm	NA	NA	Prot	Perm		
Protected Phases		2	6	4		1	8
Permitted Phases	2				4		
Detector Phase	2	2	6	4	4		
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	15.0	15.0	15.0
Total Split (s)	43.0	43.0	60.0	15.0	15.0	17.0	15.0
Total Split (%)	57.3%	57.3%	80.0%	20.0%	20.0%	23%	20%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		
Lead/Lag	Lag	Lag				Lead	
Lead-Lag Optimize?	Yes	Yes				Yes	
Recall Mode	None	None	None	None	None	None	None
Act Effct Green (s)	32.8	32.8	39.7	12.4	12.4		
Actuated g/C Ratio	0.67	0.67	0.81	0.25	0.25		
v/c Ratio	0.32	0.29	0.52	0.06	0.06		
Control Delay	5.5	3.9	5.3	25.2	12.2		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	5.5	3.9	5.3	25.2	12.2		
LOS	A	A	A	C	B		
Approach Delay		4.3	5.3	18.6			
Approach LOS		A	A	B			

Intersection Summary

Cycle Length: 75	
Actuated Cycle Length: 48.8	
Natural Cycle: 55	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.52	
Intersection Signal Delay: 5.5	Intersection LOS: A
Intersection Capacity Utilization 76.4%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 13: Galbraith Road & North Creek Drive



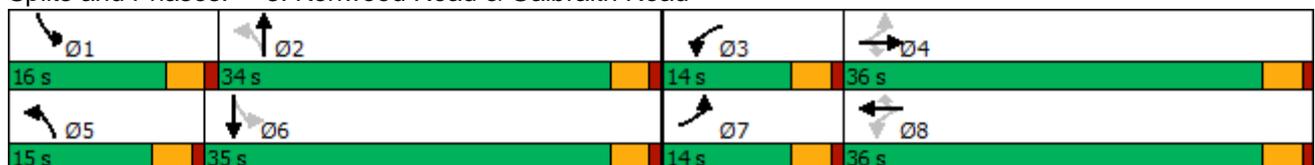


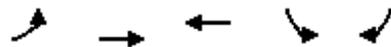
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	106	291	295	156	296	231	288	587	280	631
Future Volume (vph)	106	291	295	156	296	231	288	587	280	631
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	pm+pt	NA
Protected Phases	7	4		3	8		5	2	1	6
Permitted Phases	4		4	8		8	2		6	
Detector Phase	7	4	4	3	8	8	5	2	1	6
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	20.0	10.0	20.0
Minimum Split (s)	14.0	36.0	36.0	14.0	30.0	30.0	14.0	31.0	14.0	35.0
Total Split (s)	14.0	36.0	36.0	14.0	36.0	36.0	15.0	34.0	16.0	35.0
Total Split (%)	14.0%	36.0%	36.0%	14.0%	36.0%	36.0%	15.0%	34.0%	16.0%	35.0%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes									
Recall Mode	None	Max	None	Max						
Act Effct Green (s)	31.3	21.3	21.3	32.2	24.4	24.4	41.2	30.1	43.2	31.1
Actuated g/C Ratio	0.35	0.24	0.24	0.36	0.27	0.27	0.46	0.34	0.48	0.35
v/c Ratio	0.32	0.71	0.52	0.53	0.64	0.41	0.88	0.63	0.82	0.62
Control Delay	19.6	40.6	6.3	24.0	35.9	5.6	44.0	28.3	35.7	27.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.6	40.6	6.3	24.0	35.9	5.6	44.0	28.3	35.7	27.6
LOS	B	D	A	C	D	A	D	C	D	C
Approach Delay		22.7			23.0			33.0		29.9
Approach LOS		C			C			C		C

Intersection Summary

Cycle Length: 100
 Actuated Cycle Length: 89.6
 Natural Cycle: 100
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.88
 Intersection Signal Delay: 27.9 Intersection LOS: C
 Intersection Capacity Utilization 72.7% ICU Level of Service C
 Analysis Period (min) 15

