Traffic Evaluation

Central Middle School Athletic Field
Renovation Project
Greenwich, Connecticut
Town Contract #6720
November 12, 2019

MMI #5062-10-04

Prepared for:
Mr. Daniel M. Watson
Director of School Facilities
Greenwich Public School
290 Greenwich Avenue
Greenwich, Connecticut 06830

Prepared by:
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MILONE & MACBROOM
ENGINEERING | PLANNING | LANDSCAPE ARCHITECTURE | ENVIRONMENTAL SCIENCE

MILONE & MACBROOM

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Mr. Daniel M. Watson
Director of School Facilities
Greenwich Public School
290 Greenwich Avenue
Greenwich, CT 06830

RE: Traffic Evaluation
Central Middle School Athletic Field Renovation Project
Greenwich, Connecticut
Town Contract #6720
MMI #5062-10-04

Dear Mr. Watson:

At the request of Greenwich Public Schools, Milone & MacBroom, Inc. (MMI) has prepared this traffic evaluation to assess the feasibility of renovating and converting the existing natural grass athletic field at Central Middle School to synthetic turf.

Three field redevelopment options are proposed, including natural grass, synthetic turf, and a hybrid using synthetic turf and natural grass, and are as follows:

Option 1: Includes the restoration of the existing athletic fields utilizing 100% natural grass. The field will be composed of a soccer field, baseball field, and soft ball field.

Option 2: Includes the complete conversion of all grassy areas to synthetic turf. The uses of the field will be similar to that of Option 1, also including a soccer field, baseball field, and soft ball field.

Option 3: Is a hybrid field composed of a synthetic multipurpose/soccer field with a baseball/softball field with a natural grass outfield. This option does not accommodate concurrent baseball and softball activity like Options 1 and 2.

The traffic evaluation will investigate the benefits and/or impacts resulting from each of the following proposed field improvement options. The analysis involved a number of tasks, including data collection, the determination of future traffic, an estimation of traffic volumes to be generated under each field improvement option, and an evaluation of safety as well as expected traffic impacts. This report summarizes our data collection, analyses, and findings.

Existing Roadway and Site Environs

Stanwich Road is classified as a local road to the north of the intersection of Indian Rock Lane at Stanwich Road, transitioning to a collector to the south of the intersection. This roadway has one travel lane in each direction, with 1- to 2-foot shoulders sparsely located on both sides of the road. A bituminous sidewalk is present on the west side of the road south of the intersection with Indian Rock Lane. The posted speed limit on Stanwich Road is 30 miles per hour (mph).

Orchard Street is classified as a local road to the north of the intersection of Indian Rock Lane at Orchard Street Road, also transitioning to a collector to the south of the intersection. This roadway has one travel lane in each direction, with 1- to 2-foot shoulders sparsely located on both sides of the road. A bituminous sidewalk is present on the west side of the road south of the intersection with Indian Rock Lane. The posted speed limit on Orchard Street is 25 mph.

Indian Rock Lane is classified as a collector that runs from Stanwich Road to the west, to Orchard Road to the east, with the site located on the north side. Access to Central Middle School and the proposed sports field will be via this road. Sidewalks with a grass buffer are present on the north side of the road. The expanse of the road is classified as a school zone with a posted speed limit of 20 mph.

For this traffic evaluation, the following intersections were included in the study area:

- Stanwich Road at Indian Rock Lane
- Stanwich Road at Orchard Street
- Orchard Street at Indian Rock Lane
- Indian Rock Lane at Central Middle School western driveway
- Indian Rock Lane at Central Middle School eastern driveway

<u>Intersection Sight Distance</u>

Access to the renovated athletic field for all users will be via the existing Central Middle School driveways. Visibility from the school driveways was reviewed using minimum intersection sight distance (ISD) guidelines from the Connecticut Department of Transportation (CTDOT). Sight lines were assessed for a speed limit of 25 mph. The CTDOT minimum ISD guideline for this speed limit is 280 feet. Sight lines are met/exceeded from all points of access albeit the adjacent all-way-stop T intersections (Stanwich Road at Indian Rock Lane and Indian Rock Lane at Orchard Street) are approximately 200 feet away.

<u>Vehicular Crash History</u>

Traffic accident data for the latest 3-year period on record, October 15, 2016, through October 15, 2019, for the study intersections was obtained from the University of Connecticut's Connecticut Crash Data Repository. The crash data collected for this 3-year period is depicted in Table 1 and is summarized by intersection, accident severity, and collision type.

TABLE 1
Crash Summary

LOCATION:	SERIOUS INJURY	SUSPECTED MINOR INJURY	PROPERTY DAMAGE ONLY	TOTAL	TYPE OF COLLISION: Angle	Rear-End	Fixed-Object, Pole, or Support	Pedestrian	Embankment	TOTAL
Stanwich Road at Indian Rock Lane	0	0	3	**3**	0	2	1	0	0	**3**
Stanwich Road at Orchard Street	0	1	1	**2**	0	0	1	0	1	**2**
Indian Rock Lane at Orchard Street	0	1	2	**3**	1	0	1	1	0	**3**
TOTAL	**0**	**2**	**6**	**8**	**1**	**2**	**3**	**1**	**1**	**8**

Source: University of Connecticut's Connecticut Crash Data Repository from October 15, 2016, to October 15, 2019

A total of eight crashes were reported during the latest 3-year period on record within the study area. Three-fourths of the collisions resulted in only property damage, with the remaining resulting in a suspected minor injury. The most common collision type involved collisions with a fixed object, pole, or fixed support, followed by rear-end collisions. Pedestrians were involved in one of the reported crashes. It should be noted none of the crashes took place at or near the Central Middle School driveways on Indian Rock Lane. No fatalities were reported during this time.

