

TRAFFIC IMPACT STUDY

For

Orange Dev, LLC



Proposed Popeye's & Sonic Fast Food Restaurants

Property Located at:

**470 Eagle Rock Avenue (CR 611)
Block 153 – Lot 38
Township of West Orange, Essex County, NJ**

Prepared by:



**1904 Main Street | 245 Main Street, Suite #110
Lake Como, NJ 07719 | Chester, NJ 07930
(732) 681-0760**

Kevin Savage

**Kevin M. Savage, PE, PTOE
NJ PE License #55728**

Corey M. Chase

**Corey M. Chase, PE
NJ PE License #47470**

**October 21, 2022
*Revised: April 5, 2023***

1021-99-025T

INTRODUCTION

It is proposed to construct a 2,525 SF Popeye's fast food restaurant with drive-thru and a 1,616 SF Sonic fast food restaurant with drive-thru on a parcel of land located along the south side of Eagle Rock Avenue just east of Rosney Terrace in the Township of West Orange, Essex County, New Jersey, see Figure 1, in Appendix A. The site is designated as Block 153 – Lot 38 on the Township Tax Maps. The site is currently developed with a vacated restaurant known as "China Gourmet". Access to the site is currently provided via two (2) full movement driveways along Eagle Rock Avenue. It is proposed to re-construct the existing driveways to provide one (1) full movement driveway and one (1) full movement ingress/right turn egress driveway along Eagle Rock Avenue. Parking will be provided via twenty-seven (27) on-site parking spaces.

Dynamic Traffic, LLC has been retained to prepare this study to assess the traffic impact associated with the construction of The Project on the adjacent roadway network. This study documents the methodology, analyses, findings and conclusions of our study and includes:

- A detailed field inspection was conducted to obtain an inventory of existing roadway geometry, traffic control, and location and geometry of existing driveways and intersections.
- Existing traffic data was collected via manual turning movement (MTM) counts during the weekday PM and Saturday midday peak periods at the intersection of Eagle Rock Avenue with Rosney Terrace/the Mayfield Driveway.
- Projections of traffic to be generated by the proposed development were prepared utilizing trip generation data as published by the Institute of Transportation Engineers. Site traffic was then assigned to the adjacent street system based upon the anticipated directional distribution.
- Capacity analyses were conducted for the Existing, No Build, and Build conditions for the study intersections.
- The proposed points of ingress and egress were inspected for adequacy of geometric design, spacing and/or alignment to streets and driveways on the opposite side of the street, relationship to other driveways adjacent to the development, and conformance with accepted design standards.
- The site plan as designed was reviewed for sufficiency in accommodating large wheel base vehicles such as delivery trucks, refuse trucks, and emergency vehicles.
- The parking layout and supply was assessed based on accepted design standards and demand experienced at similar developments.

EXISTING CONDITIONS

A review of the existing roadway conditions near the proposed site was conducted to provide the basis for assessing the traffic impact of the development. This included field investigations of the surrounding roadways and intersections, collection of traffic volume data, and extensive analyses.

Existing Roadway Conditions

The following are descriptions of the roadways in the study area:

Eagle Rock Avenue (CR 611) is an Urban Minor Arterial roadway under the jurisdiction of Essex County. In the vicinity of the site the posted speed limit is 35 MPH and the roadway provides two travel lanes in each direction with a general east/west orientation. Curb is provided along both sides of the roadway and sidewalk is provided along the south side of the roadway. Eagle Rock Avenue provides a curved horizontal alignment and a rolling vertical alignment. The land uses along Eagle Rock Avenue in the vicinity of The Project are primarily commercial to the east and primarily residential to the west.

Rosney Terrace is a local roadway under the jurisdiction of the Township of West Orange. In the vicinity of the site the posted speed limit is 25 MPH and the roadway provides one travel lane in each direction with a general north/south orientation. Curb is provided along both sides of the roadway while sidewalk is not provided along either side of the roadway. Rosney Terrace provides a straight horizontal alignment and an uphill vertical alignment from south to north. The land uses along Rosney Terrace in the vicinity of The Project are primarily residential.

Existing Traffic Volumes

Manual turning movement (MTM) counts were originally conducted on Saturday, May 22, 2021 between 11:00 AM – 2:00 PM and on Wednesday, May 26, 2021 between 4:30 – 6:30 PM at the intersection Eagle Rock Avenue and Rosney Terrace/the Mayfield Driveway.

It should be noted that traffic impacts associated with the COVID-19 pandemic may have still been in effect as of the time of the traffic counts. As a result, the collected traffic volumes on the surrounding roadways may not be representative of “existing” traffic conditions. Therefore, historical traffic volume data has been reviewed and compared with current traffic conditions.

MTM counts were previously conducted by this firm in January 2018 during the PM peak hour at the intersection of Eagle Rock Avenue and Prospect Avenue. In order to better represent 2022 traffic volumes, the 2018 MTM volumes were grown utilizing an annual growth rate contained within the NJDOT Annual Background Growth Rate Table, which indicates a growth rate of 2% per year, for a period of four (4) years. The 2021 MTM volumes were grown utilizing an annual growth rate of 2% per year for a period of one (1) year. The individual intersection movements were then utilized to establish the traffic volumes along Eagle Rock Avenue between Rosney Terrace and Prospect Avenue. The MTM traffic volumes representative of “existing” conditions were then compared to the May 2021 MTM traffic volumes for the PM peak hour along Eagle Rock Avenue between Rosney Terrace and Prospect Avenue.

Upon comparing the traffic volumes, an adjustment factor of 1.39 was then calculated and applied to the weekday evening count to develop traffic volumes that best represent “existing” conditions at the study intersection. As mentioned above, MTM counts were also conducted during the Saturday midday peak hour which also need to be adjusted due to the potentially lower traffic volumes associated with the COVID-19 pandemic. In order to account for this effect, the PM peak hour adjustment factor of 1.39 was also applied to the Saturday count data.

Additionally, the adjusted 2021 counts were increased to better represent existing 2023 traffic volumes by applying a growth rate of 2% per year obtained from the NJDOT Annual Background Growth Rate Table for a period of two (2) years. Figure 2, located in the Appendix, shows the existing peak hour traffic volumes at the study intersections.

Review of the collected traffic data reveals that the weekday evening peak street hour (PSH) occurs between 4:30 – 5:30 PM and the Saturday PSH occurs between 12:00 – 1:00 PM. Figure 2, located in Appendix A, shows the existing peak hour traffic volumes at the study intersections. All MTM counts are contained in Appendix B.

Existing Capacity Analysis

The methodology utilized in the capacity analyses is based on the *Highway Capacity Manual 2010*, published by the Transportation Research Board. In general, the term Level of Service (LOS) is used to provide a “qualitative” evaluation of capacity based upon certain “quantitative” calculations related to empirical values, such as traffic volume and intersection control.

When analyzing an unsignalized intersection, it is assumed that both the major street through and right turn movements are unimpeded and have the right-of-way over all side street traffic and left turns from the major street. All other turning movements in the intersection cross, merge with, or are otherwise impeded by major street movements. Traffic delays at unsignalized intersections are determined by sequentially processing these impeded movements. Table I describes the Level of Service ranges for unsignalized (stop controlled) intersections.

**Table I
Level of Service Criteria
for Unsignalized Intersections**

Level of Service	Average Control Delay (seconds per vehicle)
A	0.0 to 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	greater than 50.0

It should be noted that the analyses within the 2010 Highway Capacity Manual assume a random arrival for all the movements, which may not be the case if an adjacent traffic signal is present that platoons vehicles. All capacity analyses were performed utilizing the Highway Capacity Software (HCS 7). Table II summarizes the existing Levels of Service (LOS) and delays. All capacity analysis calculation worksheets are contained in Appendix C.

**Table II
Existing Levels of Service**

Intersection	Direction/ Movement		PM PSH	SAT PSH
Eagle Rock Avenue and Rosney Terrace/Mayfield Driveway	EB	LT	A (9)	A (9)
	WB	LT	A (9)	A (9)
	NB	LTR	B (12)	C (18)
	SB	LTR	C (24)	C (23)

A (#) - Unsignalized Intersection Level of Service (seconds of delay per vehicle)

The following are discussions pertaining to each of the existing intersections analyzed.

Eagle Rock Avenue and Rosney Terrace/Mayfield Driveway

Rosney Terrace/the Mayfield Driveway intersect Eagle Rock Avenue to form a an unsignalized four-leg intersection with Rosney Terrace and the Mayfield Driveway under stop control. The eastbound and westbound approaches of Eagle Rock Avenue each provide a shared left turn/through lane and a shared through/right turn lane. The northbound approach of Rosney Terrace provides a shared left turn/through/right turn lane. The southbound approach of the Mayfield Driveway provides a shared left turn/through/right turn lane.

A review of the existing analysis reveals that the individual intersection movements operate at Level of Service “C” or better during the analyzed peak periods. See Table II for the individual movement Levels of Service and delays.

FUTURE CONDITIONS

Traffic volumes and operational analyses were developed for both the No Build and Build conditions. The No Build conditions provide a baseline for assessing the impact of site development traffic on the roadway system. The process of developing the No Build and Build traffic volumes and the subsequent analyses is outlined below.

Regardless of whether the subject site is developed or not, traffic volumes on the surrounding roadways are expected to increase as a result of developments throughout the region. A growth rate for roadways within the study area was obtained from the NJDOT Annual Background Growth Rate Table, which indicates a growth rate of 2% per year.

It should also be noted that there is one (1) development in the vicinity of the site that had been approved but not yet constructed at the time of the counts that is identified as potential significant traffic generator, described below. The Adjacent Development Traffic Volumes passing the site are shown on Figure 3.

- A proposed gas station with ten (10) fueling positions and a 4,034 SF convenience store, located in the southeast quadrant of the intersection of Eagle Rock Avenue and Prospect Avenue. Projections of the associated traffic volumes were gathered from the *Traffic Impact Study*, last revised February 27, 2019 prepared by this firm.

Future No Build traffic volumes were developed by applying the background growth rate of 2% for two (2) years to the study area roadways existing traffic volumes and adding the adjacent development traffic volumes. Figure 4, in Appendix A, shows the No Build traffic volumes.

Traffic Generation

Projections of future traffic volumes were developed utilizing data as published in the Institute of Transportation Engineers (ITE) publication *Trip Generation, 11th Edition* for Land Use Code (LUC) 934 – Fast-Food Restaurant with Drive-Through Window. This publication sets forth trip generation rates based on empirical traffic count data conducted at numerous research sites.

According to studies conducted by ITE, traffic associated with LUC 934 is not 100% newly generated. Rather, a portion of the traffic is diverted from the existing traffic stream on the adjacent roadway network. This is because the Popeye's and Sonic fast food restaurants are not destination land uses, instead patrons stop on their way to/from other locations such as home or work. ITE identifies 55% and 37% passby traffic percentages during the respective PM and Saturday peak hours, which are also accepted by NJDOT. Table III below details the traffic volumes associated with the subject project taking into account the passby credits.

Table III
Trip Generation Considering Passby Traffic

Land Use	Trip Type	PM PSH			SAT PSH		
		In	Out	Total	In	Out	Total
4,141 SF Fast Food Restaurants with Drive-Thru	Total	71	66	137	117	112	229
	Passby	39	36	75	43	42	85
	New (Primary)	32	30	62	74	70	144

As mentioned previously, the site is currently developed with a vacated restaurant which has trip generation potential if re-occupied. Therefore, ITE data for LUC 932 – High-Turnover (Sit-Down) Restaurant was utilized to project the trip generation associated with the potential re-occupation of the existing use. The following Table IV compares the trips associated with the proposed use to the existing trip generation potential of the site.