Splits and Phases: 3: Kenwood Road & Galbraith Road



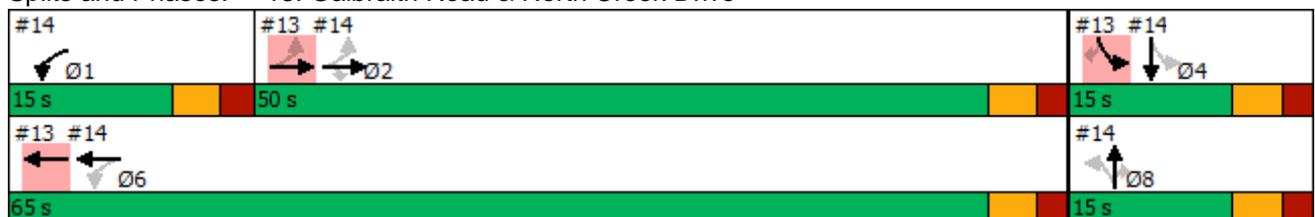


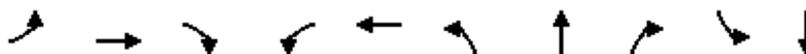
Lane Group	EBL	EBT	WBT	SBL	SBR	Ø1	Ø8
Lane Configurations							
Traffic Volume (vph)	19	897	463	176	104		
Future Volume (vph)	19	897	463	176	104		
Turn Type	Perm	NA	NA	Prot	Perm		
Protected Phases		2	6	4		1	8
Permitted Phases	2				4		
Detector Phase	2	2	6	4	4		
Switch Phase							
Minimum Initial (s)	20.0	20.0	20.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	15.0	15.0	15.0
Total Split (s)	50.0	50.0	65.0	15.0	15.0	15.0	15.0
Total Split (%)	62.5%	62.5%	81.3%	18.8%	18.8%	19%	19%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		
Lead/Lag	Lag	Lag				Lead	
Lead-Lag Optimize?	Yes	Yes				Yes	
Recall Mode	None	None	None	None	None	None	None
Act Effct Green (s)	41.2	41.2	43.6	10.2	10.2		
Actuated g/C Ratio	0.64	0.64	0.68	0.16	0.16		
v/c Ratio	0.04	0.81	0.43	0.68	0.33		
Control Delay	3.7	12.5	5.3	43.1	9.8		
Queue Delay	0.0	0.0	0.0	0.0	0.0		
Total Delay	3.7	12.5	5.3	43.1	9.8		
LOS	A	B	A	D	A		
Approach Delay		12.3	5.3	30.7			
Approach LOS		B	A	C			

Intersection Summary

Cycle Length: 80	
Actuated Cycle Length: 64.1	
Natural Cycle: 80	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 0.81	
Intersection Signal Delay: 13.3	Intersection LOS: B
Intersection Capacity Utilization 65.3%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 13: Galbraith Road & North Creek Drive



