
To: Matthew C. Benoit – Town of Douglas Community Development Director
Jennifer Hager – Town of Sutton Planning & Economic Development Director

Cc: Wayne Belec – Land Design Collaborative
Timothy Flynn – Flynn Build & Develop

From: Courtney E. Sudak, PE – Tetra Tech

Date: June 2, 2022

Subject: Peak Season Traffic Volume Assessment
Proposed Sutton Douglas Development
Sutton & Douglas, MA

Tetra Tech has conducted an evaluation of peak season traffic volume conditions at the six study area intersections previously evaluated in the September 2021 Traffic Impact and Access Study (TIAS) previously prepared by Tetra Tech for the proposed Sutton Douglas Development (the “Project”). The TIAS included an analysis of existing and future (with and without the Project) intersection operations at the study intersections based on turning movement counts collected in July 2021. As reported in the TIAS, seasonal traffic volume adjustment factors published by the Massachusetts Department of Transportation (MassDOT) indicate that July is an above average travel month. However, the region was still experiencing some impacts to typical traffic volume conditions even though travel and occupancy restrictions associated with the COVID-19 pandemic were no longer in place in Massachusetts at the time the counts were conducted. Furthermore, during the local planning board hearings for the project, residents indicated that the study area roadways have historically experienced a measurable amount of traffic associated with several area campgrounds that may not have been in operation or not fully occupied in July 2021 due to the pandemic. This evaluation provides estimates for traffic associated with these seasonal recreational uses and includes an assessment of intersection operations during this peak season condition.

This memorandum documents our findings.

AREA RECREATIONAL USE TRIP GENERATION

Based on consultation with Town of Sutton Planning staff, the following recreational uses in the area may impact traffic at the study area intersections:

- Kings Family Campground located at 24 Holt Road in Sutton (114 camp sites)
- Sutton Falls Campground located at 90 Manchaug Road in Sutton (104 camp sites)
- Blueberry Island located at Whitin Reservoir in Douglas (1 camp site)
- Lake Manchaug Camping located at 70 Oak Street in Douglas (217 camp sites)
- Breezy Picnic Grounds & Water Slides located at 520 NW Main Street in Douglas (2.49 acres)
- Old Holbrook Place Campground located at 114 Manchaug Road in Sutton

It is our understanding that Old Holbrook Place Campground has been sold and will not be reopening as a campground. Therefore, traffic associated with Old Holbrook Place is assumed to be negligible for this analysis. Traffic associated with the other five recreational uses was estimated based on industry standard trip rates published by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual, 11th Edition* (2021) using the most closely related land uses. The trip generation calculations are provided in Attachment A.

The majority of traffic associated with these sites is anticipated to use the regional highway system. There are several travel paths between the five properties and the regional roadway network. However, all traffic associated with these uses was assumed to use Duval Road to present a conservative analysis.

PEAK SEASON TRAFFIC VOLUMES

The baseline traffic volumes were based on turning movement count data collected in July 2021 during the weekday morning (7AM to 9AM) and weekday evening (4PM to 6PM) peak periods as part of the TIAS. Seasonal adjustment factors published by the Massachusetts Department of Transportation (MassDOT) indicate that July is an above-average travel month (approximately 8 percent higher than average season conditions). As a conservative measure, the observed traffic volumes were not adjusted (reduced) to represent average season conditions.

MassDOT data for the week the traffic volumes were collected in July 2021 indicated that traffic at count locations nearest the site (Station ID AET06 Charlton and Station ID ASET07 Hopkinton) were approximately 1 percent to 10 percent lower than the same week in July 2019. The Town's traffic peer review consultant, MDM Transportation Consultants, Inc. (MDM) stated in their April 5, 2022 comment letter that traffic volume data for the area in 2020 (when COVID-19 travel and occupancy permits were in place) were 20 percent lower when compared to 2017 (pre-pandemic). As a conservative measure, the observed traffic volumes were adjusted (increased) by 20 percent to account for general COVID-19 related traffic volume fluctuations at the study intersections.