**Table IV
Trip Generation Comparison**

Land Use	Trip Type	PM PSH			SAT PSH		
		In	Out	Total	In	Out	Total
Existing 6,190 SF Restaurant	Total	34	22	56	35	34	69
	Passby	15	9	24	0	0	0
	New (Primary)	19	13	32	35	34	69
4,141 SF Fast Food Restaurants with Drive-Thru	Total	71	66	137	117	112	229
	Passby	39	36	75	43	42	85
	New (Primary)	32	30	62	74	70	144
Difference	Total	+37	+44	+81	+82	+78	+160
	Passby	+24	+27	+51	+43	+42	+85
	New (Primary)	+13	+17	+30	+39	+36	+75

As shown in Table IV above, it is anticipated that 30 additional trips during the weekday evening peak hour and 75 additional trips during the Saturday midday peak hour are anticipated to access the site that are considered “new” to the adjacent roadway network with the proposed redevelopment. However, no credit was taken for the potential use of the site and all trip generation was considered an increase over vacant land. This accounts for a “worst case scenario” from a traffic impact perspective.

Once the magnitude of traffic to be generated by the site is known, it is necessary to assign that traffic to the adjacent street system. The distribution of new traffic to the surrounding roadways is based on the location of primary arterial roadways, major signalized intersections and existing traffic patterns. Located in Appendix A, Figure 5 illustrates the percent distribution of primary site generated trips, Figure 6 illustrates the primary site generate volumes, Figure 7 illustrates the distribution of passby site generated trips, Figure 8 illustrates the passby site generated volumes, and Figure 9 illustrates the total site generated volumes assigned to the study area network. The site generated volumes were added to the No Build traffic volumes to generate the Build traffic volumes, shown in Figure 10.

Future Capacity Analysis

Operational conditions at the study intersections were analyzed under the No Build and Build conditions and are summarized in Table V below.

Table V
Future Levels of Service

Intersection	Direction/ Movement		PM PSH		SAT PSH	
			No Build	Build	No Build	Build
Eagle Rock Avenue and Rosney Terrace/Mayfield Driveway	EB	LT	A (9)	A (9)	A (9)	A (9)
	WB	LT	A (9)	A (10)	A (9)	A (9)
	NB	LTR	B (13)	B (13)	C (19)	C (17)
	SB	LTR	D (25)	D (27)	C (24)	D (27)
Eagle Rock Avenue and East Site Driveway	WB	LT	-	A (9)	-	A (9)
	NB	LR	-	C (23)	-	D (28)
Eagle Rock Avenue and West Site Driveway	WB	LT	-	A (9)	-	A (9)
	NB	R	-	B (11)	-	B (11)

A (#) - Unsignalized Intersection Level of Service (seconds of delay per vehicle)

Eagle Rock Avenue and Rosney Terrace/Mayfield Driveway

With the addition of the site traffic, the individual intersection movements are anticipated to operate at Levels of Service “D” or better during the analyzed peak periods. See Table V for the individual movement Levels of Service and delays.

Eagle Rock Avenue and the East Site Driveway

The east site driveway is proposed to intersect Eagle Rock Avenue to form an unsignalized T-intersection with the site driveway under stop control. The eastbound approach of Eagle Rock Avenue is proposed to provide a dedicated through lane and a shared through/right turn lane. The westbound approach of Eagle Rock Avenue is proposed to provide a shared left turn/through lane and a dedicated through lane. The northbound approach of the site driveway is proposed to provide a single lane for left and right turn movements.

As designed, the individual intersection movements are anticipated to operate at Levels of Service “D” or better during the analyzed peak periods. See Table V for the individual movement Levels of Service and delays.

Eagle Rock Avenue and the West Site Driveway

The west site driveway is proposed to intersect Eagle Rock Avenue to form an unsignalized T-intersection with the site driveway under stop control. The eastbound approach of Eagle Rock Avenue is proposed to provide a dedicated through lane and a shared through/right turn lane. The westbound approach of Eagle Rock Avenue is proposed to provide a shared left turn/through lane and a dedicated through lane. The northbound approach of the site driveway is proposed to provide a single lane for right turn movements only.

As designed, the individual intersection movements are anticipated to operate at Levels of Service “B” or better during the analyzed peak periods. See Table V for the individual movement Levels of Service and delays.

SITE PLAN

Site Access and Circulation

The site plan was reviewed with respect to the site access and on-site circulation design. As noted previously, access to The Project will be provided via one (1) full movement driveway and one (1) full movement ingress/right turn egress driveway along Eagle Rock Avenue.

The newly constructed parking lot will be serviced by parking aisles with a width of 18 feet for one-way circulation with 60-degree parking and 24 feet for two-way circulation with 90-degree parking, both of which meet the Ordinance requirements. These dimensions are also consistent with accepted engineering design standards and as such will adequately accommodate the anticipated site traffic.

The drive-thru lanes will operate in a counter clockwise direction with the ability to stack ten (10) cars in the drive-thru lane for both restaurants, which exceeds the Ordinance requirement of six (6) total vehicles for fast food restaurant uses. The drive-thru lanes are proposed to be 11 feet wide, which exceeds the Ordinance requirement of 9 feet. Therefore, the proposed drive-thru design will provide more than enough stacking for the maximum anticipated demand and will adequately accommodate the anticipated site traffic. An 11-foot-wide bypass lane will also be provided to ensure adequate and efficient circulation and to ensure that drive-thru queues do not impact on site circulation for patrons who park and walk in to the restaurant.

Parking

The Township of West Orange Ordinance sets forth a parking requirement of 1 space per 3 seats or 1 space per 45 SF of floor area available to patrons, whichever is greater. Based on square footage, this equates to a parking requirement of 33 spaces for the proposed 1,472 SF of total restaurant area available to patrons. Based on number of seats, this equates to a parking requirement of 13 spaces for the proposed 38 total seats. As such, the requirement of 33 spaces based on square footage was utilized. The site as proposed provides 27 parking spaces, and as such a variance is required.

As per the current Municipal Land Use Law ("M.L.U.L.") (N.J.A.C. 40:55-D), at least two (2) electric vehicle charging or "make-ready" spaces are required for a commercial parking lot containing between 25 and 50 parking spaces, which is satisfied as designed with three (3) electric vehicle parking spaces proposed. Additionally, electric vehicle charging stations count as two spaces for the purposes of complying with parking supply requirements, up to a maximum of 10% of the requirement. As such, the effective proposed parking supply is calculated to be 30 spaces.

It should be noted that national parking demand data has been collected by the ITE within their publication *Parking Generation, 5th Edition*. This publication establishes peak parking demands for multiple land uses based upon different independent variables, such as GFA and employees. For LUC 934 – Fast-Food Restaurant with Drive-Through Window, ITE sets forth an average peak demand of 0.44 vehicles per seat. This equates to a demand of 17 parking spaces, which is met as designed.

It is proposed to provide parking stalls with dimensions of 9'x18' for both 60-degree and 90-degree parking which meets the minimum Ordinance requirements. It should also be noted that industry standards recommend stall widths of between 8'9" and 9' and a length of 18' for high-turnover land uses such as The Project, which is met as designed.

FINDINGS & CONCLUSIONS

Findings

Based upon the detailed analyses as documented herein, the following findings are noted:

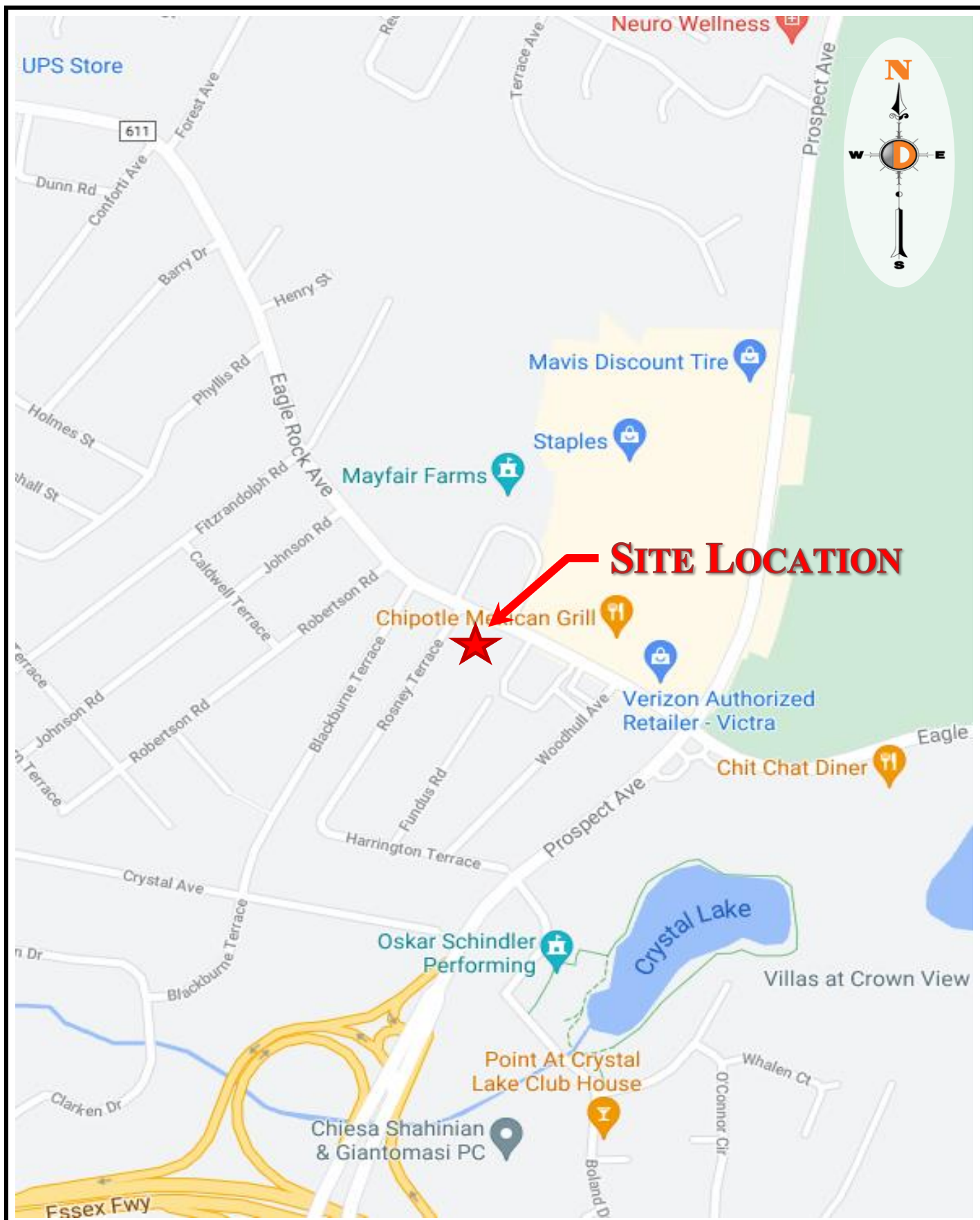
- The proposed 2,525 SF Popeye's and 1,616 SF Sonic fast-food restaurants with drive-thru are projected to generate 32 entering trips and 30 exiting trips during the weekday evening peak hour and 74 entering trips and 70 exiting trips during the Saturday midday peak hour that are "new" to the adjacent roadway network.
- Access to the site will be provided via one (1) full movement driveway and one (1) full movement ingress/right turn egress driveway along Eagle Rock Avenue.
- With the addition of the site generated traffic, the individual intersection movements of Eagle Rock Avenue and Rosney Terrace/the Mayfield Driveway are anticipated to operate at Levels of Service "D" or better during the studied peak hours.
- As designed, the individual intersection movements of Eagle Rock Avenue and the east site driveway are anticipated to operate at Levels of Service "D" or better during the studied peak hours.
- As designed, the individual intersection movements of Eagle Rock Avenue and the west site driveway are anticipated to operate at Levels of Service "B" or better during the studied peak hours.
- As proposed, The Project's site driveways and internal circulation have been designed to provide for safe and efficient movement of automobiles.
- The proposed parking supply and design is sufficient to support the projected demand.