<u>Existing Traffic Volumes</u>

Manual turning movement counts were conducted during the fall sports season on Thursday, October 4, 2018, from 2:00 p.m. to 8:00 p.m. The following intersections were counted during this time:

- Stanwich Road at Indian Rock Lane
- Stanwich Road at Orchard Street
- Orchard Street at Indian Rock Lane
- Indian Rock Lane at Central Middle School western driveway
- Indian Rock Lane at Central Middle School eastern driveway

Traffic was found to peak from 3:15 p.m. to 4:15 p.m., coinciding with the dismissal of Central Middle School after school sports activities. Peak-hour traffic volumes for the after-school peak hour are illustrated in Figure 2. Additionally, Town of Greenwich parks and recreational activities were found to peak from 5:15 p.m. to 6:15 p.m. and are illustrated in Figure 3.

<u>Current Athletic Field Activity Schedule</u>

Based on the information provided to MMI by the Town of Greenwich, typical activities on the athletic field during the fall and spring seasons are presented in Table 2 and Table 3, respectively.

TABLE 2
Fall Season Athletic Field Activities

Athletic Field Use Fall Season	NUMBER OF USERS ON THE FIELD Time of Use	
	WEEKDAY ACTIVITY	**WEEKEND ACTIVITY**
Central Middle School (CMS) Activities		
CMS Field Hockey Games and/or Practices	3:00 p.m. – 5:30 p.m.	No Scheduled Use
CMS Soccer Games and/or Practices	3:00 p.m. – 5:30 p.m.	No Scheduled Use
Town League and Community Activities		
Adult Soccer	No Scheduled Use	Mornings
Town Travel Soccer	Evenings after 5:30 p.m.	Afternoons
Flag Football	No Scheduled Use	Evenings

TABLE 3
Spring Season Athletic Field Activities

Athletic Field Use Spring Season	NUMBER OF USERS ON THE FIELD Time of Use	
	WEEKDAY ACTIVITY	**WEEKEND ACTIVITY**
Central Middle School (CMS) Activities		
CMS Baseball/Softball Games and/or Practices	3:00 p.m. – 5:30 p.m.	No Scheduled Use
Track and Field Meets and/or Practices	3:00 p.m. – 5:30 p.m.	No Scheduled Use
Town League and Community Activities		
Adult Soccer/Youth Softball	No Scheduled Use	Mornings
Town Travel Soccer	Evenings after 5:30 p.m.	Afternoons

Athletic Field Trip Generation

Vehicle trips associated with the field usage were evaluated for both the fall and spring season activities, known to be the peak seasons of the year for athletic field activity. The methodology used for site trip generation was based on the number of players and number of coaches anticipated to be on the field during peak activity. Although conservative, each person on the field was assumed to generate an individual vehicle trip in the analysis for this evaluation. The anticipated site traffic for each of the uses is presented in Table 4 below.

TABLE 4
Athletic Field Activity Trip Generation

Athletic Field Activities	NUMBER OF TRIPS					
	OPTION 1 FIELD ACTIVITY		OPTION 2 FIELD ACTIVITY		OPTION 3 FIELD ACTIVITY	
	IN	OUT	IN	OUT	IN	OUT
Weekday Fall Season Field Users (Central Middle School)						
CMS Boys Soccer (two teams)	34	36	34	36	34	36
CMS Girls Soccer	16	18	16	18	16	18
CMS Student Field Hockey	11	12	11	12	11	12
Total Trips –	***61***	***66***	***61***	***66***	***61***	***66***
Weekday Fall Season Field Users (Town and Community Leagues)						
Travel Soccer	16	16	16	16	16	16
Weekend Fall Season Field Users (Town and Community Leagues)						
Adult Soccer	16	16	16	16	16	16
Travel Soccer	16	16	16	16	16	16
Flag Football	18	18	18	18	18	18
Weekday Spring Season Field Users (Central Middle School)						
CMS Baseball/Softball	30	32	30	32	15	16
CMS Track and Field	20	21	20	21	20	21
Total New Trips –	***50***	***53***	***50***	***53***	**35**	**37**
Weekday Spring Season Field Users (Town and Community Leagues)						
Travel Soccer	16	16	16	16	16	16
Weekend Spring Season Field Users (Town and Community Leagues)						
Adult Soccer	16	16	16	16	16	16
Travel Soccer	16	16	16	16	16	16
Flag Football	18	18	18	18	18	18

As illustrated in Table 4, the fall season typically generates more trips based on the higher number of different sporting activities as well as the size of teams. Fall activity is estimated to generate about 20 percent more trips in comparison with the spring season regardless of the type of athletic field. Trips associated with each of the field options is not expected to differ during the peak-hour activity in the fall season as each option would be supporting the same type of sporting activity. In the spring, Options 1 and 2 would generate similar peak-hour volumes; however, Option 3 is expected to be lower given that this option does not accommodate baseball and softball at the same time.

Due to differences in field material and their durability, the frequency of use of each field option is however expected to be different. Consequently, the total number of trips in the course of a given year is anticipated to vary for each option. For instance, during the off-peak season from December to March a natural grass field will probably not be utilized whereas a synthetic turf field can be utilized if it is not covered with snow. A synthetic turf field could therefore generate in order of magnitude about10% to 20% more use than a natural grass field in the course of a given year.