A comparison of the peak season 2021 Existing Condition peak hour traffic volumes and the Existing Conditions volumes reported in the September 2021 TIAS for the project is provided in Table 1. A Traffic Projection Model detailing the traffic volume assumptions from the observed (raw) traffic volume count data through the development of the peak season 2028 Build (with project) traffic volumes is provided in Attachment B.

Table 1 2021 Existing Condition Peak Hour Traffic Volume Comparison

Intersection	Overall Intersection Volume (vehicles per hour)					
	AM Peak Hour			PM Peak Hour		
	2021 TIAS ¹	Peak Season ²	Net Change	2021 TIAS	Peak Season	Net Change
Torrey Road/ Duval Road	31	177	+146	66	254	+188
Mumford Road/ Duval Road	39	186	+147	57	244	+187
Birch Street/ Fairfax Way	24	88	+64	52	119	+67
Birch Street/ Belvoir Avenue	21	85	+64	46	112	+66

- 1) 2021 Existing Condition peak hour traffic volumes presented in *Transportation Impact and Access Study, Proposed Residential Development, 61 Duval Road, Sutton, Massachusetts*, prepared by Tetra Tech, dated September 2021.
- 2) July 2021 peak hour traffic volumes adjusted for general traffic volume fluctuations due to the COVID-19 pandemic (20 percent increase) and traffic associated with area recreational properties.

PEAK SEASON CAPACITY ANALYSES

Tetra Tech conducted capacity analyses at the six study intersections for the future 2028 Build (with project) peak season peak hour traffic volumes described above. The peak season capacity analyses indicate that the study intersections are expected to operate well below capacity with minimal delay at LOS B or better operations during the weekday morning and weekday evening peak hours under future conditions with the project in place. Therefore, ample capacity is available at the study area roadways and intersections to support the proposed residential project. Capacity analysis worksheets are provided in Attachment C.

CONCLUSIONS

Supplemental capacity analyses were prepared at the six study intersections previously evaluated in the September 2021 TIAS prepared for the project to assess intersection operations during peak season conditions. The peak season peak hour traffic volumes were estimated and include a 20 percent increase to the observed data to account for general COVID-19 traffic volume fluctuations, traffic associated with several area recreational uses that may not have been in operation or were not fully occupied at the time the TIAS traffic counts were collected in July 2021 and the future year growth assumptions used in the TIAS. The supplemental capacity analyses conducted for the peak season traffic volume conditions indicate that the study intersections are expected to operate well below capacity with minimal delay at LOS B or better operations during the weekday morning and weekday evening peak hours under future conditions with the project in place. Therefore, ample capacity is available at the study area roadways and intersections to support the proposed residential project.

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Attachment A
Trip Generation Calculations

Trip Generation Calculations
ITE Trip Generation, 11th Edition Average Trip Rates (September 2021)
Area Campgrounds/Water Park

BREEZY PICNIC GROUNDS & WATER SLIDES

Land Use Code 411 - Public Park						Size:	2.49	Acres
Time Period	R ² Value	Use Equation or Rate?	Equation	Rate	Percent Enter	In	Out	Total
Saturday Peak Hour		Rate		22.92	58%	33	24	57

Source: *Trip Generation, Eleventh Edition*, (Institute of Transportation Engineers, 2021).

NOTE: LUC 482 (Water Slide Park) does not have any weekday data. Therefore, the Saturday peak hour data was used for both the weekday morning and weekday evening peak hours. The similar land use for LUC 411 (Public Park) results in negligible trips during the weekday peak hour. Therefore, it is anticipated that use of the Water Slide Park Saturday peak hour data is conservative.

