TIM MILLER ASSOCIATES, INC.

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September 6, 2016

Steven T. Cipolla Fredrick P. Clark Associates, Inc. 350 Theodore Fremd Avenue Rye, NY 10580 914-967-6615

Re: Parth Knolls, LLC Residential Project

Dear Steven,

The following is provided in response to your memo dated September 1, 2016 relative to comments regarding traffic associated with the proposed Parth Knolls project at the intersection of NYS Route 9A and NYS Route 134 in Ossining, NY.

FP Clark Comment 1: Site Traffic Distribution - Review of the site traffic distribution illustrated that while 50 percent of the site traffic would arrive from the east on NYS Route 9A, only 40 percent would depart to the east on NYS Route 9A. The remaining 10 percent would turn right from Kitchawan State Road and travel south on Croton Dam Road. The Applicant should explain why there is this discrepancy. As stated at the bottom of page 2 of the Applicant's latest Response to Comments, " no traffic is rerouted based upon the congested condition."

In our previous memorandum dated March 15, 2016, it was our assumption that 50 percent of the departing site traffic would access NYS Route 9A eastbound at the NYS Route 9A/NYS Route 134 intersection. Using this assumption, it was estimated that a total of 15 and 26 vehicle trip ends generated by the proposed site would travel through this intersection during the weekday morning and weekday afternoon peak hours, respectively.

TMA Response 1: Our original analysis looked at a worst case scenario and did not take into consideration the actual volume turning distribution at Kitchaman State Road and Croton Dam Road. Based on the existing equilibrium of the traffic network, traffic was distributed for the July 2016 analysis. The increased congestion caused by No Build traffic was not considered in routing site traffic in that analysis.

The traffic distribution has been revised balancing the percent distributions to 50 percent in each direction by sending the two additional trips as requested to the NYS Route 9A and NYS Route 134 intersection. See attachment A for a complete set of revised figures.

FP Clark Comment 2: Capacity Analysis – Review of the SYNCHRO files indicates that appropriate peak hour factors (PHF), pedestrians and heavy vehicle percentages were utilized from the River Knoll Traffic Study. The capacity analysis table should be revised to show the results from SYNCHRO not HCM 2010. A storage/queue analysis should be conducted for this intersection and illustrated in a tabular format.

TMA Response 2: The model analysis has been updated to Synchro 9. See Attachment B for a revised summary table showing the Synchro analysis. Attachment C has the revised calculations. Attachment D has the level of service performance measures.

Attachment E contains a queue analysis summary table. Due to the existing and future congested conditions at this intersection, none of the these analysis Synchro, HCM, or SimTraffic can accurately represent the queues; in particular it is unreasonable to expect the models to shown queue changes between the No Build and Build Conditions given the minor change in volumes. Except for the low traffic volume on NYS Route 9A left turns, any movements with level of service F should be expected to have queuing.

What is clear in both the SYNCHRO and HCM analysis, is that adding left turns from northbound Croton Dam Road (NYS Route 134) to NYS Route 9A increases delay substantially. However, Parth Knolls traffic uses the Hawkes Avenue ramp and thus does not contribute to this movement. Furthermore, adding two percent per year background growth onto the NYS Route 9A through traffic also contributes to increased delays, although historically NYS Route 9A volumes are declining according to New York State Department of Transportation data.

FP Clark Comment 3: There are the following errors in the signal coding for this intersection:

- The side roads should be Phase 3 not Phases 4 and 8.
- The vehicle extension and minimum gap should be 2 seconds for Phases 1 and 5.
- There are some minor errors in the detection location.

These errors were also found in the River Knoll Traffic Study. Also, the control type should be Fully Actuated-Uncoordinated not Semi Actuated-Uncoordinated. All of these errors do not significantly change the results of the analysis; therefore, no action is needed.