Given that the athletic field is currently in use and CMS athletic activity is not anticipated to significantly change from existing activity, additional site traffic is not expected to be generated during peak after-school athletics activity. It should be noted that the existing traffic counts include trips associated with peak after-school sporting activities.

As indicated, per conversations with the Town of Greenwich, the existing athletic field is currently in use by local and travel leagues. Town and travel league use of the athletic field is permitted after 5:30 p.m. to dusk. During these times, it is understood that travel soccer and flag football activity will be the primary users of the field following Central Middle School athletic activities. Since the traffic counts were conducted from 2:00 p.m. to 8:00 p.m., the existing traffic volumes also include town recreational activities.

Future Traffic

For the purpose of this study, a future horizon year of 2020 was used for analysis. It is anticipated that the field renovations will be completed by this time. To capture any traffic growth during the corridor peak hour (3:15 p.m. to 4:15 p.m.), the existing traffic volumes were projected to the year 2020 using an ambient annual growth rate of 2 percent. Discussions with the Town of Greenwich and CTDOT indicate there are no other approved significant projects whose volumes should be included in future traffic volumes. The future volumes for the after-school afternoon peak and after-hours evening peak periods are shown in Figures 4 and 5, respectively. It should be noted that the volumes will be the same for each of the three field options.

Roadway Capacity Analysis

Future traffic analyses with the proposed athletic field renovations in place were evaluated utilizing *Highway Capacity Software*, which uses the methodologies of the *Highway Capacity Manual*. Levels of service (LOS) were determined for the critical movements at each intersection, which are qualitative measures of the efficiency of operations in terms of delay and inconvenience to motorists. The levels are expressed with letter designations of A through F. LOS A represents little or no vehicle delay. LOS F reflects an intersection or movement that is over capacity and where long delays can be expected. Table 5 summarizes the results of the capacity analysis. As noted, all intersections within the study area are expected to operate at an acceptable overall LOS B or better, which indicates the traffic generated from the athletic field renovations will have minimal impact on the roadway network.

TABLE 5
Capacity Analysis Summary

INTERSECTION	CMS ATHLETICS PEAK HOUR	TOWN LEAGUE ACTIVITY PEAK HOUR
Stanwich Road at Indian Rock Lane		
Northbound Right	B	B
Westbound Left	B	B
Southbound Left	A	A
Overall LOS	**B**	**B**
Stanwich Road at Orchard Street		
Northbound Left	A	A
Eastbound Left	A	A
Overall LOS	**A**	**A**
Indian Rock Lane at CMS Driveway west		
Eastbound Left	A	A
Southbound Left	B	A
Overall LOS	**B**	**A**
Indian Rock Lane at CMS Driveway east		
Eastbound Left	A	A
Southbound Left	B	B
Overall LOS	**B**	**B**
Indian Rock Lane at Orchard Street		
Eastbound Left	B	B
Northbound Left	B	B
Overall LOS	**B**	**B**

Summary and Recommendations

A traffic evaluation was completed to assess the feasibility of renovating and converting to the existing natural grass athletic field at Central Middle School to synthetic turf. Three athletic field options including natural grass, synthetic turf, and a hybrid of natural grass and turf were evaluated.

Based on the evaluation, the following reports our findings:

1. Fall athletic field activities will generate approximately 20% more activity in comparison to the spring season.

2. Peak-hour trips associated with fall activities are expected to remain the same under each of the proposed field options (natural grass, synthetic turf, or a hybrid of natural grass and synthetic turf) as each option would be supporting the same sporting activities.

3. The total number of vehicle trips in a given year anticipated with the three field options is however expected to differ based on the material used. The synthetic turf field option in comparison to the completely natural grass (Option 1) field is anticipated to generate approximately 10% to 20% more vehicle trips with its wider capacity for use.

4. Based on the capacity analysis, the adjacent roadway system will be able to accommodate traffic associated with any of the three field options, regardless of which option is in place. No mitigation is required on the adjacent roadway.

We hope this traffic feasibility evaluation is useful to you and the Town of Greenwich in assessing the traffic impact from this renovation. If you have any questions or need any further information, please do not hesitate to contact me.

Very truly yours,

MILONE & MACBROOM, INC.

Kwesi Brown, PE, PTOE, Associate
Manager of Transportation Engineering

Enclosures

5062-10-04-n1119-ltr.docx

SITE LOCATION
Central Middle School Athletic Field Renovations
Greenwich, Connecticut