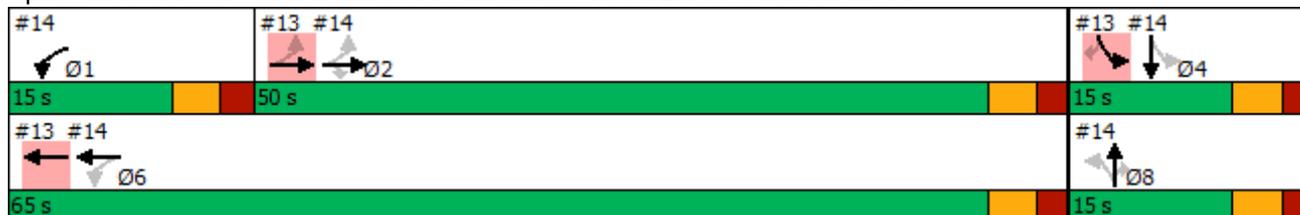


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations										
Traffic Volume (vph)	9	635	22	17	389	40	0	52	10	0
Future Volume (vph)	9	635	22	17	389	40	0	52	10	0
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	NA	Perm	Perm	NA
Protected Phases		2		1	6		8			4
Permitted Phases	2		2	6		8		8	4	
Detector Phase	2	2	2	1	6	8	8	8	4	4
Switch Phase										
Minimum Initial (s)	20.0	20.0	20.0	10.0	20.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.0	25.0	25.0	15.0	25.0	15.0	15.0	15.0	15.0	15.0
Total Split (s)	50.0	50.0	50.0	15.0	65.0	15.0	15.0	15.0	15.0	15.0
Total Split (%)	62.5%	62.5%	62.5%	18.8%	81.3%	18.8%	18.8%	18.8%	18.8%	18.8%
Yellow Time (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0
Lead/Lag	Lag	Lag	Lag	Lead						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None									
Act Effct Green (s)	41.2	41.2	41.2	43.6	43.6		10.2	10.2		10.2
Actuated g/C Ratio	0.64	0.64	0.64	0.68	0.68		0.16	0.16		0.16
v/c Ratio	0.02	0.58	0.02	0.03	0.34		0.19	0.17		0.07
Control Delay	5.8	9.8	0.0	2.3	3.2		29.8	4.0		0.4
Queue Delay	0.0	0.1	0.0	0.0	0.1		0.0	0.0		0.0
Total Delay	5.8	9.8	0.0	2.3	3.3		29.8	4.0		0.4
LOS	A	A	A	A	A		C	A		A
Approach Delay		9.5			3.2		15.1			0.4
Approach LOS		A			A		B			A

Intersection Summary

Cycle Length: 80
 Actuated Cycle Length: 64.1
 Natural Cycle: 80
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.81
 Intersection Signal Delay: 7.6 Intersection LOS: A
 Intersection Capacity Utilization 62.6% ICU Level of Service B
 Analysis Period (min) 15

Splits and Phases: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road



Appendix E – SimTraffic Queue Analysis Reports

Intersection: 3: Kenwood Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	102	184	66	127	204	81	239	210	197	106	180	171
Average Queue (ft)	40	88	31	46	103	39	106	114	108	51	101	76
95th Queue (ft)	76	152	55	93	176	69	185	186	178	92	161	147
Link Distance (ft)		1524	1524		1884			818	818		582	582
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	260			200		420	310			360		
Storage Blk Time (%)						0	0					
Queuing Penalty (veh)						1	0					

Intersection: 9: Montgomery Road & Galbraith Road

Movement	EB	EB	WB	WB	NE	NE	NE	SW	SW	SW
Directions Served	L	T	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	101	149	155	478	148	224	163	74	308	262
Average Queue (ft)	38	69	125	301	84	95	64	32	161	122
95th Queue (ft)	78	122	197	497	147	192	135	83	259	225
Link Distance (ft)		961		451		891	891		365	365
Upstream Blk Time (%)				7					0	
Queuing Penalty (veh)				0					0	
Storage Bay Dist (ft)	185		130		125			50		
Storage Blk Time (%)			4	36	6	2		1	36	
Queuing Penalty (veh)			15	77	14	4		3	25	

Intersection: 13: Galbraith Road & North Creek Drive

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	105	71	169	61	40
Average Queue (ft)	41	19	53	16	14
95th Queue (ft)	81	58	131	45	40
Link Distance (ft)		334	961		812
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			300	
Storage Blk Time (%)	0				
Queuing Penalty (veh)	0				

Intersection: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	17	177	24	54	74	29	20	34
Average Queue (ft)	1	50	3	21	16	3	3	14
95th Queue (ft)	9	123	17	45	51	16	15	38
Link Distance (ft)	1884			334		209	209	253
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	175		275	175				
Storage Blk Time (%)	0							
Queuing Penalty (veh)	0							

Network Summary

Network wide Queuing Penalty: 138

Intersection: 3: Kenwood Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	160	272	159	206	226	134	254	226	225	259	241	204
Average Queue (ft)	53	126	64	77	122	53	113	133	123	121	132	118
95th Queue (ft)	111	209	118	156	201	99	208	208	198	220	205	190
Link Distance (ft)		1524	1524		1884				818	818		582
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	260			200		420	310			360		
Storage Blk Time (%)		0		0	1		0			0	0	
Queuing Penalty (veh)		0		1	3		1			0	0	

Intersection: 9: Montgomery Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	NE	NE	NE	SW	SW	SW
Directions Served	L	T	R	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	210	326	41	154	256	150	296	290	74	214	169
Average Queue (ft)	108	167	3	61	129	80	152	149	27	120	65
95th Queue (ft)	205	285	40	125	221	154	260	254	73	202	148
Link Distance (ft)		961			451		891	891		365	365
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	185		500	130		125			50		
Storage Blk Time (%)	1	6		1	10	1	13		3	28	
Queuing Penalty (veh)	4	34		1	13	2	22		6	19	