TMA Response 3: These changes have been made to the analysis although they were indicated as not being significant. For example the detector location is not a variable in the HCM analysis¹. HCM does not support non-NEMA phasing so for the HCM analysis side roads could not be phase 3 as used in the revised Synchro analysis. See Attachments B and C for summary table and Synchro analysis.

¹ Transportation Research Board of the National Academies, HCM 2010 the Highway Capacity Manual, Volume 3 page 18-8.

FP Clark Comment 4: When attempting to review the SimTraffic microscopic model, there were fatal errors and we were unable to run the simulation. The reason for the fatal errors is that the model is not properly scaled. The Applicant should provide a model that is appropriately scaled.

TMA Response 4: The model is scaled to the aerial photo underneath. The link length is not a variable used in the HCM 2010 signalized intersection analysis². Therefore inputting the link lengths had no effect on the HCM results, however it does impact the SimTraffic model which was not included as part of the study. The link lengths have been extended to extent to facilitate viewing in SimTraffic, although not to the maximum link lengths.

FP Clark Comment 5: The Applicant should provide a reason for the departing site traffic distribution used, revised capacity analysis tables, a storage/queue analysis table and a properly scaled model. When these items are received, we can provide our findings.

TMA Response 5: We trust the above responses one to four respond to your comments.

Should you have any problem viewing SimTraffic please call.