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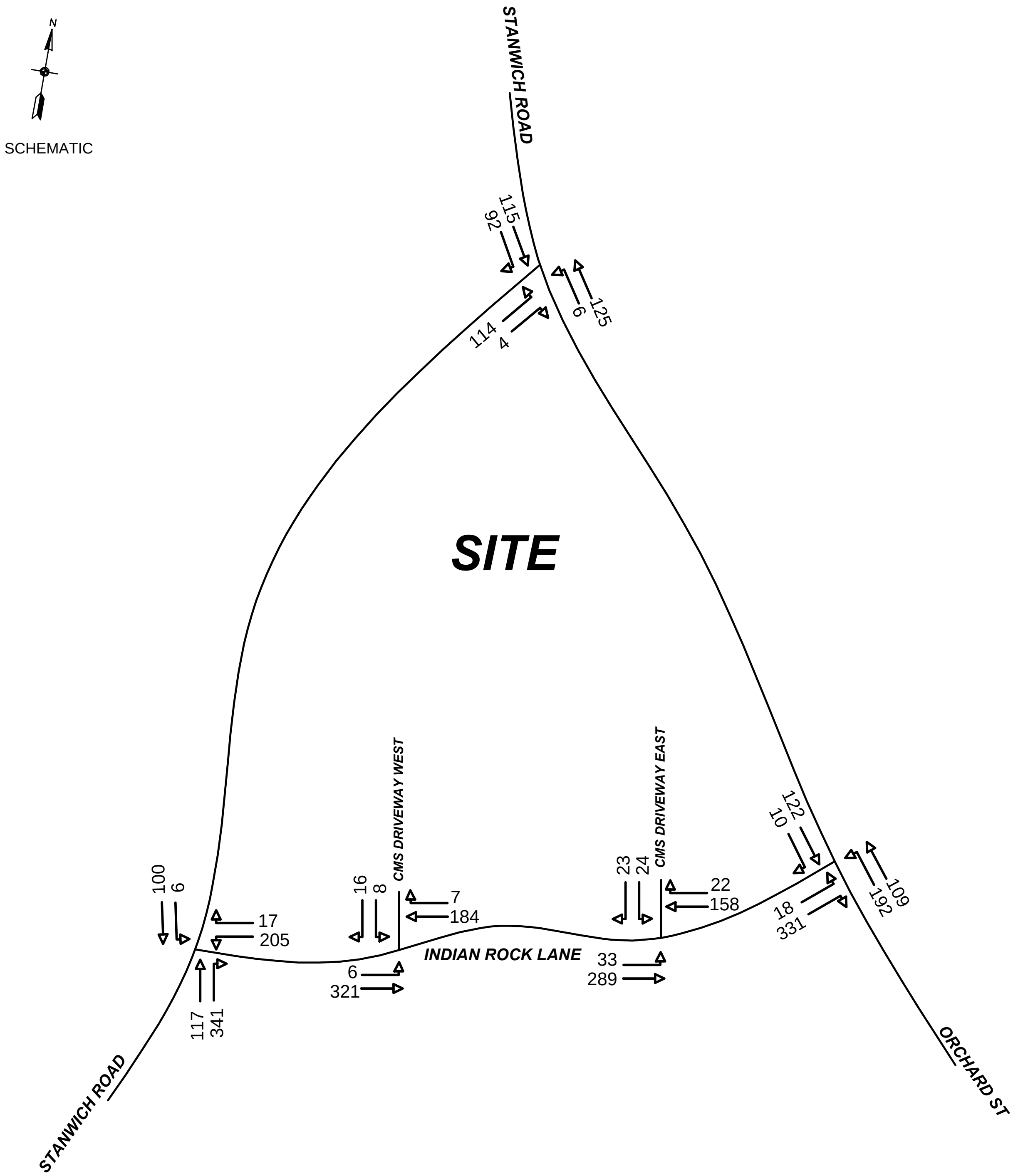
FIGURE 1