Conclusions

Based upon our Traffic Impact Study as detailed in the body of this report, it is the professional opinion of Dynamic Traffic, LLC that the adjacent street system of the Township of West Orange and Essex County will not experience any significant degradation in operating conditions with the construction of The Project. The site driveways are located to provide safe and efficient access to the adjacent roadway system. The site plan as proposed provides for good circulation throughout the site and provides adequate parking to accommodate The Project's needs.

Appendix A

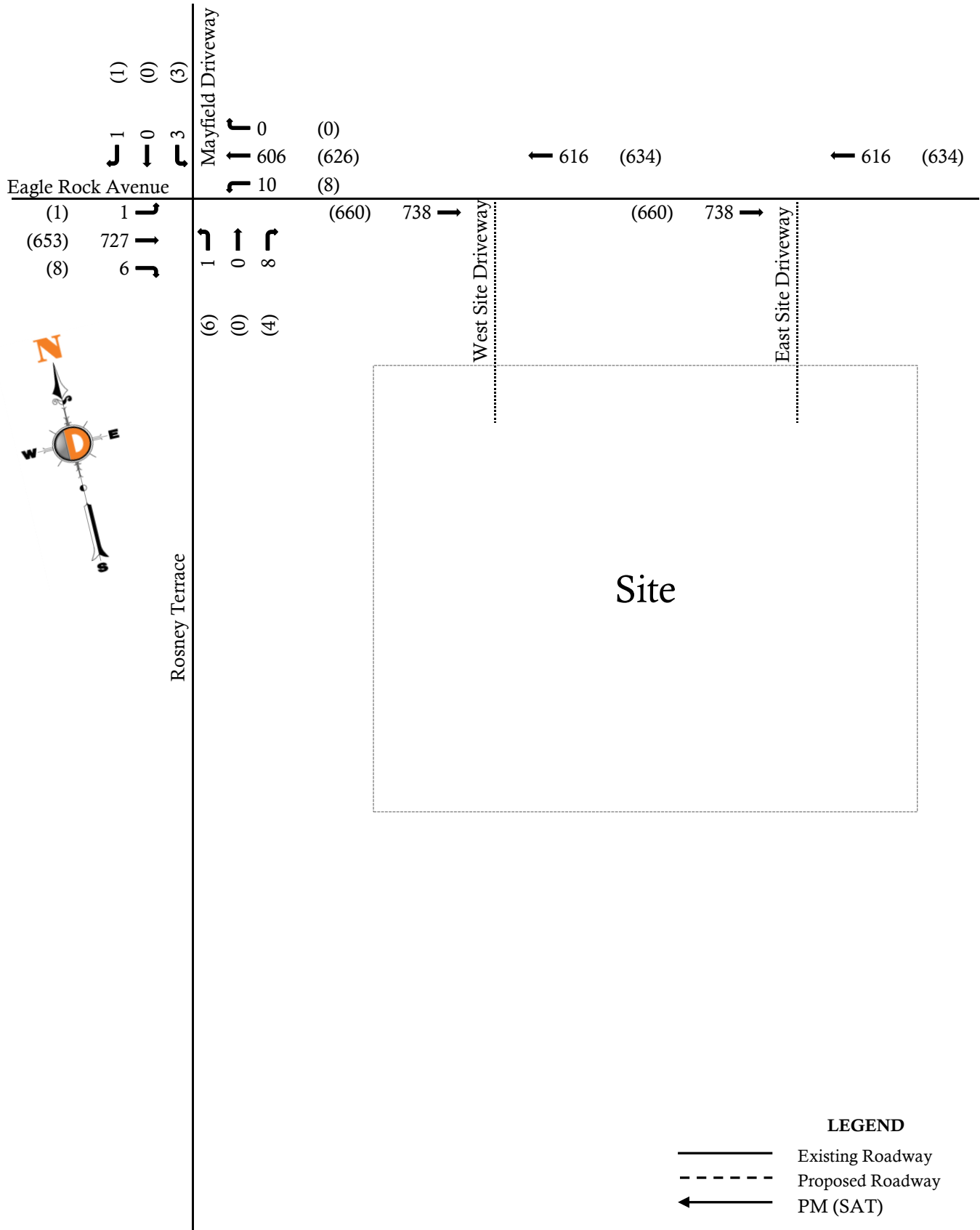
Traffic Volume Figures

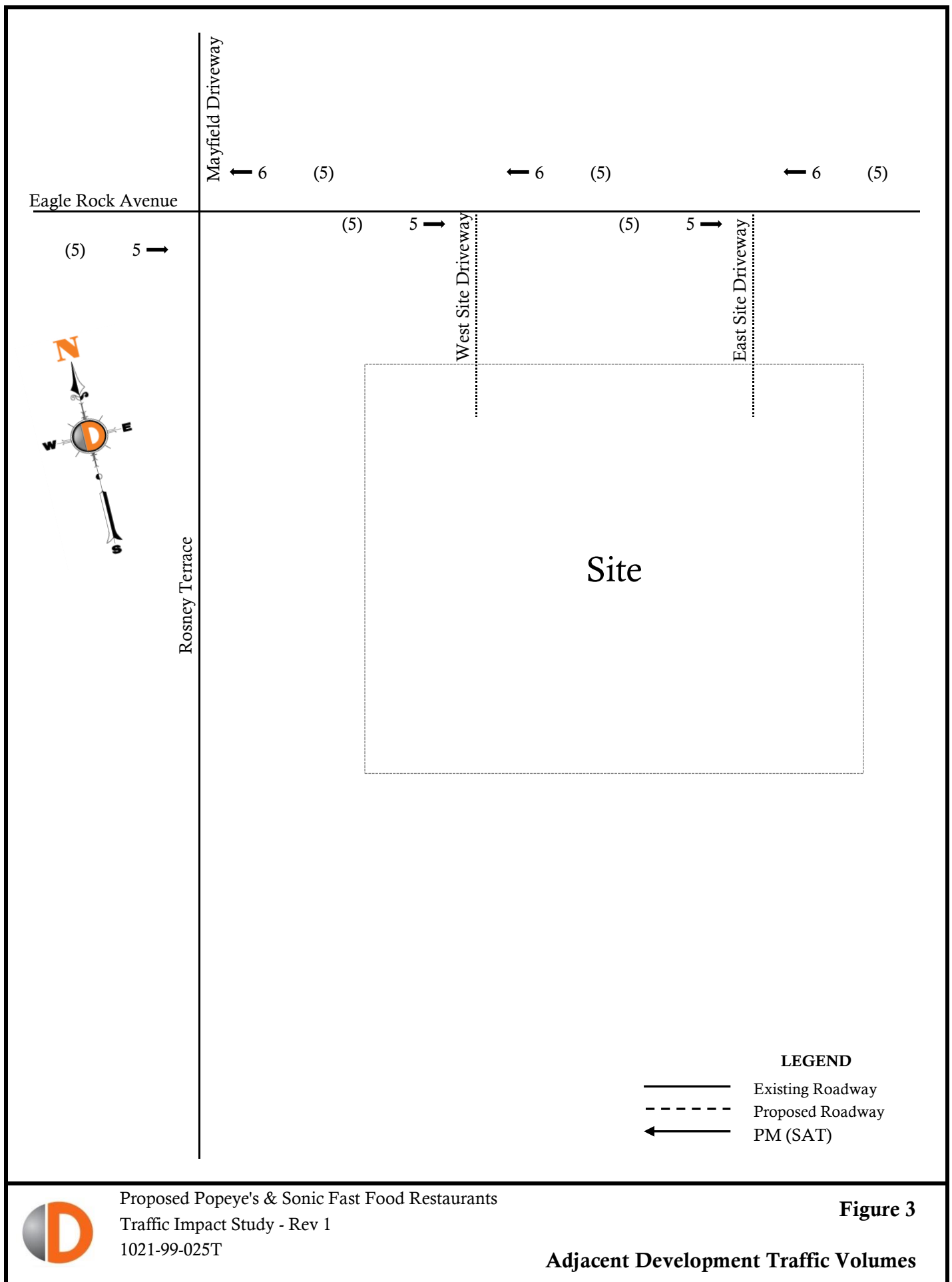


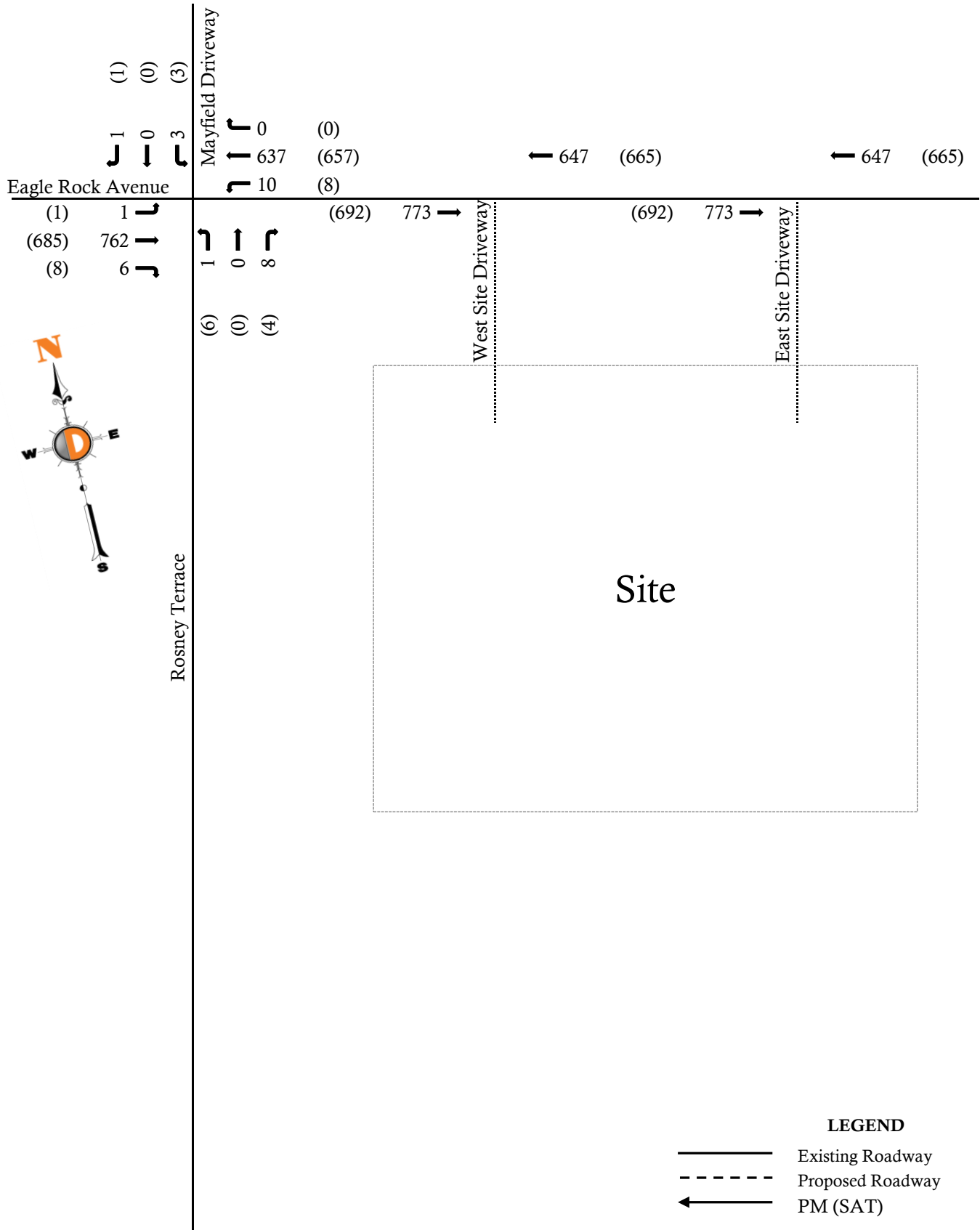
Proposed Popeye's & Sonic Fast Food Restaurants
 Traffic Impact Study - Rev 1
 1021-99-025T