Intersection: 13: Galbraith Road & North Creek Drive

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	44	215	174	141	70
Average Queue (ft)	7	96	70	57	31
95th Queue (ft)	30	171	141	107	60
Link Distance (ft)		334	961		812
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			300	
Storage Blk Time (%)		1			
Queuing Penalty (veh)		0			

Intersection: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	30	327	30	39	108	99	75	33
Average Queue (ft)	4	129	3	11	41	38	30	8
95th Queue (ft)	21	248	18	34	87	80	62	29
Link Distance (ft)	1884			334		209	209	253
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	175		275	175				
Storage Blk Time (%)	2							
Queuing Penalty (veh)	1							

Network Summary

Network wide Queuing Penalty: 108

Intersection: 3: Kenwood Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	89	201	72	149	257	92	309	378	280	129	207	179
Average Queue (ft)	45	90	34	45	123	42	150	152	138	62	118	86
95th Queue (ft)	81	167	61	94	208	74	284	287	245	111	192	154
Link Distance (ft)		1524	1524		1884			818	818		582	582
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	260			200		420	310			360		
Storage Blk Time (%)		0			1		3	0				
Queuing Penalty (veh)		0			3		9	0				

Intersection: 9: Montgomery Road & Galbraith Road

Movement	EB	EB	WB	WB	NE	NE	NE	SW	SW	SW
Directions Served	L	T	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	132	168	155	486	244	204	197	74	323	297
Average Queue (ft)	42	83	138	397	105	104	82	36	194	147
95th Queue (ft)	92	151	190	562	195	173	159	86	297	245
Link Distance (ft)		961		451		891	891		365	365
Upstream Blk Time (%)			26				0		0	
Queuing Penalty (veh)			0				0		0	
Storage Bay Dist (ft)	185		130		250			50		
Storage Blk Time (%)		0	7	50	1			1	41	
Queuing Penalty (veh)		0	32	116	1			5	32	

Intersection: 13: Galbraith Road & North Creek Drive

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	93	100	176	57	40
Average Queue (ft)	44	29	60	18	18
95th Queue (ft)	81	79	145	47	43
Link Distance (ft)		334	961		812
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			300	
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			

Intersection: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	18	210	35	83	92	25	20	56
Average Queue (ft)	1	65	4	28	23	3	5	13
95th Queue (ft)	11	154	20	60	68	17	18	41
Link Distance (ft)		1884			334	209	209	253
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	175		275	175				
Storage Blk Time (%)		1						
Queuing Penalty (veh)		0						

Network Summary

Network wide Queuing Penalty: 199

Intersection: 3: Kenwood Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	142	258	163	207	280	132	298	378	361	271	299	240
Average Queue (ft)	58	137	73	81	141	55	161	179	169	131	156	142
95th Queue (ft)	124	231	130	154	229	103	291	343	302	230	242	221
Link Distance (ft)		1524	1524		1884			818	818		582	582
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	260			200		420	310			360		
Storage Blk Time (%)		1		0	2		5			0		
Queuing Penalty (veh)		1		0	8		16			0		

Intersection: 9: Montgomery Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	NE	NE	NE	SW	SW	SW
Directions Served	L	T	R	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	210	415	149	154	370	150	350	328	74	258	179
Average Queue (ft)	109	189	10	86	161	94	186	185	38	135	78
95th Queue (ft)	208	345	118	170	292	174	303	293	85	225	169
Link Distance (ft)		961			451		891	891		365	365
Upstream Blk Time (%)	0										
Queuing Penalty (veh)	0										
Storage Bay Dist (ft)	185		500	130		125			50		
Storage Blk Time (%)	2	8	0	1	16	2	21		6	30	
Queuing Penalty (veh)	15	47	0	4	23	7	39		15	22	

Intersection: 13: Galbraith Road & North Creek Drive

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	64	203	162	121	70
Average Queue (ft)	9	111	67	61	34
95th Queue (ft)	41	190	135	107	62
Link Distance (ft)		334	961		812
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			300	
Storage Blk Time (%)		3			
Queuing Penalty (veh)		0			