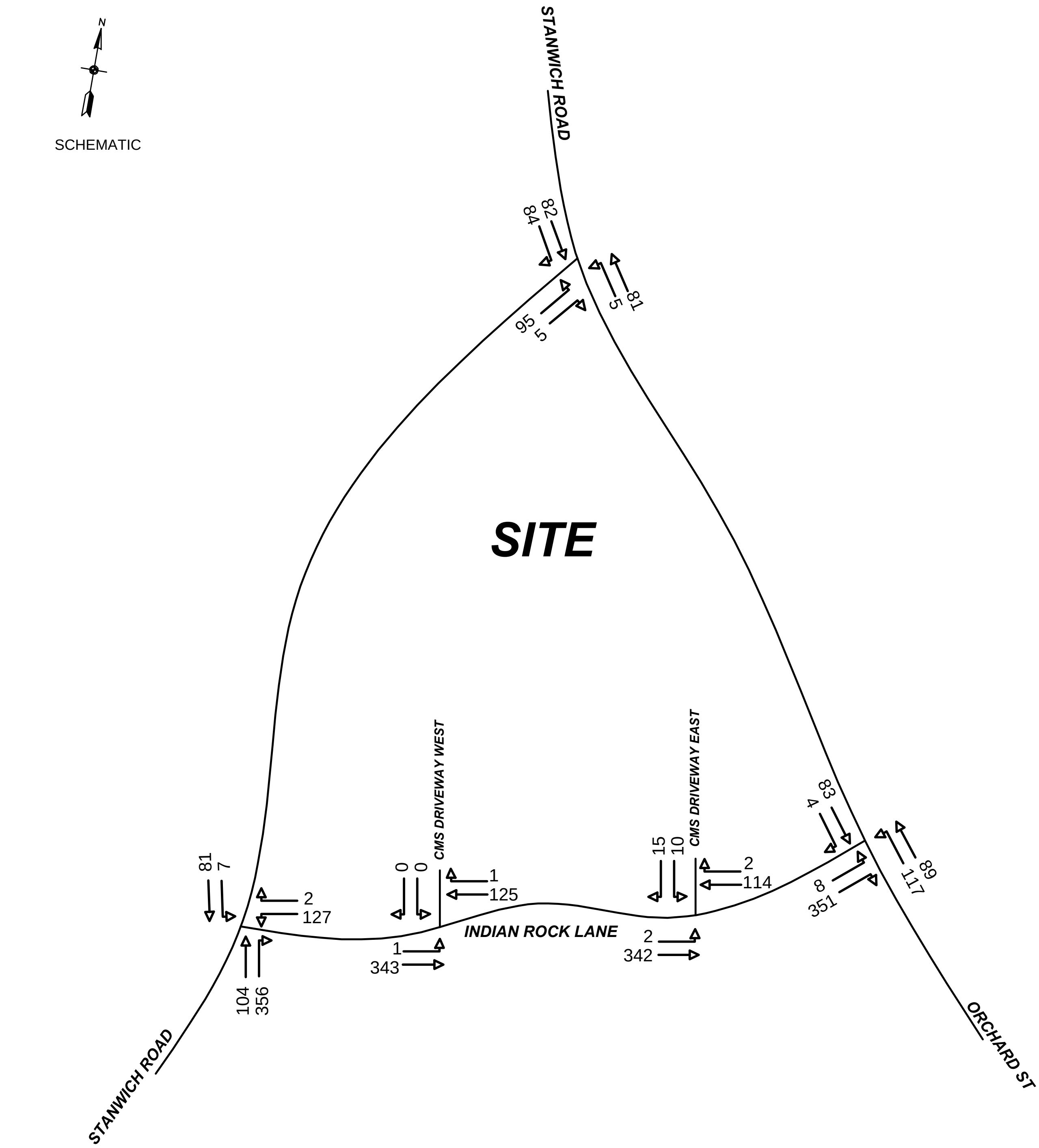
2018 EXISTING TRAFFIC VOLUMES

CMS ATHLETICS WEEKDAY PEAK HOUR

Athletic Field Renovations for Central Middle School
Greenwich, Connecticut

MILONE & MACBROOM

FIGURE 02

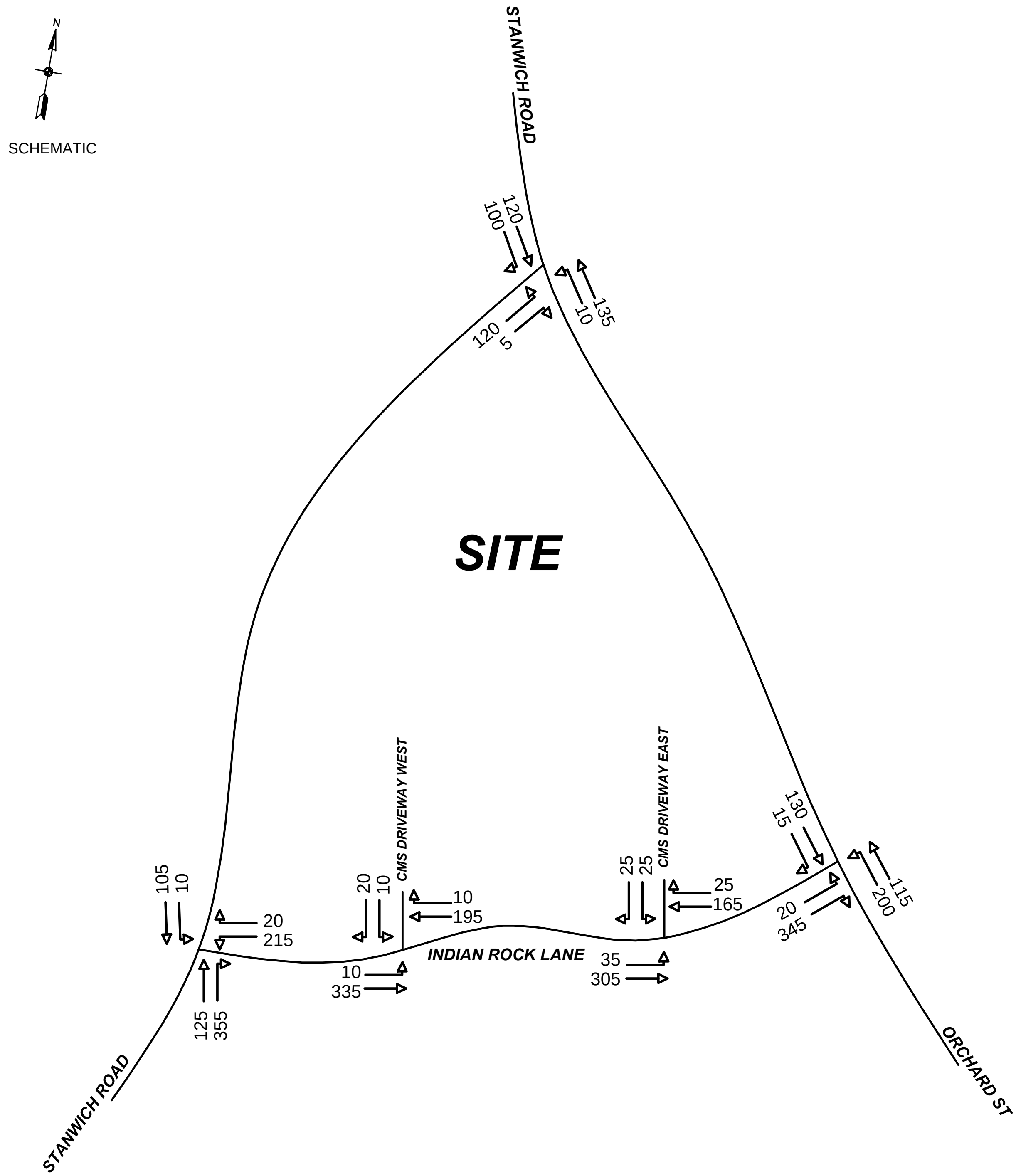


2018 EXISTING TRAFFIC VOLUMES
COMMUNITY AND TRAVEL LEAGUE ACTIVITY PEAK HOUR

Athletic Field Renovations for Central Middle School
Greenwich, Connecticut

MILONE & MACBROOM

FIGURE 03



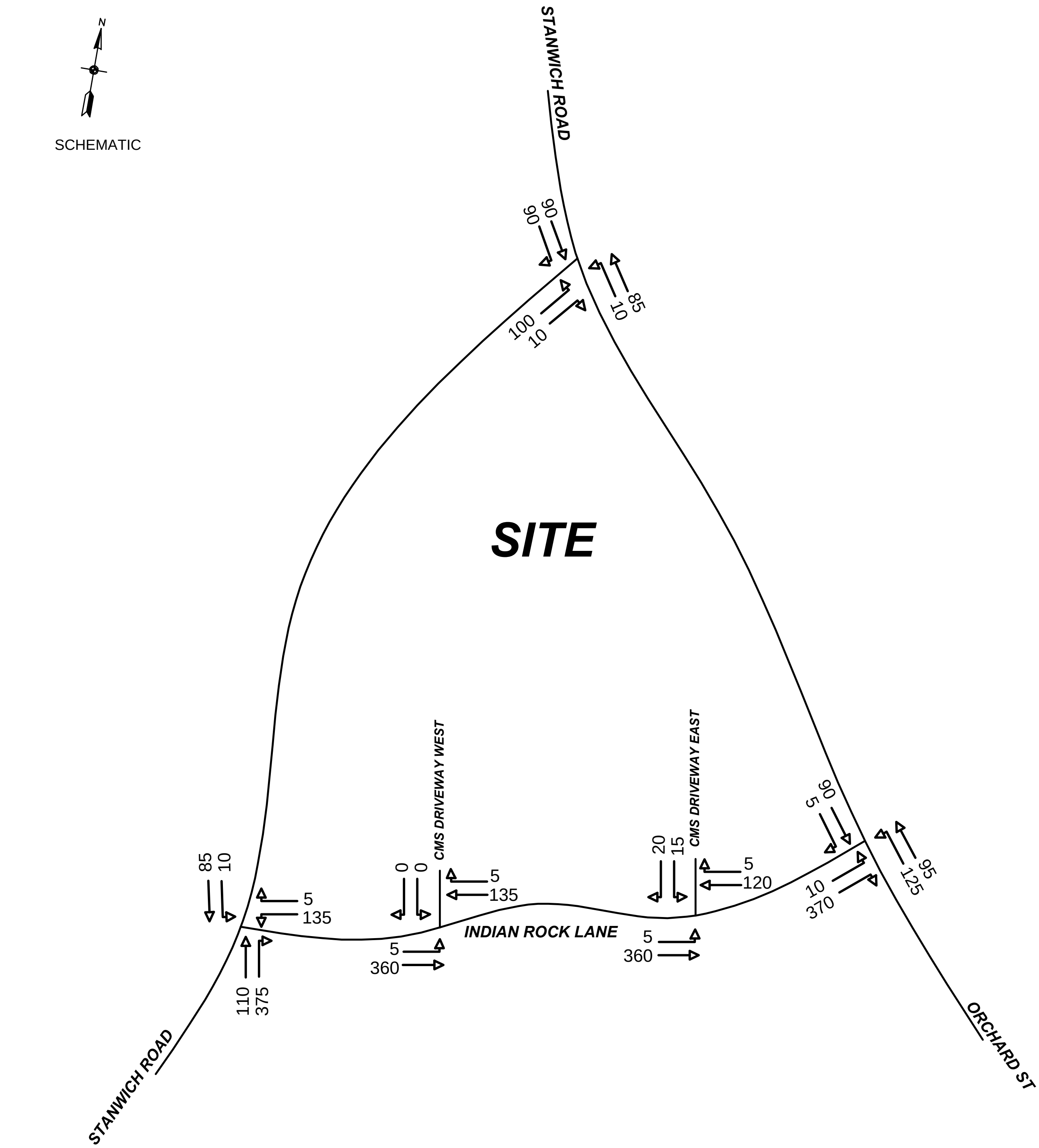
2020 FUTURE TRAFFIC VOLUMES

CMS ATHLETICS WEEKDAY PEAK HOUR

Field Renovations for Central Middle School
Greenwich, Connecticut

MILONE & MACBROOM

FIGURE 04



2020 FUTURE TRAFFIC VOLUMES

COMMUNITY AND TRAVEL LEAGUE ACTIVITY PEAK HOUR

Field Renovations for Central Middle School
Greenwich, Connecticut

MILONE & MACBROOM

FIGURE 05

APPENDIX

LEVEL OF SERVICE
FOR
UNSIGNALIZED INTERSECTIONS
ALL-WAY STOP-CONTROL (AWSC)

The criteria for AWSC intersections have different threshold values than do those for signalized intersections primarily because drivers expect different levels of performance from distinct types of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an AWSC intersection. Thus a higher level of control delay is acceptable at a signalized intersection for the same LOS. The level-of-service criteria are given below.

LEVEL-OF SERVICE CRITERIA FOR AWSC INTERSECTIONS	
LOS[1]	**CONTROL DELAY (s/veh)**
A	**≤ 10**
B	**> 10 AND ≤ 15**
C	**> 15 AND ≤ 25**
D	**> 25 AND ≤ 35**
E	**> 35 AND ≤ 50**
F	**> 50**

[1] For approaches and intersection-wide assessment, LOS is defined solely by control delay.

Note: LOS F is assigned to a movement if the volume-to-capacity ratio exceeds 1.0, regardless of the control delay.

Reference: Highway Capacity Manual Version 6.0, Transportation Research Board, 2016.