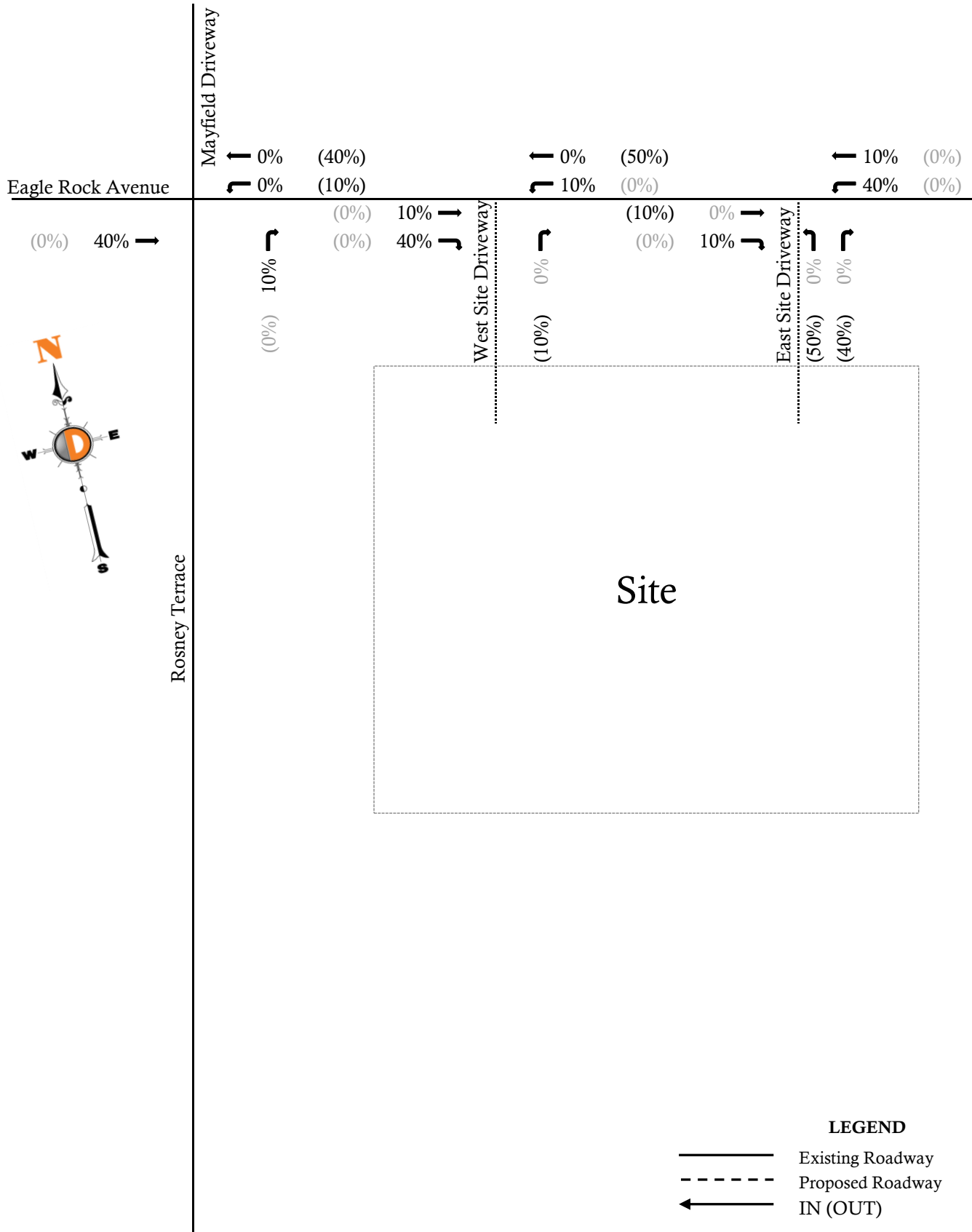
Figure 1

Site Location Map



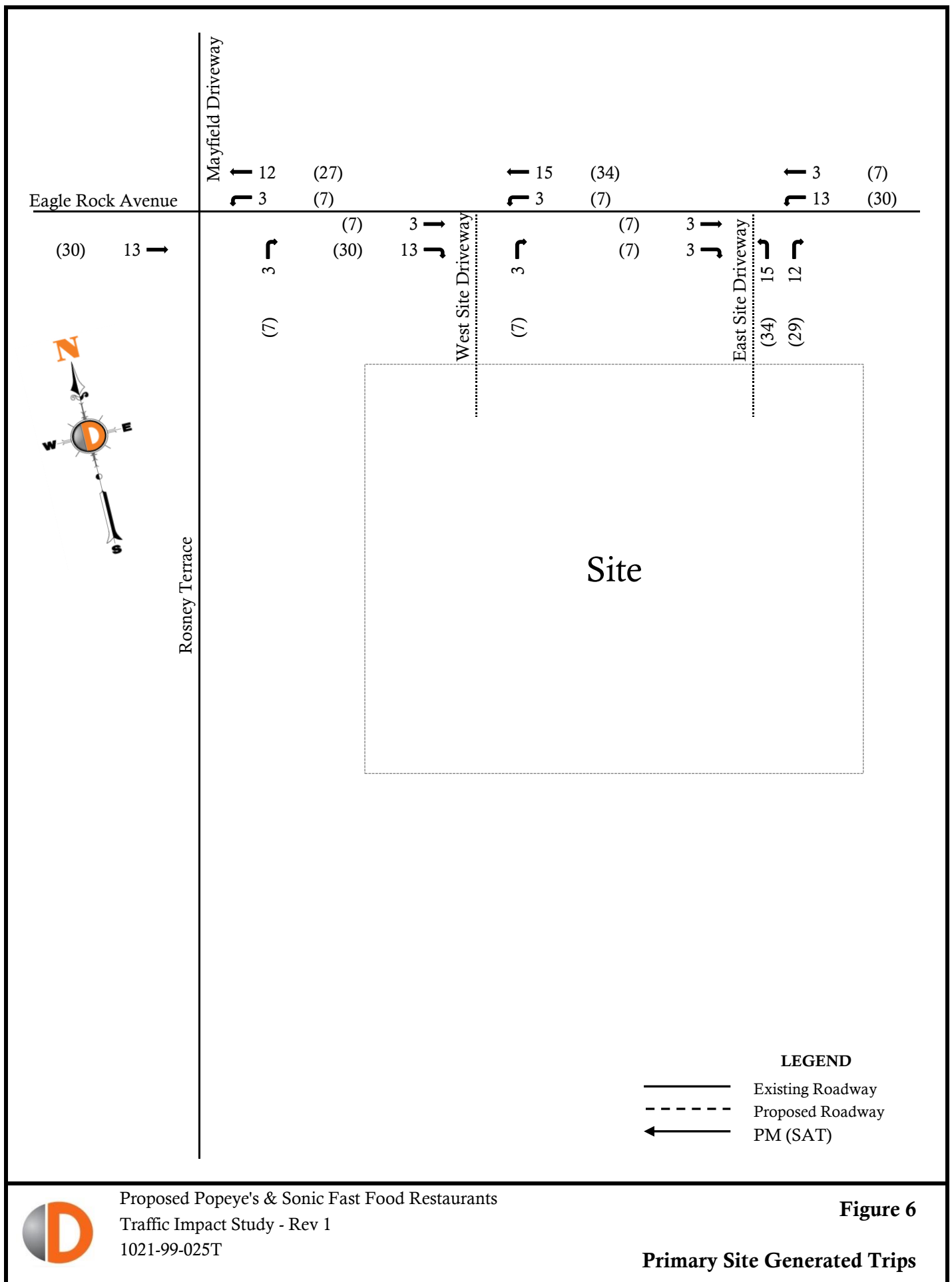


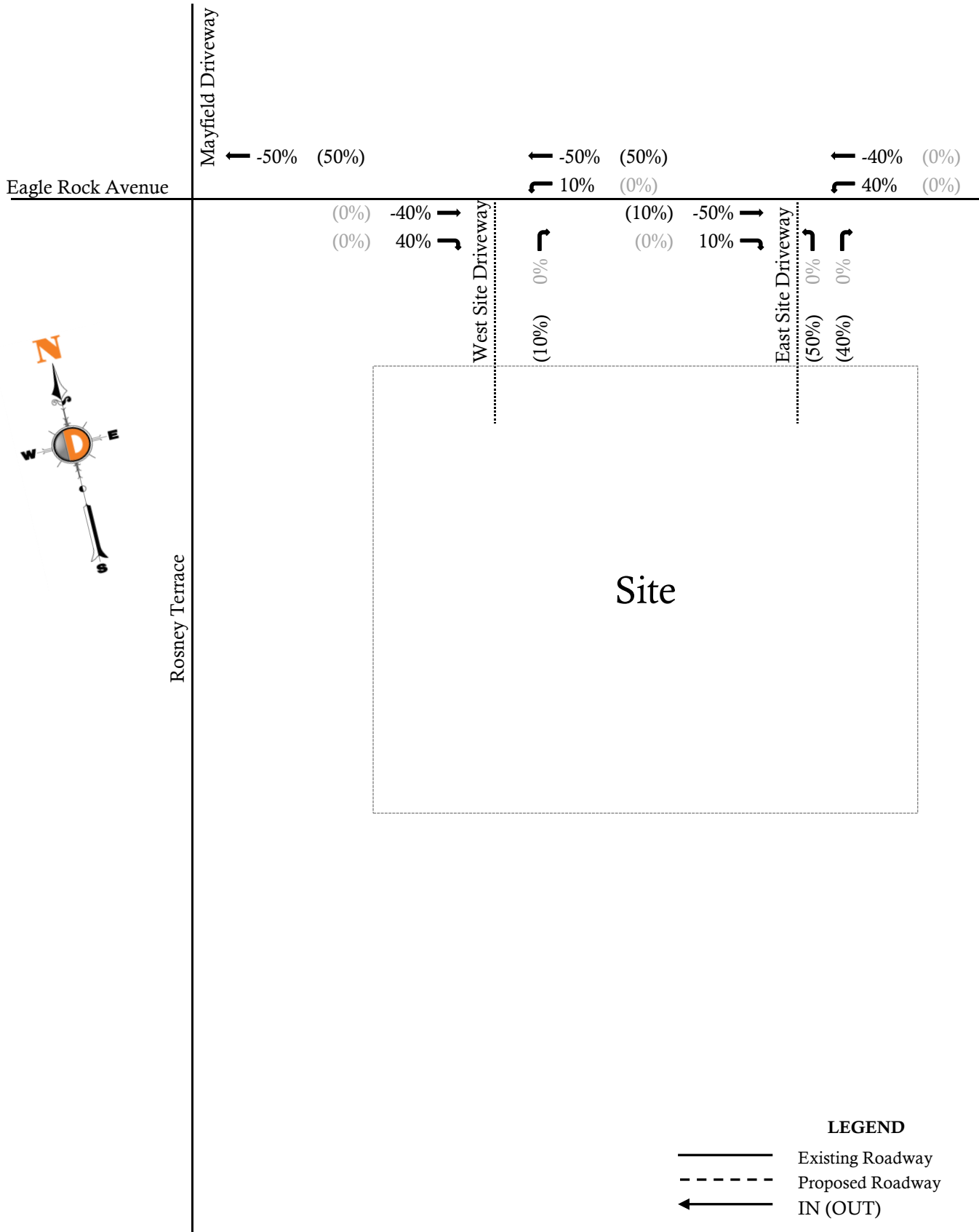