Intersection: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	38	212	35	35	87	56	59	52
Average Queue (ft)	4	98	5	8	30	21	17	16
95th Queue (ft)	22	180	24	28	68	50	41	43
Link Distance (ft)		1884			334	209	209	253
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	175		275	175				
Storage Blk Time (%)		1						
Queuing Penalty (veh)		0						

Network Summary

Network wide Queuing Penalty: 197

Intersection: 3: Kenwood Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	93	177	84	108	201	84	236	196	206	130	188	160
Average Queue (ft)	35	95	31	44	104	39	109	117	110	64	104	78
95th Queue (ft)	72	157	62	88	176	71	184	184	185	110	166	140
Link Distance (ft)		1524	1524		1884			818	818		582	582
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	260			200		420	310			360		
Storage Blk Time (%)					0		0					
Queuing Penalty (veh)					1		0					

Intersection: 9: Montgomery Road & Galbraith Road

Movement	EB	EB	WB	WB	NE	NE	NE	SW	SW	SW
Directions Served	L	T	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	86	168	155	489	150	267	243	74	290	232
Average Queue (ft)	35	81	127	324	91	99	66	28	165	123
95th Queue (ft)	73	142	199	529	152	212	161	76	264	218
Link Distance (ft)		961		451		891	891		365	365
Upstream Blk Time (%)	10									
Queuing Penalty (veh)	0									
Storage Bay Dist (ft)	185		130		125			50		
Storage Blk Time (%)		0	5	40	8	2		1	37	
Queuing Penalty (veh)		1	21	85	17	4		4	26	

Intersection: 13: Galbraith Road & North Creek Drive

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	115	99	212	48	49
Average Queue (ft)	56	31	67	17	15
95th Queue (ft)	98	77	156	44	42
Link Distance (ft)		334	961		812
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			300	
Storage Blk Time (%)	0				
Queuing Penalty (veh)	1				

Intersection: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	18	198	30	70	75	28	20	58
Average Queue (ft)	2	65	3	26	20	3	3	17
95th Queue (ft)	12	147	18	54	60	17	15	46
Link Distance (ft)	1884			334		209	209	253
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	175		275	175				
Storage Blk Time (%)	1							
Queuing Penalty (veh)	0							

Network Summary

Network wide Queuing Penalty: 160

Intersection: 3: Kenwood Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	118	255	142	224	266	113	206	226	220	288	238	239
Average Queue (ft)	52	132	62	77	121	50	113	133	126	128	143	131
95th Queue (ft)	99	220	112	148	213	85	185	205	203	238	219	215
Link Distance (ft)		1524	1524		1884			818	818		582	582
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	260			200		420	310			360		
Storage Blk Time (%)		0			1							
Queuing Penalty (veh)		0			5							

Intersection: 9: Montgomery Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	NE	NE	NE	SW	SW	SW
Directions Served	L	T	R	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	210	377	149	155	377	150	306	299	74	257	193
Average Queue (ft)	117	173	5	75	150	90	162	156	36	118	66
95th Queue (ft)	214	294	83	156	284	164	270	262	84	210	159
Link Distance (ft)		961			451		891	891		365	365
Upstream Blk Time (%)	0										
Queuing Penalty (veh)	0										
Storage Bay Dist (ft)	185		500	130		125			50		
Storage Blk Time (%)	1	7		1	14	2	16		5	26	
Queuing Penalty (veh)	4	41		2	19	6	28		10	18	

Intersection: 13: Galbraith Road & North Creek Drive

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	39	182	150	176	81
Average Queue (ft)	10	92	67	83	37
95th Queue (ft)	34	163	127	149	66
Link Distance (ft)		334	961		812
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			300	
Storage Blk Time (%)		1			
Queuing Penalty (veh)		0			

Intersection: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	30	347	31	48	119	108	102	29
Average Queue (ft)	6	134	3	13	42	42	31	9
95th Queue (ft)	25	262	18	37	93	88	69	30
Link Distance (ft)	1884			334		209	209	253
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	175		275	175				
Storage Blk Time (%)		2			0			
Queuing Penalty (veh)		1			0			