LEVEL OF SERVICE
FOR TWO-WAY
STOP SIGN CONTROLLED INTERSECTIONS

The level of service for a TWSC (two-way stop controlled) intersection is determined by the computed or measured control delay and is defined for each minor movement. Level of service is not defined for the intersection as a whole. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. LOS criteria are given in the Table**.** LOS criteria are given below:

LEVEL-OF SERVICE CRITERIA FOR AWSC INTERSECTIONS	
LOS[1]	**CONTROL DELAY (s/veh)**
A	**≤ 10**
B	**> 10 AND ≤ 15**
C	**> 15 AND ≤ 25**
D	**> 25 AND ≤ 35**
E	**> 35 AND ≤ 50**
F	**> 50**

Note: LOS criteria apply to each lane on a given approach and to each approach on the minor street.
LOS is not calculated for major-street approaches or for the intersection as a whole.
LOS F is assigned to a movement if the volume-to-capacity ratio exceeds 1.0, regardless of the control delay

Reference: Highway Capacity Manual Version 6.0, Transportation Research Board, 2016.

Intersection	
Intersection Delay, s/veh	13.3
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	215	20	125	355	10	105
Future Vol, veh/h	215	20	125	355	10	105
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	234	22	136	386	11	114
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	12.2	14.8	9.6
HCM LOS	B	B	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	91%	9%
Vol Thru, %	26%	0%	91%
Vol Right, %	74%	9%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	480	235	115
LT Vol	0	215	10
Through Vol	125	0	105
RT Vol	355	20	0
Lane Flow Rate	522	255	125
Geometry Grp	1	1	1
Degree of Util (X)	0.634	0.396	0.186
Departure Headway (Hd)	4.375	5.583	5.368
Convergence, Y/N	Yes	Yes	Yes
Cap	814	649	673
Service Time	2.454	3.589	3.368
HCM Lane V/C Ratio	0.641	0.393	0.186
HCM Control Delay	14.8	12.2	9.6
HCM Lane LOS	B	B	A
HCM 95th-tile Q	4.6	1.9	0.7

Intersection	
Intersection Delay, s/veh	8.8
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	116	0	0	135	120	100
Future Vol, veh/h	116	0	0	135	120	100
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	126	0	0	147	130	109
Number of Lanes	1	0	0	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	9	8.5	8.8
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	SBLn1
Vol Left, %	0%	100%	0%
Vol Thru, %	100%	0%	55%
Vol Right, %	0%	0%	45%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	135	116	220
LT Vol	0	116	0
Through Vol	135	0	120
RT Vol	0	0	100
Lane Flow Rate	147	126	239
Geometry Grp	1	1	1
Degree of Util (X)	0.184	0.174	0.276
Departure Headway (Hd)	4.505	4.967	4.151
Convergence, Y/N	Yes	Yes	Yes
Cap	797	722	868
Service Time	2.528	2.999	2.17
HCM Lane V/C Ratio	0.184	0.175	0.275
HCM Control Delay	8.5	9	8.8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.7	0.6	1.1

Intersection	
Int Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	10	335	195	10	10	20
Future Vol, veh/h	10	335	195	10	10	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	364	212	11	11	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	223	0	-	0	604	218
Stage 1	-	-	-	-	218	-
Stage 2	-	-	-	-	386	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1346	-	-	-	461	822
Stage 1	-	-	-	-	818	-
Stage 2	-	-	-	-	687	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1346	-	-	-	456	822
Mov Cap-2 Maneuver	-	-	-	-	456	-
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	687	-

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1346	-	-	-	648
HCM Lane V/C Ratio	0.008	-	-	-	0.05
HCM Control Delay (s)	7.7	0	-	-	10.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

Intersection	
Int Delay, s/veh	1.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	35	305	165	25	25	25
Future Vol, veh/h	35	305	165	25	25	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	38	332	179	27	27	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	206	0	-	0	601	193
Stage 1	-	-	-	-	193	-
Stage 2	-	-	-	-	408	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1365	-	-	-	463	849
Stage 1	-	-	-	-	840	-
Stage 2	-	-	-	-	671	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1365	-	-	-	447	849
Mov Cap-2 Maneuver	-	-	-	-	447	-
Stage 1	-	-	-	-	811	-
Stage 2	-	-	-	-	671	-

Approach	EB	WB	SB
HCM Control Delay, s	0.8	0	11.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1365	-	-	-	447	849
HCM Lane V/C Ratio	0.028	-	-	-	0.061	0.032
HCM Control Delay (s)	7.7	0	-	-	13.6	9.4
HCM Lane LOS	A	A	-	-	B	A
HCM 95th %tile Q(veh)	0.1	-	-	-	0.2	0.1

Intersection	
Intersection Delay, s/veh	12.7
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	345	200	115	130	15
Future Vol, veh/h	20	345	200	115	130	15
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	22	375	217	125	141	16
Number of Lanes	1	0	0	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	12.8	13.7	10.1
HCM LOS	B	B	B

Lane	NBLn1	EBLn1	SBLn1
Vol Left, %	63%	5%	0%
Vol Thru, %	37%	0%	90%
Vol Right, %	0%	95%	10%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	315	365	145
LT Vol	200	20	0
Through Vol	115	0	130
RT Vol	0	345	15
Lane Flow Rate	342	397	158
Geometry Grp	1	1	1
Degree of Util (X)	0.505	0.522	0.236
Departure Headway (Hd)	5.311	4.738	5.396
Convergence, Y/N	Yes	Yes	Yes
Cap	678	766	665
Service Time	3.342	2.738	3.434
HCM Lane V/C Ratio	0.504	0.518	0.238
HCM Control Delay	13.7	12.8	10.1
HCM Lane LOS	B	B	B
HCM 95th-tile Q	2.9	3.1	0.9