KINGS CAMPGROUND

Land Use Code 416 - Campground/RV Park						Size:	114	Occupied Campsites
Time Period	R ² Value	Use Equation or Rate?	Equation	Rate	Percent Enter	In	Out	Total
AM Street Peak Hour	0.96	Equation	$T = 0.16(X) + 2.93$	0.21	36%	8	13	21
PM Street Peak Hour	0.72	Rate	$\ln(T) = .71\ln(x) - 0.06$	0.27	65%	20	11	31

Source: *Trip Generation, Eleventh Edition*, (Institute of Transportation Engineers, 2021).

SUTTON FALLS CAMPGROUND

Land Use Code 416 - Campground/RV Park						Size:	104	Occupied Campsites
Time Period	R ² Value	Use Equation or Rate?	Equation	Rate	Percent Enter	In	Out	Total
AM Street Peak Hour	0.96	Equation	$T = 0.16(X) + 2.93$	0.21	36%	7	13	20
PM Street Peak Hour	0.72	Rate	$\ln(T) = .71\ln(x) - 0.06$	0.27	65%	18	10	28

Source: *Trip Generation, Eleventh Edition*, (Institute of Transportation Engineers, 2021).

BLUEBERRY ISLAND CAMPGROUND

Land Use Code 416 - Campground/RV Park						Size:	1	Occupied Campsites
Time Period	R ² Value	Use Equation or Rate?	Equation	Rate	Percent Enter	In	Out	Total
AM Street Peak Hour	0.96	Equation	$T = 0.16(X) + 2.93$	0.21	36%	1	2	3
PM Street Peak Hour	0.72	Rate	$\ln(T) = .71\ln(x) - 0.06$	0.27	65%	0	0	0

Source: *Trip Generation, Eleventh Edition*, (Institute of Transportation Engineers, 2021).

LAKE MANCHAUG CAMPGROUND

Land Use Code 416 - Campground/RV Park						Size:	217	Occupied Campsites
Time Period	R ² Value	Use Equation or Rate?	Equation	Rate	Percent Enter	In	Out	Total
AM Street Peak Hour	0.96	Equation	$T = 0.16(X) + 2.93$	0.21	36%	14	24	38
PM Street Peak Hour	0.72	Rate	$\ln(T) = .71\ln(x) - 0.06$	0.27	65%	38	21	59

Source: *Trip Generation, Eleventh Edition*, (Institute of Transportation Engineers, 2021).