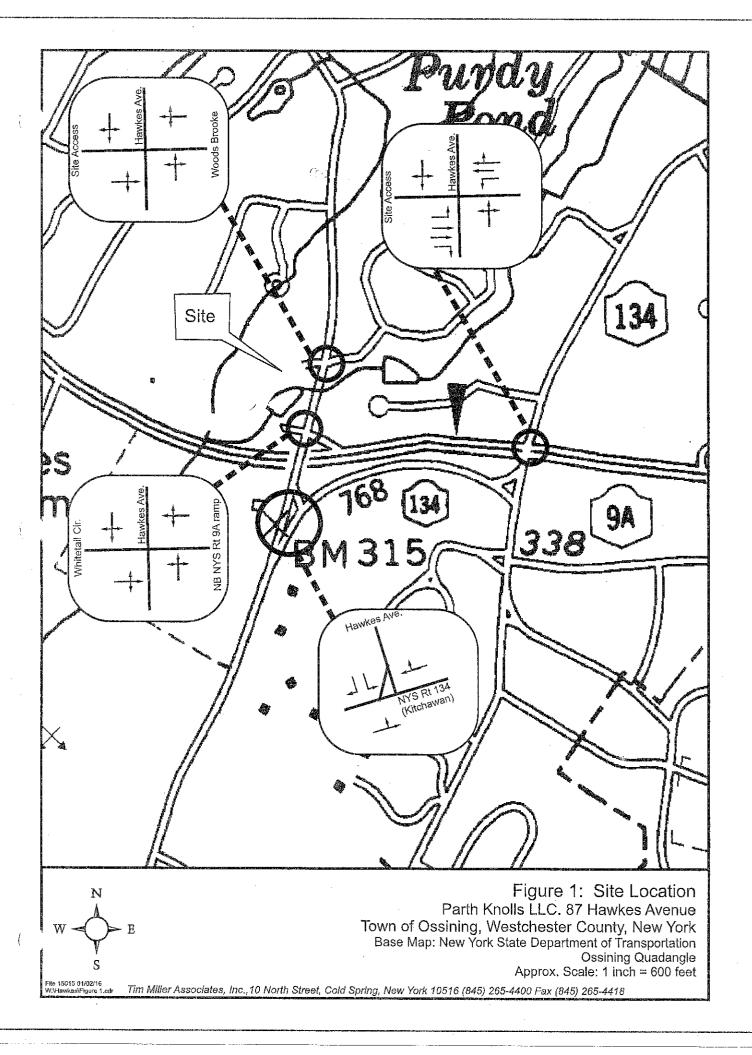
Sincerely,

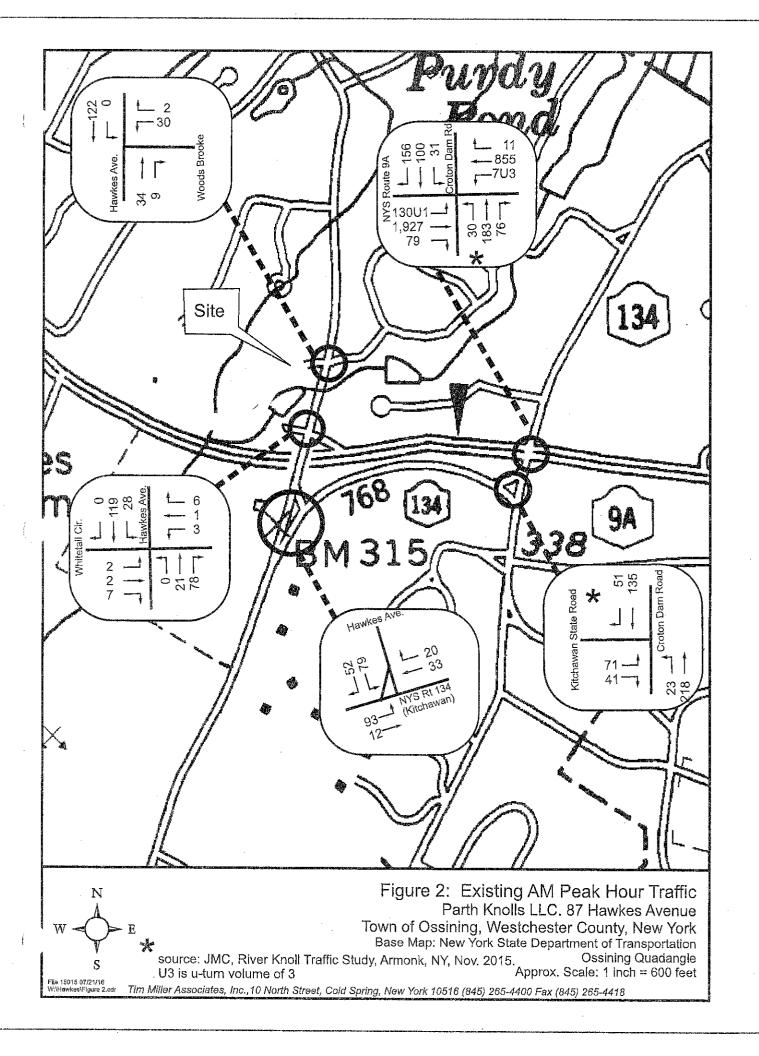
James Garofalo, AICP Director Transportation Division TIM MILLER ASSOCIATES, INC.