Intersection	
Intersection Delay, s/veh	11.5
Intersection LOS	B

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	135	5	100	375	10	85
Future Vol, veh/h	135	5	100	375	10	85
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	147	5	109	408	11	92
Number of Lanes	1	0	1	0	0	1

Approach	WB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	NB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right	SB	WB	
Conflicting Lanes Right	1	1	0
HCM Control Delay	10.1	12.4	8.7
HCM LOS	B	B	A

Lane	NBLn1	WBLn1	SBLn1
Vol Left, %	0%	96%	11%
Vol Thru, %	21%	0%	89%
Vol Right, %	79%	4%	0%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	475	140	95
LT Vol	0	135	10
Through Vol	100	0	85
RT Vol	375	5	0
Lane Flow Rate	516	152	103
Geometry Grp	1	1	1
Degree of Util (X)	0.575	0.228	0.14
Departure Headway (Hd)	4.011	5.384	4.891
Convergence, Y/N	Yes	Yes	Yes
Cap	898	663	730
Service Time	2.038	3.449	2.94
HCM Lane V/C Ratio	0.575	0.229	0.141
HCM Control Delay	12.4	10.1	8.7
HCM Lane LOS	B	B	A
HCM 95th-tile Q	3.8	0.9	0.5

Intersection	
Intersection Delay, s/veh	8.3
Intersection LOS	A

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	110	0	0	85	90	90
Future Vol, veh/h	110	0	0	85	90	90
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	120	0	0	92	98	98
Number of Lanes	1	0	0	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	8.7	8	8.2
HCM LOS	A	A	A

Lane	NBLn1	EBLn1	SBLn1
Vol Left, %	0%	100%	0%
Vol Thru, %	100%	0%	50%
Vol Right, %	0%	0%	50%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	85	110	180
LT Vol	0	110	0
Through Vol	85	0	90
RT Vol	0	0	90
Lane Flow Rate	92	120	196
Geometry Grp	1	1	1
Degree of Util (X)	0.114	0.158	0.219
Departure Headway (Hd)	4.429	4.75	4.035
Convergence, Y/N	Yes	Yes	Yes
Cap	811	757	892
Service Time	2.443	2.769	2.047
HCM Lane V/C Ratio	0.113	0.159	0.22
HCM Control Delay	8	8.7	8.2
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.4	0.6	0.8

Intersection						
Int Delay, s/veh	0.1					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	360	135	5	0	0
Future Vol, veh/h	5	360	135	5	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	391	147	5	0	0

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	152	0	-	0	551	150
Stage 1	-	-	-	-	150	-
Stage 2	-	-	-	-	401	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1429	-	-	-	495	896
Stage 1	-	-	-	-	878	-
Stage 2	-	-	-	-	676	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1429	-	-	-	493	896
Mov Cap-2 Maneuver	-	-	-	-	493	-
Stage 1	-	-	-	-	874	-
Stage 2	-	-	-	-	676	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1429	-	-	-	-
HCM Lane V/C Ratio	0.004	-	-	-	-
HCM Control Delay (s)	7.5	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Intersection	
Int Delay, s/veh	0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	5	360	120	5	15	20
Future Vol, veh/h	5	360	120	5	15	20
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	391	130	5	16	22

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	135	0	-	0	534	133
Stage 1	-	-	-	-	133	-
Stage 2	-	-	-	-	401	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1449	-	-	-	507	916
Stage 1	-	-	-	-	893	-
Stage 2	-	-	-	-	676	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1449	-	-	-	505	916
Mov Cap-2 Maneuver	-	-	-	-	505	-
Stage 1	-	-	-	-	889	-
Stage 2	-	-	-	-	676	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	10.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1449	-	-	-	505	916
HCM Lane V/C Ratio	0.004	-	-	-	0.032	0.024
HCM Control Delay (s)	7.5	0	-	-	12.4	9
HCM Lane LOS	A	A	-	-	B	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1	0.1

Intersection	
Intersection Delay, s/veh	10.8
Intersection LOS	B

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	370	125	95	90	5
Future Vol, veh/h	10	370	125	95	90	5
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	402	136	103	98	5
Number of Lanes	1	0	0	1	1	0

Approach	EB	NB	SB
Opposing Approach		SB	NB
Opposing Lanes	0	1	1
Conflicting Approach Left	SB	EB	
Conflicting Lanes Left	1	1	0
Conflicting Approach Right	NB		EB
Conflicting Lanes Right	1	0	1
HCM Control Delay	11.2	10.8	9.1
HCM LOS	B	B	A

Lane	NBLn1	EBLn1	SBLn1
Vol Left, %	57%	3%	0%
Vol Thru, %	43%	0%	95%
Vol Right, %	0%	97%	5%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	220	380	95
LT Vol	125	10	0
Through Vol	95	0	90
RT Vol	0	370	5
Lane Flow Rate	239	413	103
Geometry Grp	1	1	1
Degree of Util (X)	0.338	0.485	0.147
Departure Headway (Hd)	5.081	4.223	5.123
Convergence, Y/N	Yes	Yes	Yes
Cap	701	851	693
Service Time	3.159	2.264	3.21
HCM Lane V/C Ratio	0.341	0.485	0.149
HCM Control Delay	10.8	11.2	9.1
HCM Lane LOS	B	B	A
HCM 95th-tile Q	1.5	2.7	0.5