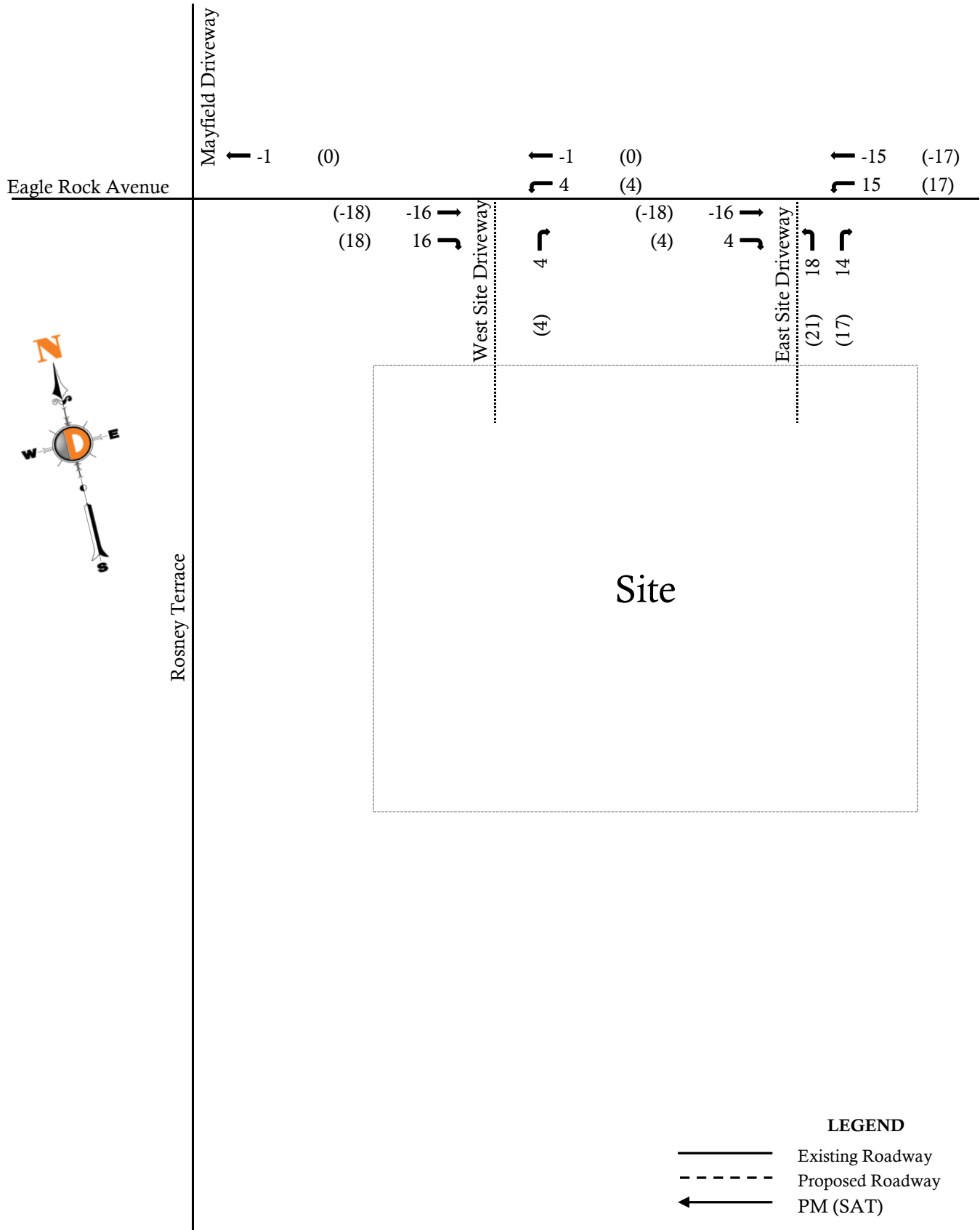


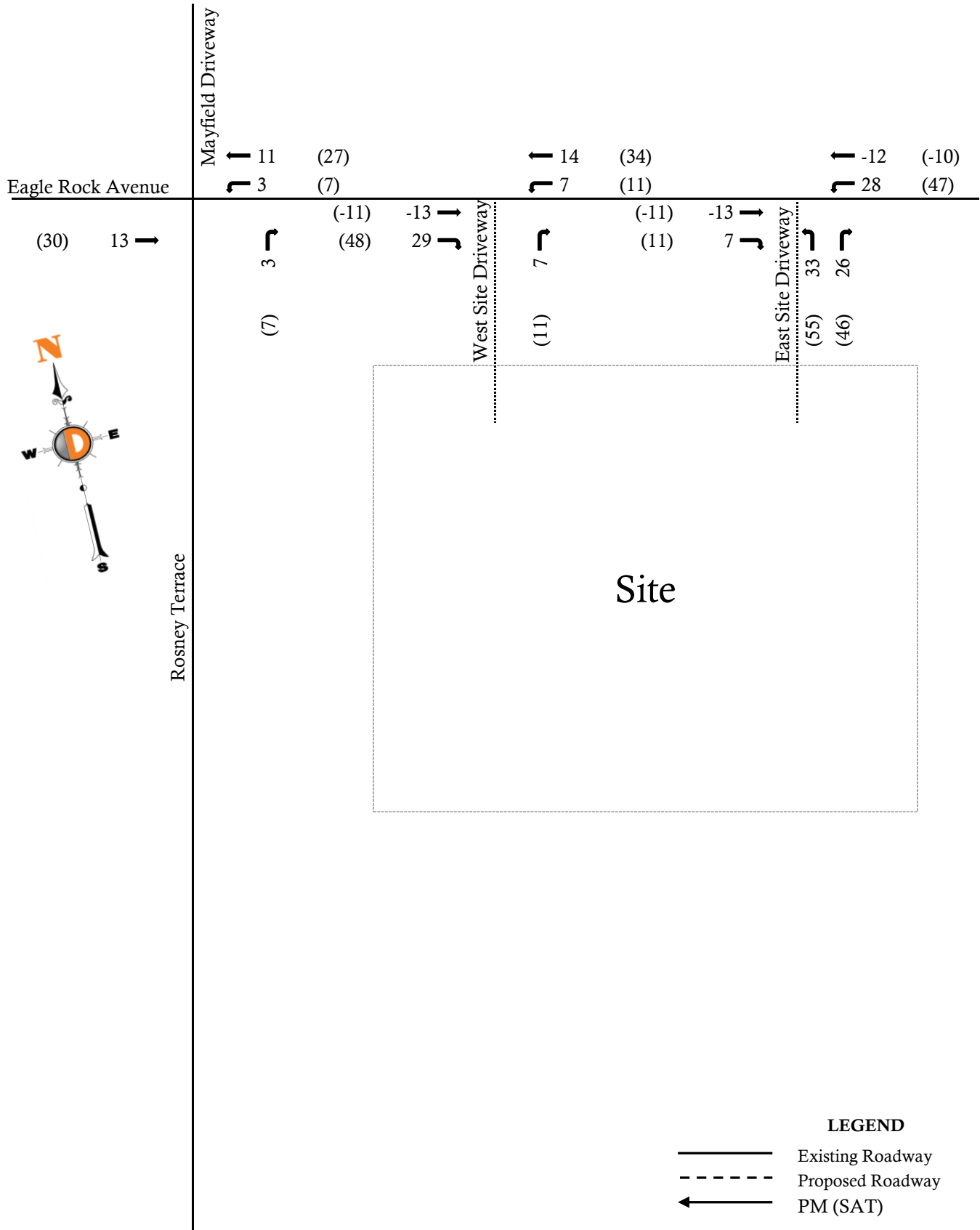
Proposed Popeye's & Sonic Fast Food Restaurants
 Traffic Impact Study - Rev 1
 1021-99-025T