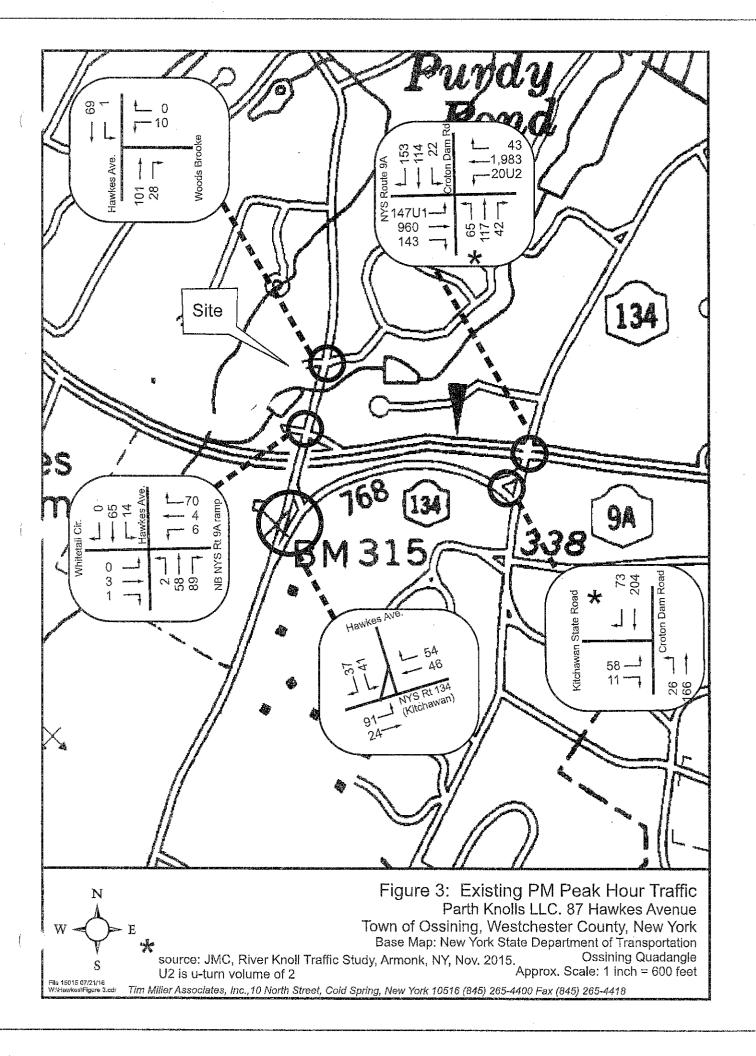
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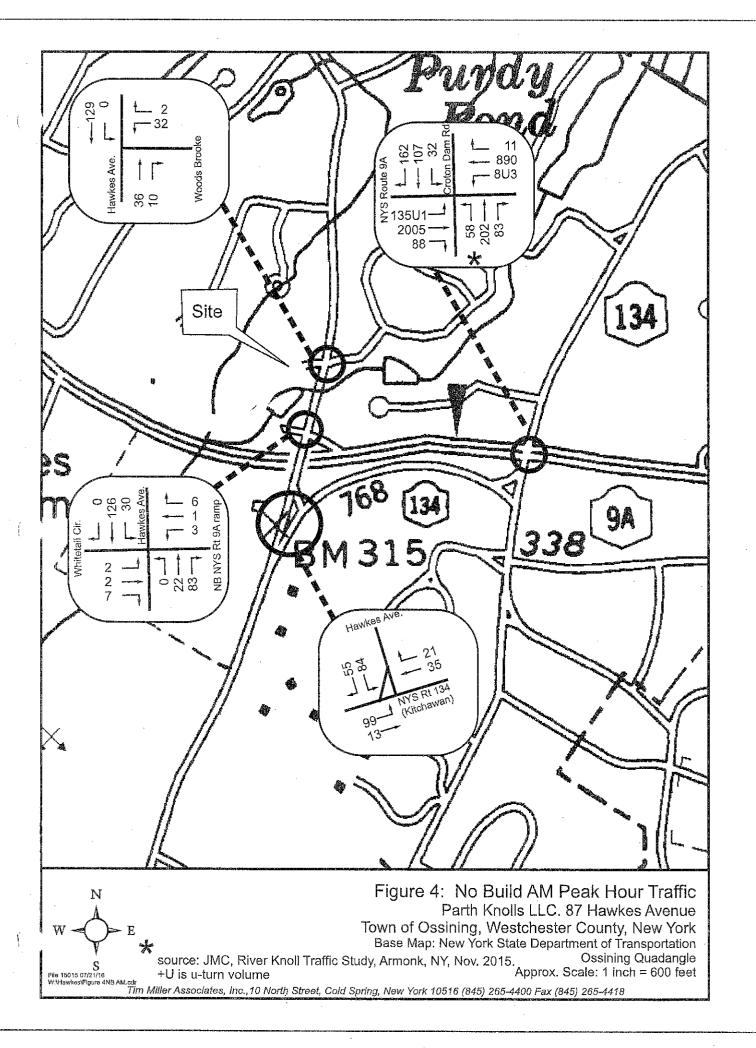
² Transportation Research Board of the National Academies, HCM 2010 the Highway Capacity Manual, Volume 3 page 18-8.