Attachment B
Traffic Projection Model




TRAFFIC PROJECTION MODEL

		July 2021 AM Peak Hour As- Counted Volumes (Unadjusted)	AM Peak Hour Traffic Volumes Adjusted for COVID-19	Seasonal ly Adjusted AM Peak Hour Traffic Volumes	Existing AM Peak Hour Balancing	Kings Family Campgrou nd AM Peak Hour Trips	Sutton Falls Campgrou nd AM Peak Hour Trips	Blueberry Island Campgrou nd AM Peak Hour Trips	Lake Manchaug Campgrou nd AM Peak Hour Trips	Breezy Picnic Grounds & Water Slides AM Peak Hour Trips	2021 Existing AM Peak Hour Traffic Volumes (Adjusted)	2028 Grown AM Peak Hour Traffic Volumes (Unadjusted)	2028 Grown AM Peak Hour Balancing	2028 No Build AM Peak Hour Traffic Volumes	Entering Distribution	Exiting Distribution	Site Trips AM Peak Hour (Adjusted)	2028 Build AM Peak Hour Traffic Volumes	July 2021 PM Peak Hour As Counted Volumes (Unadjusted)	PM Peak Hour Traffic Volumes Adjusted for COVID-19	Seasonal ly Adjusted PM Peak Hour Traffic Volumes	Existing PM Peak Hour Balancing	Kings Family Campgrou nd PM Peak Hour Trips	Sutton Falls Campgrou nd PM Peak Hour Trips	Blueberry Island Campgrou nd PM Peak Hour Trips	Lake Manchaug Campgrou nd PM Peak Hour Trips	Breezy Picnic Grounds & Water Slides PM Peak Hour Trips	2021 Existing PM Peak Hour Traffic Volumes (Adjusted)	2028 Grown PM Peak Hour Traffic Volumes (Unadjusted)	2028 Grown PM Peak Hour Balancing	2028 No Build PM Peak Hour Traffic Volumes	Entering Distribution	Exiting Distribution	Site Trips PM Peak Hour (Adjusted)	2028 Build PM Peak Hour Traffic Volumes			
Torrey Road & Duval Road																																						
7:45 AM - 8:00 AM	NBT	10	12	12							12	14		14			10%	2	16	7	8	8						8	9		9			10%	1	10		
4:00 PM - 5:00 PM	NBR	4	5	5				2		24	31	36		36	10%			0	36	8	10	10				0		24	34	39		39	10%		2	41		
Seasonal Adjustment Factor		SBL	7	8	8		13	13			58	67		67	20%			1	68	10	12	12		11	10			21	54	62		62	20%		4	66		
1.00		SBT	3	4	4						4	5		5	10%			1	6	22	26	26						26	30		30	10%		2	32			
Annual Growth Rate		WBL	3	4	4			1		33	38	44		44		10%		2	46	16	19	19				0		33	52	60		60		10%	1	61		
2.0%		WBR	4	5	5		8	7		14	34	39		39		20%		4	43	3	4	4		20	18		38		80	92		92		20%	3	95		
Mumford Road & Duval Road																																						
7:00 AM - 8:00 AM	NBL	1	1	1		8	7		14		30	34		34				0	34	3	4	4		20	18		38		80	92		92			0	92		
4:00 PM - 5:00 PM	NBT	18	22	22							22	25		25				0	25	12	14	14							14	16		16			0	16		
Design Horizon (Years)		SBT	3	4	4						4	5		5				0	5	10	12	12							12	14		14			0	14		
7.00		SBR	4	5	5			1		33	39	45		45	50%			4	49	18	22	22				0		33	55	63		63	50%		11	74		
Growth Factor		EBL	11	13	13			2		24	39	45		45		50%		9	54	11	13	13				0		24	37	43		43		50%	6	49		
1.149		EBR	2	2	2		13	13		24	52	60		60				0	60	3	4	4		11	10		21		46	53		53			0	53		
Birch Street & Fairfax Way																																						
8:00 AM - 9:00 AM	NBT	12	14	14				2		24	40	46		46	10%	10%		2	48	11	13	13				0		24	37	43		43	10%	10%	3	46		
4:00 PM - 5:00 PM	NBR	1	1	1							1	1		1				0	1	1	1	1							1	1		1			0	1		
COVID Adjustment Factor		SBL	2	2	2						2	2		2				0	2	6	7	7							7	8		8			0	8		
1.20		SBT	5	6	6			1		33	40	46		46	10%	10%		3	49	30	36	36				0		33	69	79		79	10%	10%	3	82		
	WBL	1	1	1							1	1		1				0	1	0	0	0							0	0		0			0	0		
	WBR	3	4	4							4	5		5				0	5	4	5	5							5	6		6			0	6		
Birch Street & Belvoir Avenue																																						
8:00 AM - 9:00 AM	NBT	10	12	12				2		24	38	44		44	10%			0	44	10	12	12				0		24	36	41		41	10%			2	43	
4:00 PM - 5:00 PM	NBR	1	1	1							1	1		1	10%			1	2	2	2	2							2	2		2	10%			2	4	
	SBL	0	0	0							0	0		0	10%			1	1	5	6	6							6	7		7	10%			2	9	
	SBT	6	7	7			1			33	41	47		47		10%		2	49	25	30	30				0		33	63	72		72			10%	1	73	
	WBL	1	1	1							1	1		1		10%		2	3	1	1	1							1	1		1		10%	1	2		
	WBR	3	4	4							4	5		5		10%		2	7	3	4	4							4	5		5		10%	1	6		
Proposed Subdivision Roadway & Duval Road																																						
7:30 AM - 8:30 AM	NBL	0	0	0							0	0		0		30%		6	6	0	0	0							0	0		0		30%	4	4		
4:00 PM - 5:00 PM	NBR	0	0	0							0	0		0		50%		9	9	0	0	0							0	0		0		50%	6	6		
	EBT	12	14	14		13	13	2	24	24	90	103		103				0	103	15	18	18		11	10	0	21	24	84	96		96			0	96		
	EBR	0	0	0							0	0		0	30%			1	1	0	0	0							0	0		0	30%		6	6		
	WBL	0	0	0							0	0		0	50%			4	4	0	0	0							0	0		0	50%		11	11		
	WBT	9	11	11		8	7	1	14	33	74	85		85				0	85	20	24	24		20	18	0	38	33	133	153		153			0	153		
Forest Street & Proposed Subdivision Roadway																																						
8:00 AM - 9:00 AM	NBT	1	1	1							1	1		1				0	1	3	4	4							4	5		5			0	5		
4:00 PM - 5:00 PM	NBR	0	0	0							0	0		0				0	0	0	0	0							0	0		0			0	0		
	SBL	0	0	0							0	0		0	20%			2	2	0	0	0							0	0		0	20%		4	4		
	SBT	1	1	1							1	1		1				0	1	1	1	1							1	1		1			0	1		
	WBL	0	0	0							0	0		0				0	0	0	0	0							0	0		0			0	0		
	WBR	0	0	0							0	0		0		20%		4	4	0	0	0							0	0		0		20%	2	2		