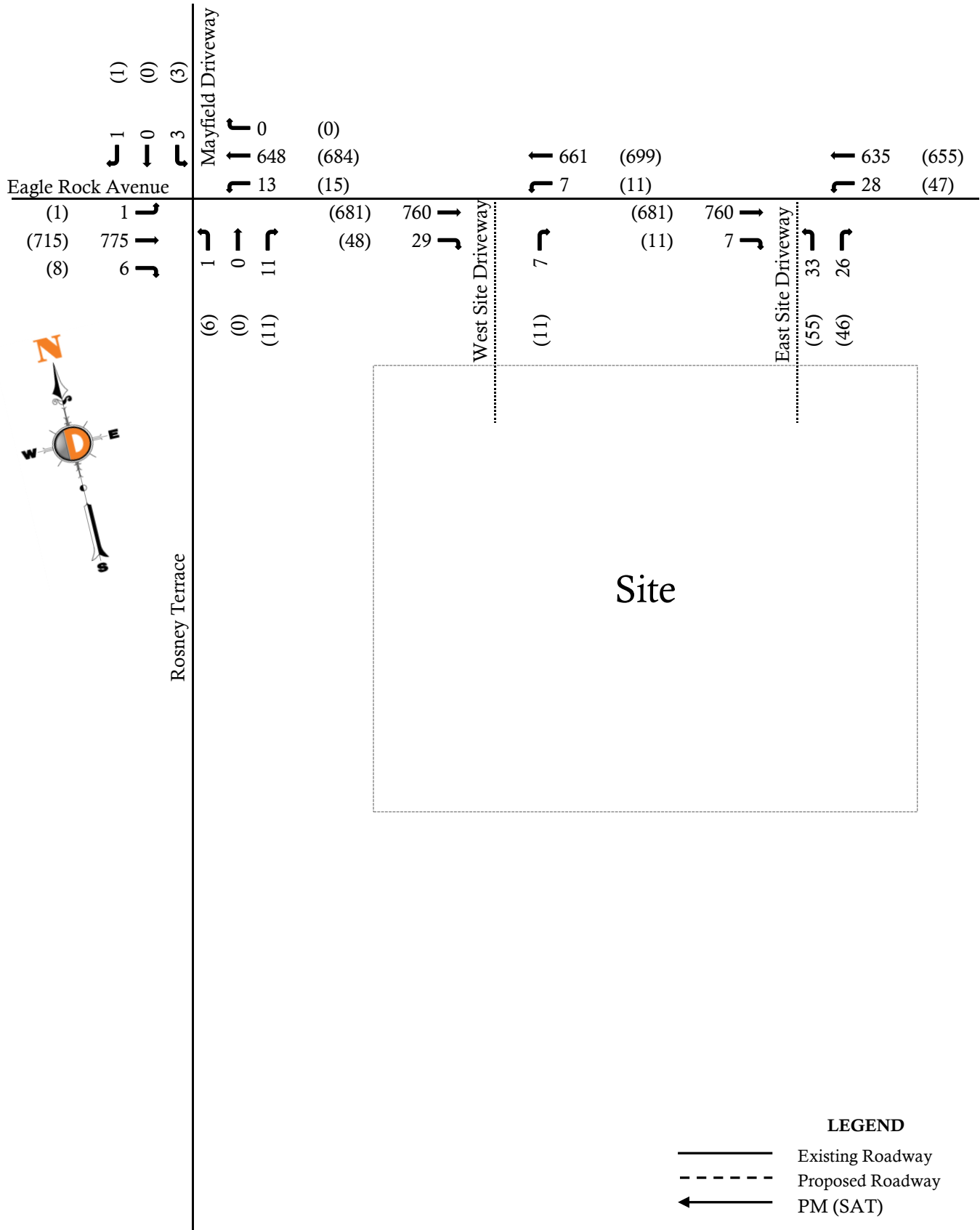
Figure 5
Percent Distribution
(Primary Trips)











Proposed Popeye's & Sonic Fast Food Restaurants
 Traffic Impact Study - Rev 1
 1021-99-025T

Figure 10

Build Traffic Volumes

Appendix B

Traffic Counts

1904 Main Street, Lake Como, NJ 07719
245 Main Street - Suite 110, Chester, NJ 07930
732-681-0760

E/W: Eagle Rock Ave
N/S: Rosney Terrace/Dway
Town/County: West Orange/Essex
Job #: 1021-99-025T

File Name : Eagle Rock Ave & Rosney Terrace-Dway - PM
Site Code : 00000000
Start Date : 5/26/2021
Page No : 1

Groups Printed- Cars - Trucks (SU) - Trucks (TT)

[illegible]

1904 Main Street, Lake Como, NJ 07719
245 Main Street - Suite 110, Chester, NJ 07930
732-681-0760

E/W: Eagle Rock Ave
N/S: Rosney Terrace/Dway
Town/County: West Orange/Essex
Job #: 1021-99-025T

File Name : Eagle Rock Ave & Rosney Terrace-Dway - SAT
Site Code : 00000000
Start Date : 5/22/2021
Page No : 1

Groups Printed- Cars - Trucks (SU) - Trucks (TT)

[illegible]

Dynamic Traffic, LLC

1904 Main Street, Lake Como, NJ 07719
245 Main Street - Suite 110, Chester, NJ 07930
732-681-0760

E/W: Eagle Rock Avenue
N/S: Prospect Avenue
Town/County: West Orange/Essex
Job #: 1797-16-001TE

File Name : Prospect Ave & Eagle Rock Ave PM
Site Code : 00000000
Start Date : 1/23/2018
Page No : 1

Groups Printed- Cars - Trucks

	Eagle Rock Avenue Eastbound					Eagle Rock Avenue Westbound					Prospect Avenue Northbound					Prospect Avenue Southbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
04:30 PM	16	73	50	0	139	117	67	16	0	200	76	216	134	0	426	28	189	7	1	225	990
04:45 PM	8	67	60	0	135	100	54	21	1	176	77	215	120	0	412	29	194	13	0	236	959
Total	24	140	110	0	274	217	121	37	1	376	153	431	254	0	838	57	383	20	1	461	1949
05:00 PM	19	72	65	0	156	104	51	18	0	173	94	218	158	0	470	25	168	10	0	203	1002
05:15 PM	11	83	52	0	146	98	51	23	0	172	80	180	158	0	418	30	158	15	2	205	941
05:30 PM	17	86	57	1	161	91	59	15	1	166	91	209	191	0	491	30	157	8	0	195	1013
05:45 PM	9	72	54	0	135	78	67	29	0	174	90	195	159	0	444	34	205	10	0	249	1002
Total	56	313	228	1	598	371	228	85	1	685	355	802	666	0	1823	119	688	43	2	852	3958
06:00 PM	11	70	51	0	132	88	50	8	1	147	97	183	187	0	467	33	166	11	3	213	959
06:15 PM	5	93	52	0	150	88	45	18	0	151	88	212	153	0	453	33	177	8	1	219	973
Grand Total	96	616	441	1	1154	764	444	148	3	1359	693	1628	1260	0	3581	242	1414	82	7	1745	7839
Apprch %	8.3	53.4	38.2	0.1		56.2	32.7	10.9	0.2		19.4	45.5	35.2	0		13.9	81	4.7	0.4		
Total %	1.2	7.9	5.6	0	14.7	9.7	5.7	1.9	0	17.3	8.8	20.8	16.1	0	45.7	3.1	18	1	0.1	22.3	
Cars	96	605	428	1	1130	756	438	145	3	1342	687	1614	1256	0	3557	238	1401	82	7	1728	7757
% Cars	100	98.2	97.1	100	97.9	99	98.6	98	100	98.7	99.1	99.1	99.7	0	99.3	98.3	99.1	100	100	99	99
Trucks	0	11	13	0	24	8	6	3	0	17	6	14	4	0	24	4	13	0	0	17	82
% Trucks	0	1.8	2.9	0	2.1	1	1.4	2	0	1.3	0.9	0.9	0.3	0	0.7	1.7	0.9	0	0	1	1

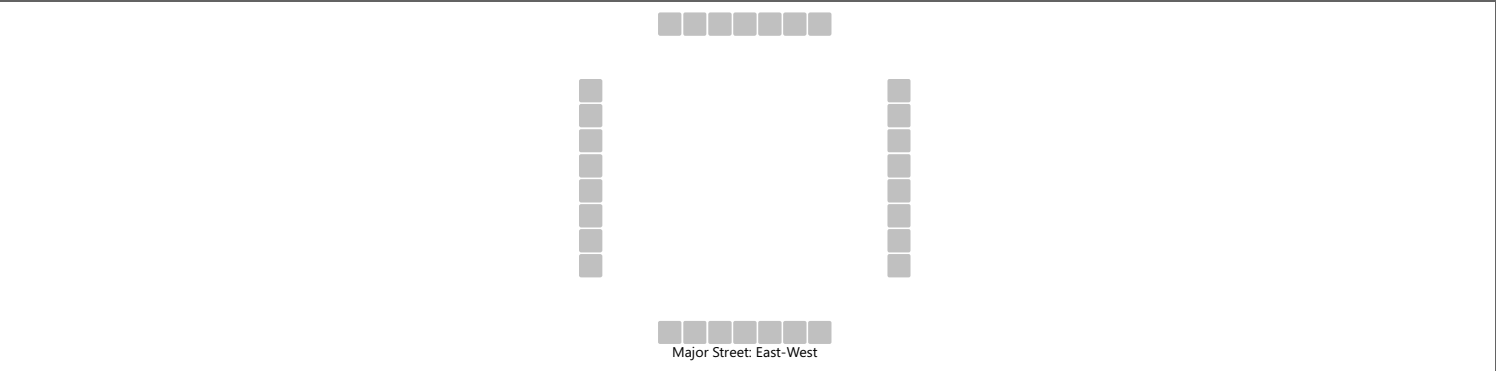
Appendix C

Capacity Analysis

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & Rosney/Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	EX	North/South Street	Rosney Terrace/Driveway
Time Analyzed	PM PSH	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	1	0		0	1	0
Configuration		LT		TR		LT		TR			LTR				LTR	
Volume (veh/h)		1	727	6		10	606	0		1	0	8		3	0	1
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									-2				2			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.10	6.10	6.70		7.90	6.90	7.10
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

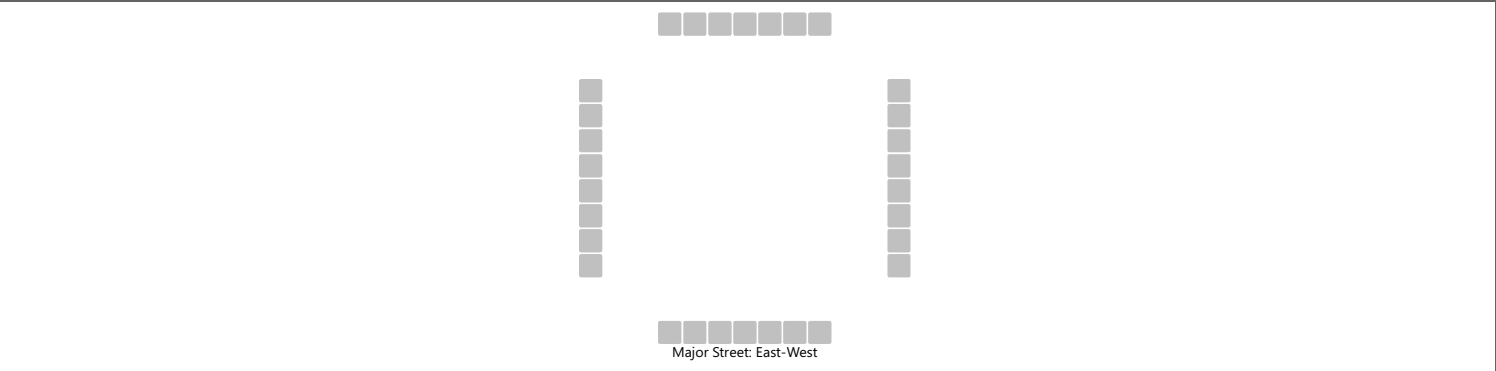
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				11					9				4	
Capacity, c (veh/h)		956				852					498				198	
v/c Ratio		0.00				0.01					0.02				0.02	
95% Queue Length, Q ₉₅ (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		8.8	0.0			9.3	0.1				12.4				23.6	
Level of Service (LOS)		A	A			A	A				B				C	
Approach Delay (s/veh)	0.0				0.3				12.4				23.6			
Approach LOS	A				A				B				C			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & Rosney/Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	EX	North/South Street	Rosney Terrace/Driveway
Time Analyzed	SAT PSH	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	1	0		0	1	0
Configuration		LT		TR		LT		TR			LTR				LTR	
Volume (veh/h)		1	653	8		8	626	0		6	0	4		3	0	1
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									-2				2			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.10	6.10	6.70		7.90	6.90	7.10
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