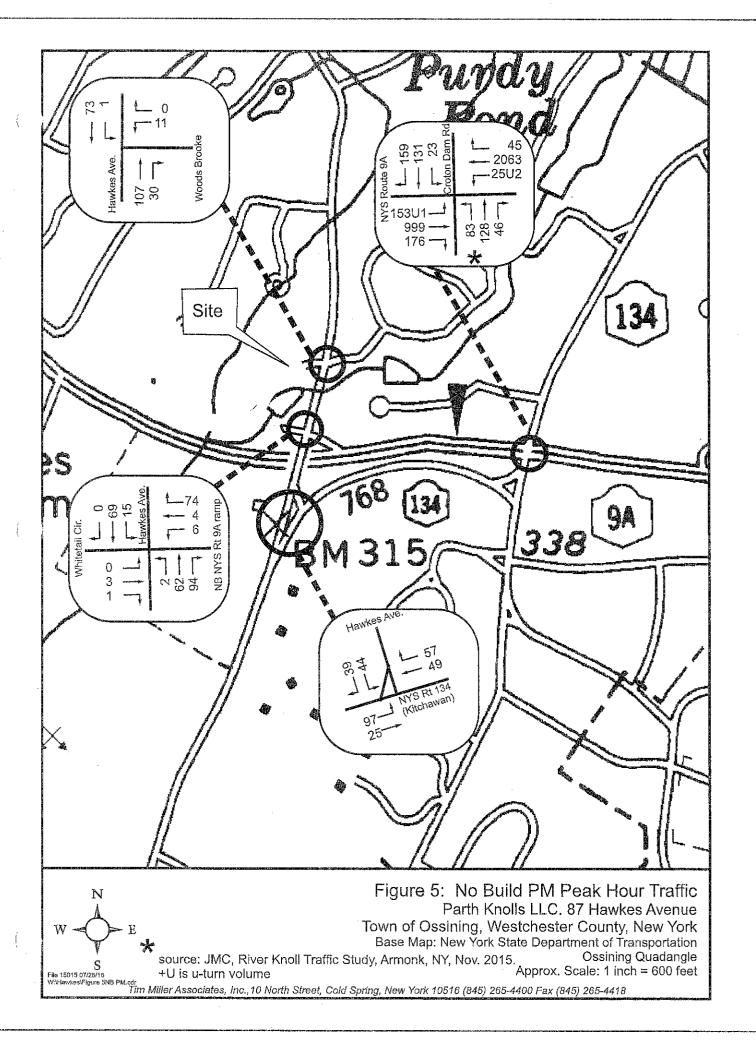
ATTACHMENT A
Figures