Attachment C
Capacity Analysis Worksheets




HCM 6th TWSC
1: Torrey Road & Duval Road

2028 Build Condition
Weekday Morning Peak Hour

Intersection						
Int Delay, s/veh	7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	46	43	16	36	68	6
Future Vol, veh/h	46	43	16	36	68	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	58	58	58	58	50	50
Heavy Vehicles, %	0	0	0	25	14	0
Mvmt Flow	79	74	28	62	136	12
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	343	59	0	0	90	0
Stage 1	59	-	-	-	-	-
Stage 2	284	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.24	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.326	-
Pot Cap-1 Maneuver	657	1012	-	-	1433	-
Stage 1	969	-	-	-	-	-
Stage 2	769	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	594	1012	-	-	1433	-
Mov Cap-2 Maneuver	594	-	-	-	-	-
Stage 1	969	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	11.1	0		7.1		
HCM LOS	B					
Minor Lane/Major Mvmt		NBT	NBRWBLn1	SBL	SBT	
Capacity (veh/h)		-	-	742	1433	-
HCM Lane V/C Ratio		-	-	0.207	0.095	-
HCM Control Delay (s)		-	-	11.1	7.8	0
HCM Lane LOS		-	-	B	A	A
HCM 95th %tile Q(veh)		-	-	0.8	0.3	-




HCM 6th TWSC
2: Mumford Road & Duval Road

2028 Build Condition
Weekday Morning Peak Hour

Intersection						
Int Delay, s/veh	5.5					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	54	60	34	25	5	49
Future Vol, veh/h	54	60	34	25	5	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	81	81	59	59	58	58
Heavy Vehicles, %	0	0	0	8	0	6
Mvmt Flow	67	74	58	42	9	84
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	209	51	93	0	-	0
Stage 1	51	-	-	-	-	-
Stage 2	158	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	784	1023	1514	-	-	-
Stage 1	977	-	-	-	-	-
Stage 2	875	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	753	1023	1514	-	-	-
Mov Cap-2 Maneuver	753	-	-	-	-	-
Stage 1	939	-	-	-	-	-
Stage 2	875	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	9.9	4.3		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1514	-	874	-	-	
HCM Lane V/C Ratio	0.038	-	0.161	-	-	
HCM Control Delay (s)	7.5	0	9.9	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0.1	-	0.6	-	-	