Network Summary

Network wide Queuing Penalty: 134

Intersection: 3: Kenwood Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	112	172	85	127	213	114	262	261	252	148	236	189
Average Queue (ft)	44	93	36	44	113	42	135	129	131	65	112	88
95th Queue (ft)	89	155	66	90	191	80	244	215	217	113	184	158
Link Distance (ft)		1524	1524		1884			818	818		582	582
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	260			200		420	310			360		
Storage Blk Time (%)					1		0	0				
Queuing Penalty (veh)					2		1	0				

Intersection: 9: Montgomery Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	NE	NE	NE	SW	SW	SW
Directions Served	L	T	R	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	142	187	40	155	484	237	354	289	74	359	306
Average Queue (ft)	42	82	1	128	398	124	129	93	38	210	157
95th Queue (ft)	86	145	29	196	568	232	292	227	88	321	266
Link Distance (ft)		961			451		891	891		365	365
Upstream Blk Time (%)					28					0	0
Queuing Penalty (veh)					0					0	0
Storage Bay Dist (ft)	185		500	130		250			50		
Storage Blk Time (%)		0		7	49	6	0		3	45	
Queuing Penalty (veh)		0		32	114	14	0		11	35	

Intersection: 13: Galbraith Road & North Creek Drive

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	134	84	202	60	40
Average Queue (ft)	59	27	71	21	16
95th Queue (ft)	111	68	162	51	42
Link Distance (ft)		334	961		812
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			300	
Storage Blk Time (%)	0				
Queuing Penalty (veh)	2				

Intersection: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	24	197	30	77	82	24	20	52
Average Queue (ft)	1	77	3	30	20	3	4	14
95th Queue (ft)	11	172	17	62	59	17	18	40
Link Distance (ft)		1884			334	209	209	253
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	175		275	175				
Storage Blk Time (%)		1						
Queuing Penalty (veh)		0						

Network Summary

Network wide Queuing Penalty: 211

Intersection: 3: Kenwood Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	T	TR	L	T	TR
Maximum Queue (ft)	148	295	157	197	258	139	312	438	429	253	293	282
Average Queue (ft)	54	144	69	82	138	56	174	202	188	138	161	151
95th Queue (ft)	106	238	124	150	222	106	321	447	401	227	246	240
Link Distance (ft)		1524	1524		1884			818	818		582	582
Upstream Blk Time (%)										0		
Queuing Penalty (veh)										0		
Storage Bay Dist (ft)	260			200		420		310		360		
Storage Blk Time (%)	0			0		2		10		0		0
Queuing Penalty (veh)	0			1		7		31		0		0

Intersection: 9: Montgomery Road & Galbraith Road

Movement	EB	EB	EB	WB	WB	NE	NE	NE	SW	SW	SW
Directions Served	L	T	R	L	TR	L	T	TR	L	T	TR
Maximum Queue (ft)	210	381	126	155	390	150	334	335	74	269	220
Average Queue (ft)	118	185	6	85	172	103	186	179	38	133	80
95th Queue (ft)	218	306	62	166	315	178	300	297	86	228	175
Link Distance (ft)		961			451		891	891		365	365
Upstream Blk Time (%)						0					
Queuing Penalty (veh)						0					
Storage Bay Dist (ft)	185		500		130		125		50		
Storage Blk Time (%)	1	8		1	17		4	19	6	29	
Queuing Penalty (veh)	5	51		3	24		13	35	16	22	

Intersection: 13: Galbraith Road & North Creek Drive

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	64	194	167	164	71
Average Queue (ft)	12	109	73	81	38
95th Queue (ft)	45	197	137	137	64
Link Distance (ft)		334	961		812
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150		300		
Storage Blk Time (%)	3				
Queuing Penalty (veh)	1				

Intersection: 14: Kenwood Towne Place/Hotel Ent & Galbraith Road

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	34	202	30	26	91	68	54	34
Average Queue (ft)	6	95	5	9	37	19	19	12
95th Queue (ft)	26	177	22	28	79	51	43	36
Link Distance (ft)	1884			334		209	209	253
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	175		275	175				
Storage Blk Time (%)	1							
Queuing Penalty (veh)	0							

Network Summary

Network wide Queuing Penalty: 210