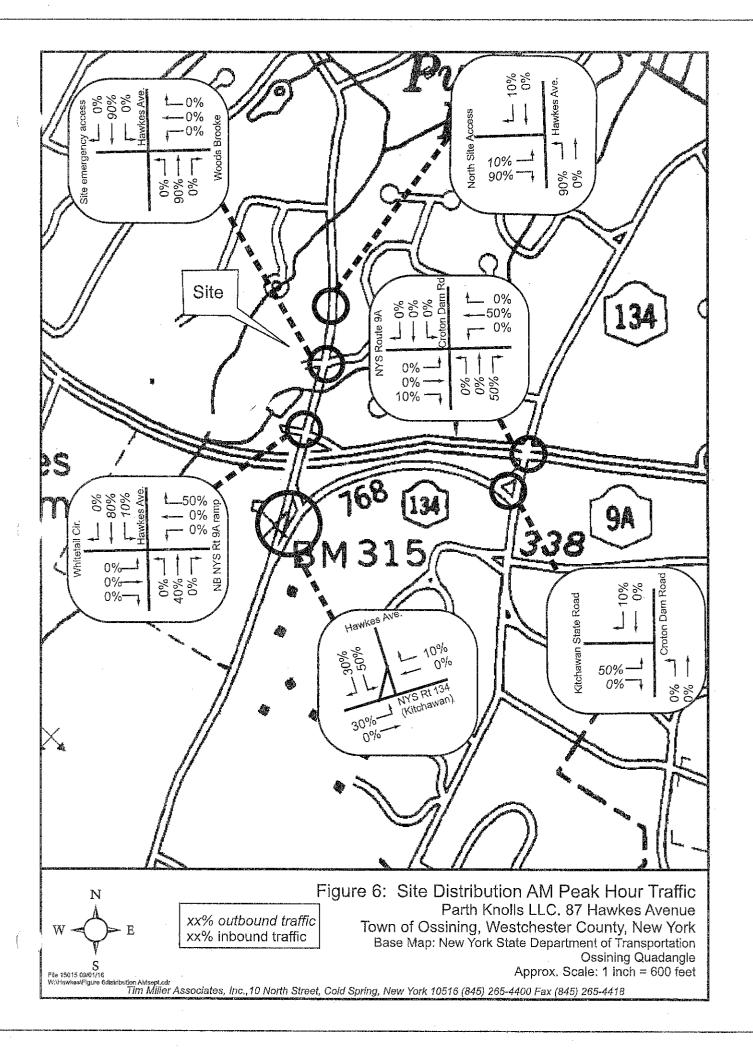


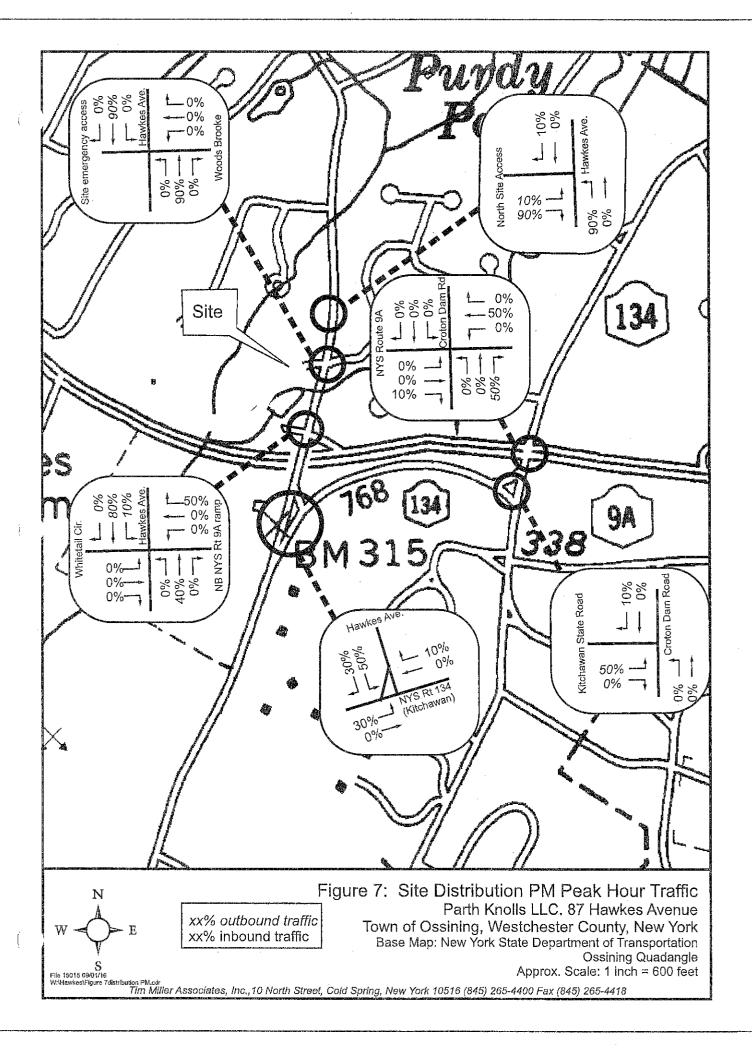