HCM 6th TWSC
3: Birch Street & Fairfax Way

2028 Build Condition
Weekday Morning Peak Hour

Intersection						
Int Delay, s/veh	0.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	1	5	48	1	2	49
Future Vol, veh/h	1	5	48	1	2	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	65	65	44	44
Heavy Vehicles, %	0	0	0	0	0	0
Mvmt Flow	1	5	74	2	5	111
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	196	75	0	0	76	0
Stage 1	75	-	-	-	-	-
Stage 2	121	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	797	992	-	-	1536	-
Stage 1	953	-	-	-	-	-
Stage 2	909	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	795	992	-	-	1536	-
Mov Cap-2 Maneuver	795	-	-	-	-	-
Stage 1	953	-	-	-	-	-
Stage 2	906	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	8.8	0		0.3		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 953		1536	-	
HCM Lane V/C Ratio	-	- 0.006		0.003	-	
HCM Control Delay (s)	-	- 8.8		7.4	0	
HCM Lane LOS	-	- A		A	A	
HCM 95th %tile Q(veh)	-	- 0		0	-	

HCM 6th TWSC
4: Birch Street & Belvoir Avenue

2028 Build Condition
Weekday Morning Peak Hour

Intersection						
Int Delay, s/veh	0.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	3	7	44	2	1	49
Future Vol, veh/h	3	7	44	2	1	49
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	100	100	69	69	50	50
Heavy Vehicles, %	0	0	0	0	0	4
Mvmt Flow	3	7	64	3	2	98




Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	168	66	0	0	67
Stage 1	66	-	-	-	-
Stage 2	102	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2
Pot Cap-1 Maneuver	827	1003	-	-	1547
Stage 1	962	-	-	-	-
Stage 2	927	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	826	1003	-	-	1547
Mov Cap-2 Maneuver	826	-	-	-	-
Stage 1	962	-	-	-	-
Stage 2	926	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	8.9	0	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	942	1547
HCM Lane V/C Ratio	-	-	0.011	0.001
HCM Control Delay (s)	-	-	8.9	7.3
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0	0




HCM 6th TWSC
5: Proposed Subdivision Roadway & Duval Road

2028 Build Condition
Weekday Morning Peak Hour

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	103	1	4	85	6	9
Future Vol, veh/h	103	1	4	85	6	9
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	60	60	38	38	92	92
Heavy Vehicles, %	8	2	2	0	2	2
Mvmt Flow	172	2	11	224	7	10
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	174	0	419	173
Stage 1	-	-	-	-	173	-
Stage 2	-	-	-	-	246	-
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	-	-	1403	-	591	871
Stage 1	-	-	-	-	857	-
Stage 2	-	-	-	-	795	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1403	-	586	871
Mov Cap-2 Maneuver	-	-	-	-	586	-
Stage 1	-	-	-	-	857	-
Stage 2	-	-	-	-	788	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.3		10.1	
HCM LOS	B					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	729	-	-	1403	-	
HCM Lane V/C Ratio	0.022	-	-	0.008	-	
HCM Control Delay (s)	10.1	-	-	7.6	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0.1	-	-	0	-	




HCM 6th TWSC
6: Forest Street & Proposed Subdivision Roadway

2028 Build Condition
Weekday Morning Peak Hour

Intersection						
Int Delay, s/veh	4.6					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	4	1	0	2	1
Future Vol, veh/h	0	4	1	0	2	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	25	25	25	25
Heavy Vehicles, %	2	2	0	2	2	0
Mvmt Flow	0	4	4	0	8	4
Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	24	4	0	0	4	0
Stage 1	4	-	-	-	-	-
Stage 2	20	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	992	1080	-	-	1618	-
Stage 1	1019	-	-	-	-	-
Stage 2	1003	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	987	1080	-	-	1618	-
Mov Cap-2 Maneuver	987	-	-	-	-	-
Stage 1	1019	-	-	-	-	-
Stage 2	998	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	8.3	0		4.8		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT		
Capacity (veh/h)	-	-	1080	1618	-	
HCM Lane V/C Ratio	-	-	0.004	0.005	-	
HCM Control Delay (s)	-	-	8.3	7.2	0	
HCM Lane LOS	-	-	A	A	A	
HCM 95th %tile Q(veh)	-	-	0	0	-	