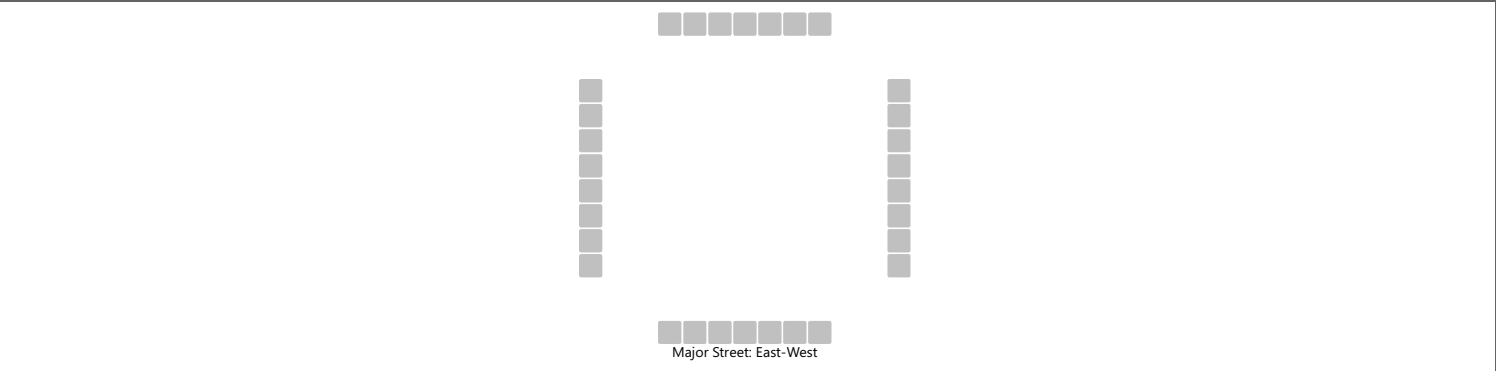
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				8					11				4	
Capacity, c (veh/h)		939				909					286				206	
v/c Ratio		0.00				0.01					0.04				0.02	
95% Queue Length, Q ₉₅ (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		8.8	0.0			9.0	0.1				18.1				22.8	
Level of Service (LOS)		A	A			A	A				C				C	
Approach Delay (s/veh)	0.0				0.2				18.1				22.8			
Approach LOS	A				A				C				C			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & Rosney/Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	NB	North/South Street	Rosney Terrace/Driveway
Time Analyzed	PM PSH	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	1	0		0	1	0
Configuration		LT		TR		LT		TR			LTR				LTR	
Volume (veh/h)		1	762	6		10	637	0		1	0	8		3	0	1
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									-2				2			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.10	6.10	6.70		7.90	6.90	7.10
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

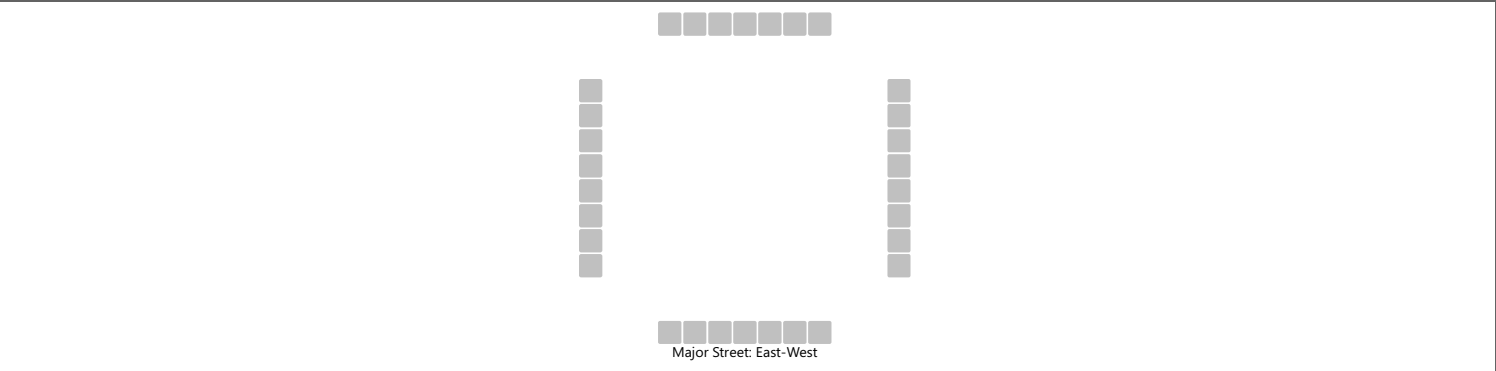
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				11					9				4	
Capacity, c (veh/h)		929				826					476				181	
v/c Ratio		0.00				0.01					0.02				0.02	
95% Queue Length, Q ₉₅ (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		8.9	0.0			9.4	0.1				12.7				25.4	
Level of Service (LOS)		A	A			A	A				B				D	
Approach Delay (s/veh)	0.0				0.3				12.7				25.4			
Approach LOS	A				A				B				D			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & Rosney/Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	NB	North/South Street	Rosney Terrace/Driveway
Time Analyzed	SAT PSH	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	1	0		0	1	0
Configuration		LT		TR		LT		TR			LTR				LTR	
Volume (veh/h)		1	685	8		8	657	0		6	0	4		3	0	1
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									-2				2			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.10	6.10	6.70		7.90	6.90	7.10
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

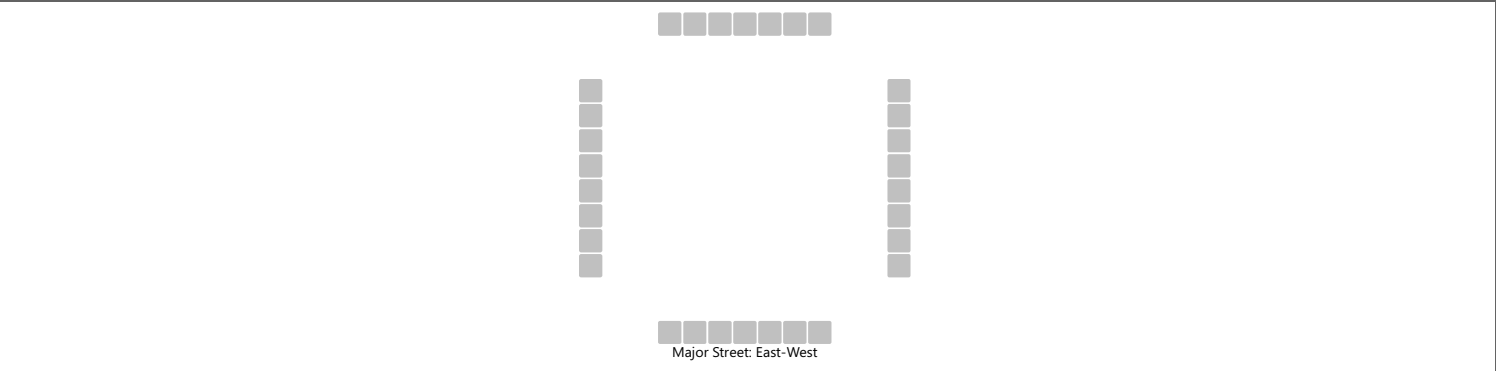
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				8					11				4	
Capacity, c (veh/h)		913				884					267				190	
v/c Ratio		0.00				0.01					0.04				0.02	
95% Queue Length, Q ₉₅ (veh)		0.0				0.0					0.1				0.1	
Control Delay (s/veh)		8.9	0.0			9.1	0.1				19.0				24.4	
Level of Service (LOS)		A	A			A	A				C				C	
Approach Delay (s/veh)	0.0				0.2				19.0				24.4			
Approach LOS	A				A				C				C			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & Rosney/Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	FB	North/South Street	Rosney Terrace/Driveway
Time Analyzed	PM PSH	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	1	0		0	1	0
Configuration		LT		TR		LT		TR			LTR				LTR	
Volume (veh/h)		1	775	6		13	648	0		1	0	11		3	0	1
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									-2				2			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.10	6.10	6.70		7.90	6.90	7.10
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

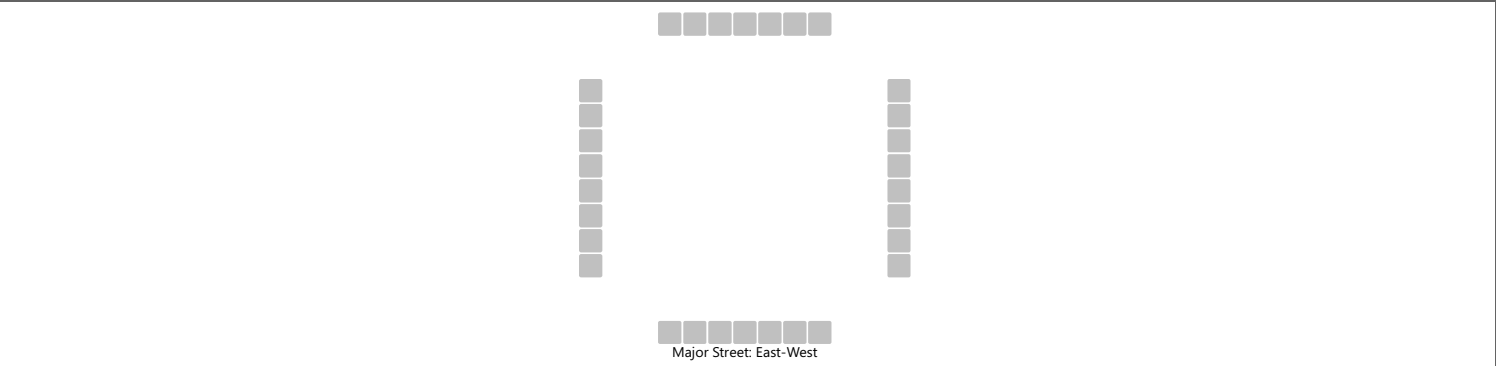
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				14					13				4	
Capacity, c (veh/h)		920				816					495				172	
v/c Ratio		0.00				0.02					0.03				0.02	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					0.1				0.1	
Control Delay (s/veh)		8.9	0.0			9.5	0.2				12.5				26.5	
Level of Service (LOS)		A	A			A	A				B				D	
Approach Delay (s/veh)	0.0				0.4				12.5				26.5			
Approach LOS	A				A				B				D			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & E. Site Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	FB	North/South Street	East Site Driveway
Time Analyzed	PM PSH	Peak Hour Factor	0.97
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	1	0		0	0	0
Configuration			T	TR		LT	T				LR					
Volume (veh/h)			760	7		28	635			33		26				
Percent Heavy Vehicles (%)						0				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1					7.5		6.9			
Critical Headway (sec)						4.10					6.84		6.94			
Base Follow-Up Headway (sec)						2.2					3.5		3.3			
Follow-Up Headway (sec)						2.20					3.52		3.32			