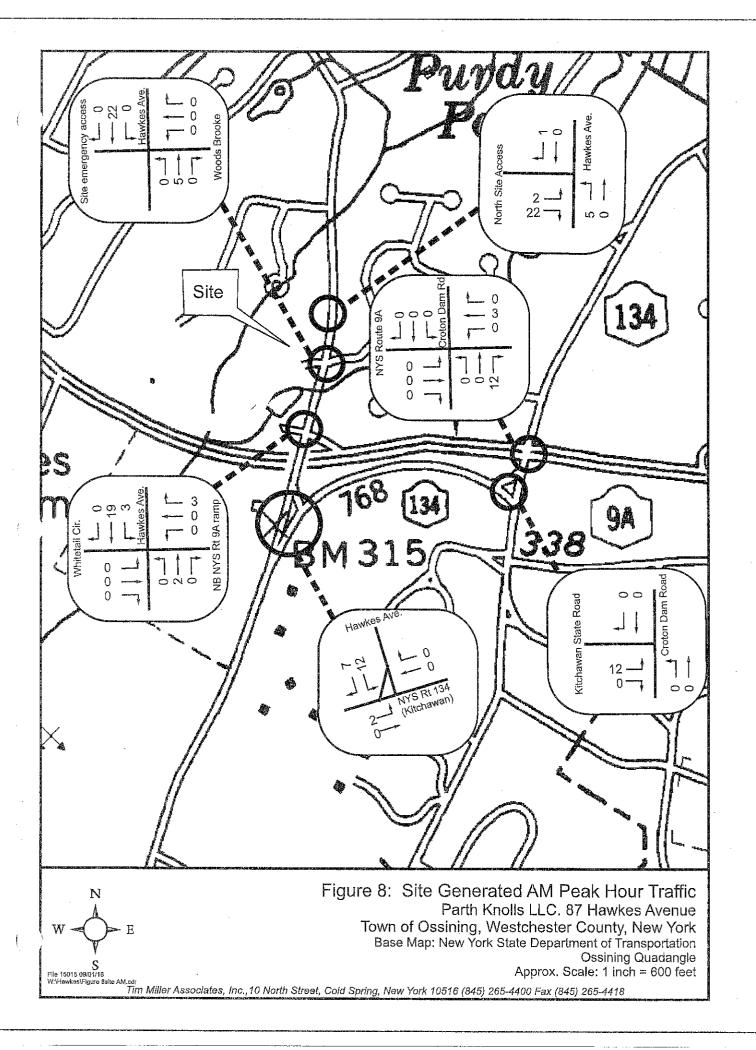