HCM 6th TWSC
1: Torrey Road & Duval Road

2028 Build Condition
Weekday Evening Peak Hour

Intersection						
Int Delay, s/veh	7.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	61	95	10	41	66	32
Future Vol, veh/h	61	95	10	41	66	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	68	68	75	75	89	89
Heavy Vehicles, %	6	0	0	0	0	0
Mvmt Flow	90	140	13	55	74	36
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	225	41	0	0	68	0
Stage 1	41	-	-	-	-	-
Stage 2	184	-	-	-	-	-
Critical Hdwy	6.46	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.46	-	-	-	-	-
Critical Hdwy Stg 2	5.46	-	-	-	-	-
Follow-up Hdwy	3.554	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	754	1036	-	-	1546	-
Stage 1	971	-	-	-	-	-
Stage 2	838	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	717	1036	-	-	1546	-
Mov Cap-2 Maneuver	717	-	-	-	-	-
Stage 1	971	-	-	-	-	-
Stage 2	797	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	10.5	0		5		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	-		882	1546	
HCM Lane V/C Ratio	-	-		0.26	0.048	
HCM Control Delay (s)	-	-		10.5	7.4	
HCM Lane LOS	-	-		B	A	
HCM 95th %tile Q(veh)	-	-		1	0.2	




HCM 6th TWSC
2: Mumford Road & Duval Road

2028 Build Condition
Weekday Evening Peak Hour

Intersection						
Int Delay, s/veh	6.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	49	53	92	16	14	74
Future Vol, veh/h	49	53	92	16	14	74
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	70	70	47	47	70	70
Heavy Vehicles, %	0	0	0	8	0	6
Mvmt Flow	70	76	196	34	20	106
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	499	73	126	0	-	0
Stage 1	73	-	-	-	-	-
Stage 2	426	-	-	-	-	-
Critical Hdwy	6.4	6.2	4.1	-	-	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	2.2	-	-	-
Pot Cap-1 Maneuver	535	995	1473	-	-	-
Stage 1	955	-	-	-	-	-
Stage 2	663	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	462	995	1473	-	-	-
Mov Cap-2 Maneuver	462	-	-	-	-	-
Stage 1	825	-	-	-	-	-
Stage 2	663	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	12.3	6.7		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1473	-	640	-	-	
HCM Lane V/C Ratio	0.133	-	0.228	-	-	
HCM Control Delay (s)	7.8	0	12.3	-	-	
HCM Lane LOS	A	A	B	-	-	
HCM 95th %tile Q(veh)	0.5	-	0.9	-	-	




HCM 6th TWSC
3: Birch Street & Fairfax Way

2028 Build Condition
Weekday Evening Peak Hour

Intersection						
Int Delay, s/veh	1					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	6	46	1	8	82
Future Vol, veh/h	0	6	46	1	8	82
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	50	50	75	75	75	75
Heavy Vehicles, %	0	0	0	0	0	3
Mvmt Flow	0	12	61	1	11	109
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	193	62	0	0	62	0
Stage 1	62	-	-	-	-	-
Stage 2	131	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	800	1009	-	-	1554	-
Stage 1	966	-	-	-	-	-
Stage 2	900	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	794	1009	-	-	1554	-
Mov Cap-2 Maneuver	794	-	-	-	-	-
Stage 1	966	-	-	-	-	-
Stage 2	893	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	8.6	0		0.7		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 1009		1554	-	
HCM Lane V/C Ratio	-	- 0.012		0.007	-	
HCM Control Delay (s)	-	- 8.6		7.3	0	
HCM Lane LOS	-	- A		A	A	
HCM 95th %tile Q(veh)	-	- 0		0	-	