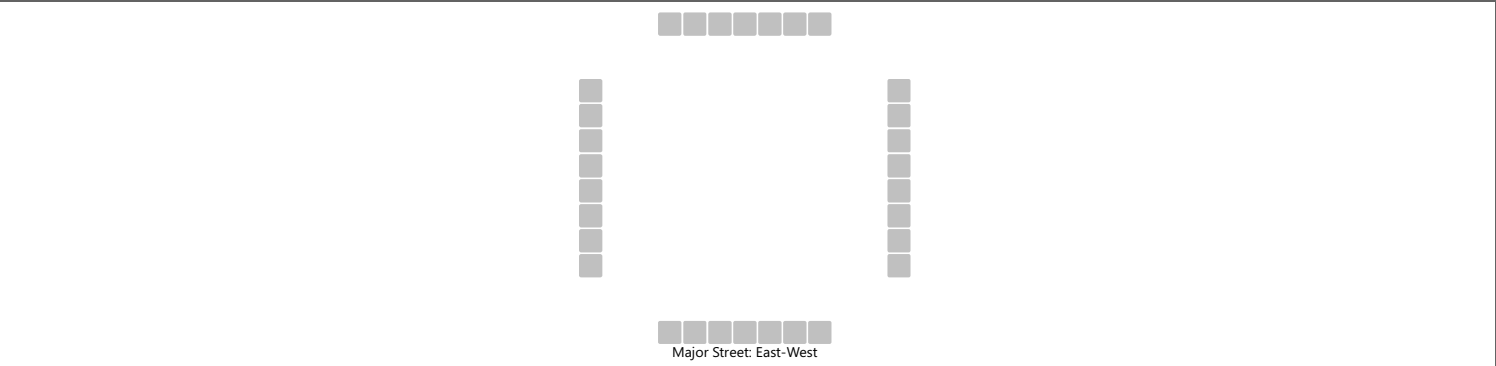
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						29					61					
Capacity, c (veh/h)						838					258					
v/c Ratio						0.03					0.24					
95% Queue Length, Q ₉₅ (veh)						0.1					0.9					
Control Delay (s/veh)						9.4	0.4				23.2					
Level of Service (LOS)						A	A				C					
Approach Delay (s/veh)					0.7				23.2							
Approach LOS					A				C							

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & W. Site Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	FB	North/South Street	West Site Driveway
Time Analyzed	PM PSH	Peak Hour Factor	0.97
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	1		0	0	0
Configuration			T	TR		LT	T					R				
Volume (veh/h)			760	29		7	661					7				
Percent Heavy Vehicles (%)						0						2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									No							
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1						6.9				
Critical Headway (sec)						4.10						6.94				
Base Follow-Up Headway (sec)						2.2						3.3				
Follow-Up Headway (sec)						2.20						3.32				

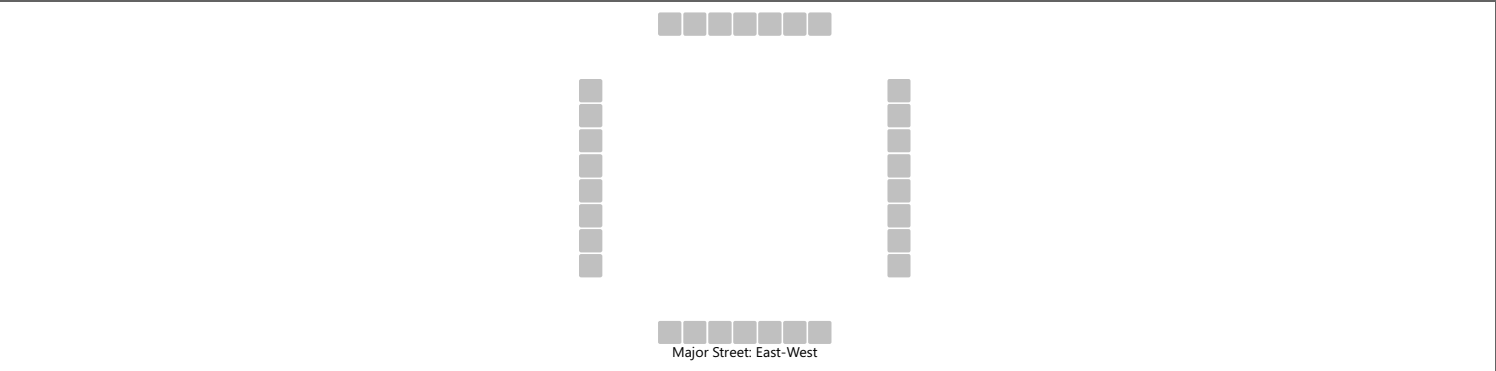
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						7						7				
Capacity, c (veh/h)						822						594				
v/c Ratio						0.01						0.01				
95% Queue Length, Q ₉₅ (veh)						0.0						0.0				
Control Delay (s/veh)						9.4	0.1					11.1				
Level of Service (LOS)						A	A					B				
Approach Delay (s/veh)					0.2				11.1							
Approach LOS					A				B							

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & Rosney/Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	FB	North/South Street	Rosney Terrace/Driveway
Time Analyzed	SAT PSH	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	1	0		0	1	0
Configuration		LT		TR		LT		TR			LTR				LTR	
Volume (veh/h)		1	715	8		15	684	0		6	0	11		3	0	1
Percent Heavy Vehicles (%)		0				0				0	0	0		0	0	0
Proportion Time Blocked																
Percent Grade (%)									-2				2			
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		4.1				4.1				7.5	6.5	6.9		7.5	6.5	6.9
Critical Headway (sec)		4.10				4.10				7.10	6.10	6.70		7.90	6.90	7.10
Base Follow-Up Headway (sec)		2.2				2.2				3.5	4.0	3.3		3.5	4.0	3.3
Follow-Up Headway (sec)		2.20				2.20				3.50	4.00	3.30		3.50	4.00	3.30

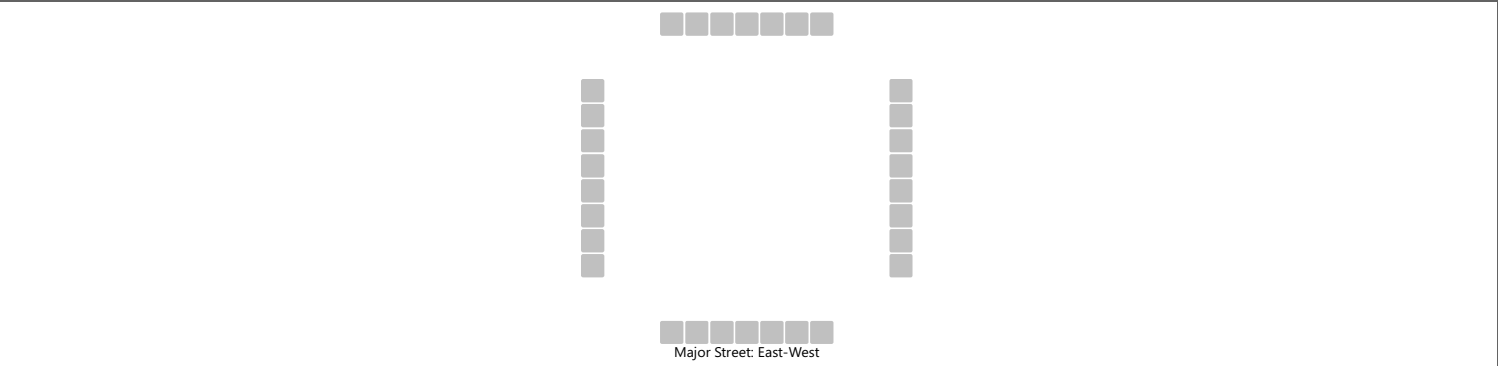
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)		1				16					18				4	
Capacity, c (veh/h)		891				860					326				168	
v/c Ratio		0.00				0.02					0.05				0.03	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					0.2				0.1	
Control Delay (s/veh)		9.0	0.0			9.3	0.2				16.7				27.0	
Level of Service (LOS)		A	A			A	A				C				D	
Approach Delay (s/veh)	0.0				0.4				16.7				27.0			
Approach LOS	A				A				C				D			

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & E. Site Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	FB	North/South Street	East Site Driveway
Time Analyzed	SAT PSH	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	1	0		0	0	0
Configuration			T	TR		LT	T				LR					
Volume (veh/h)			681	11		47	655			55		46				
Percent Heavy Vehicles (%)						0				2		2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1					7.5		6.9			
Critical Headway (sec)						4.10					6.84		6.94			
Base Follow-Up Headway (sec)						2.2					3.5		3.3			
Follow-Up Headway (sec)						2.20					3.52		3.32			

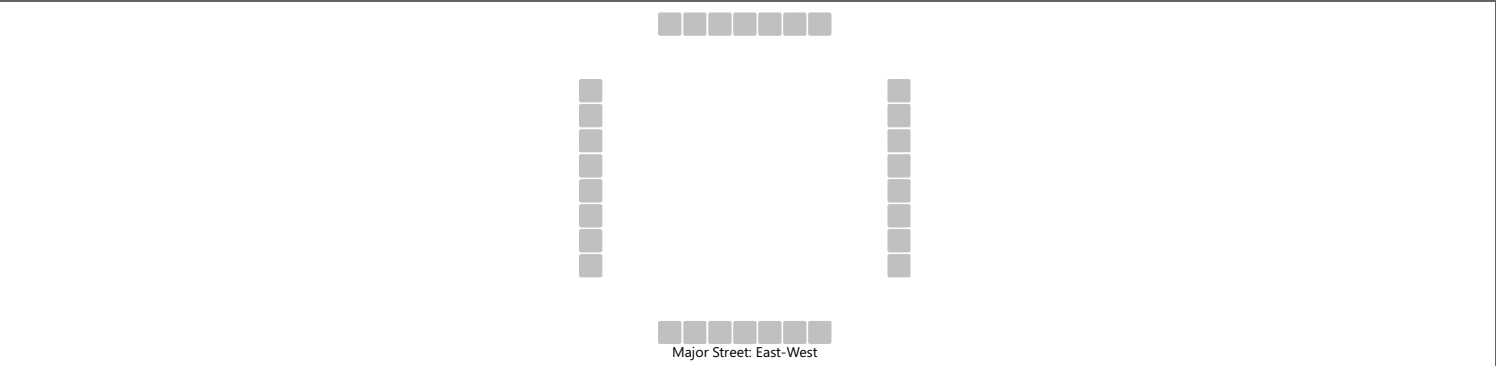
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						49					106					
Capacity, c (veh/h)						884					260					
v/c Ratio						0.06					0.41					
95% Queue Length, Q ₉₅ (veh)						0.2					1.9					
Control Delay (s/veh)						9.3	0.6				28.1					
Level of Service (LOS)						A	A				D					
Approach Delay (s/veh)					1.1				28.1							
Approach LOS					A				D							

HCS Two-Way Stop-Control Report

General Information		Site Information	
Analyst	CGH	Intersection	Eagle Rock & W. Site Dway
Agency/Co.	Dynamic Traffic	Jurisdiction	Essex County
Date Performed	3/28/2023	East/West Street	Eagle Rock Avenue
Analysis Year	FB	North/South Street	West Site Driveway
Time Analyzed	SAT PSH	Peak Hour Factor	0.95
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description	1021-99-025T		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	2	0	0	0	2	0		0	0	1		0	0	0
Configuration			T	TR		LT	T					R				
Volume (veh/h)			681	48		11	699					11				
Percent Heavy Vehicles (%)						0						2				
Proportion Time Blocked																
Percent Grade (%)									0							
Right Turn Channelized									No							
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)						4.1						6.9				
Critical Headway (sec)						4.10						6.94				
Base Follow-Up Headway (sec)						2.2						3.3				
Follow-Up Headway (sec)						2.20						3.32				

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)						12						12				
Capacity, c (veh/h)						855						614				
v/c Ratio						0.01						0.02				
95% Queue Length, Q ₉₅ (veh)						0.0						0.1				
Control Delay (s/veh)						9.3	0.2					11.0				
Level of Service (LOS)						A	A					B				
Approach Delay (s/veh)					0.3				11.0							
Approach LOS					A				B							