HCM 6th TWSC
4: Birch Street & Belvoir Avenue

2028 Build Condition
Weekday Evening Peak Hour

Intersection						
Int Delay, s/veh	1.4					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	2	6	43	4	9	73
Future Vol, veh/h	2	6	43	4	9	73
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	33	33	65	65	63	63
Heavy Vehicles, %	0	0	0	0	0	4
Mvmt Flow	6	18	66	6	14	116
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	213	69	0	0	72	0
Stage 1	69	-	-	-	-	-
Stage 2	144	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	780	1000	-	-	1541	-
Stage 1	959	-	-	-	-	-
Stage 2	888	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	772	1000	-	-	1541	-
Mov Cap-2 Maneuver	772	-	-	-	-	-
Stage 1	959	-	-	-	-	-
Stage 2	879	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	9	0		0.8		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 931		1541	-	
HCM Lane V/C Ratio	-	- 0.026		0.009	-	
HCM Control Delay (s)	-	- 9		7.4	0	
HCM Lane LOS	-	- A		A	A	
HCM 95th %tile Q(veh)	-	- 0.1		0	-	




HCM 6th TWSC
5: Proposed Subdivision Roadway & Duval Road

2028 Build Condition
Weekday Evening Peak Hour

Intersection						
Int Delay, s/veh	0.6					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	96	6	11	153	4	6
Future Vol, veh/h	96	6	11	153	4	6
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	75	75	56	56	92	92
Heavy Vehicles, %	8	2	2	0	2	2
Mvmt Flow	128	8	20	273	4	7
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	136	0	445	132
Stage 1	-	-	-	-	132	-
Stage 2	-	-	-	-	313	-
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	-	-	1448	-	571	917
Stage 1	-	-	-	-	894	-
Stage 2	-	-	-	-	741	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1448	-	562	917
Mov Cap-2 Maneuver	-	-	-	-	562	-
Stage 1	-	-	-	-	894	-
Stage 2	-	-	-	-	729	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.5		10	
HCM LOS					B	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	732	-	-	1448	-	
HCM Lane V/C Ratio	0.015	-	-	0.014	-	
HCM Control Delay (s)	10	-	-	7.5	0	
HCM Lane LOS	B	-	-	A	A	
HCM 95th %tile Q(veh)	0	-	-	0	-	

HCM 6th TWSC
6: Forest Street & Proposed Subdivision Roadway

2028 Build Condition
Weekday Evening Peak Hour

Intersection						
Int Delay, s/veh	3.8					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	2	5	0	4	1
Future Vol, veh/h	0	2	5	0	4	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	38	38	25	25
Heavy Vehicles, %	2	2	0	2	2	0
Mvmt Flow	0	2	13	0	16	4
Major/Minor	Minor1	Major1		Major2		
Conflicting Flow All	49	13	0	0	13	0
Stage 1	13	-	-	-	-	-
Stage 2	36	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.12	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	960	1067	-	-	1606	-
Stage 1	1010	-	-	-	-	-
Stage 2	986	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	950	1067	-	-	1606	-
Mov Cap-2 Maneuver	950	-	-	-	-	-
Stage 1	1010	-	-	-	-	-
Stage 2	976	-	-	-	-	-
Approach	WB	NB		SB		
HCM Control Delay, s	8.4	0		5.8		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	NBRWBLn1		SBL	SBT	
Capacity (veh/h)	-	- 1067		1606	-	
HCM Lane V/C Ratio	-	- 0.002		0.01	-	
HCM Control Delay (s)	-	- 8.4		7.3	0	
HCM Lane LOS	-	- A		A	A	
HCM 95th %tile Q(veh)	-	- 0		0	-	