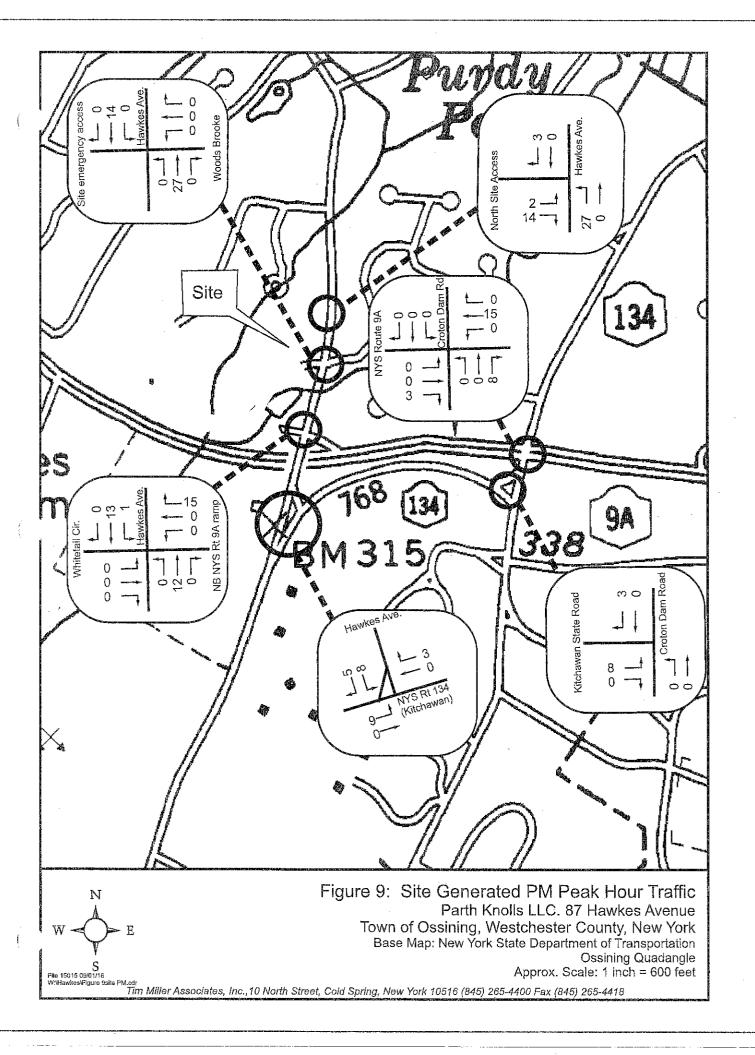


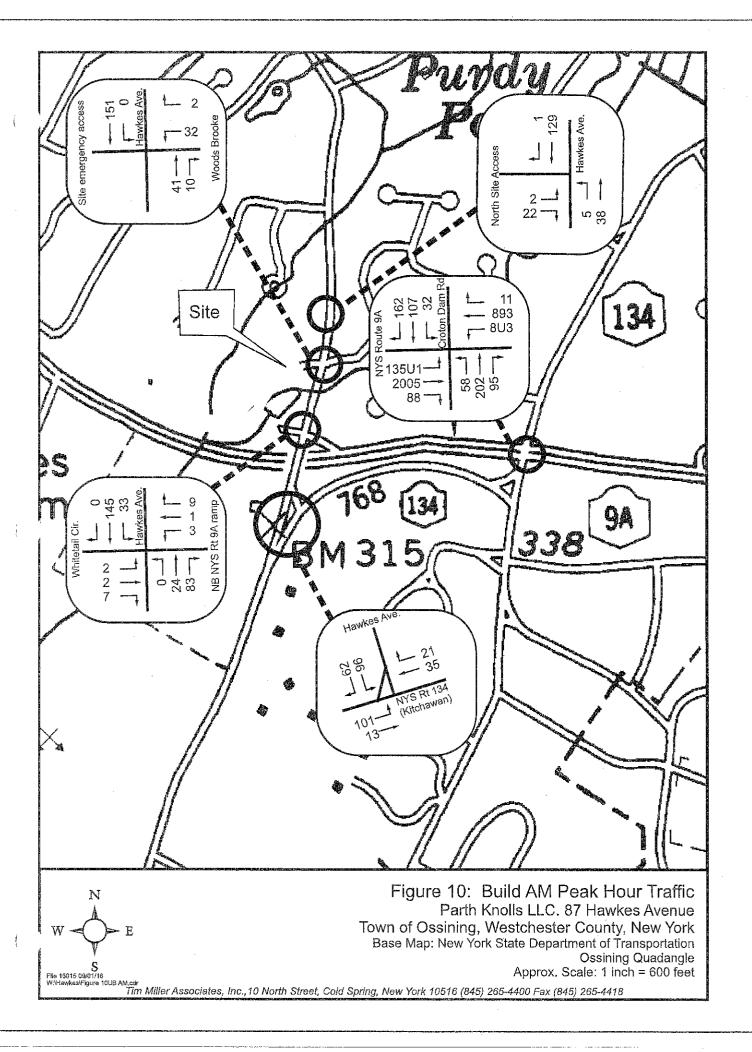


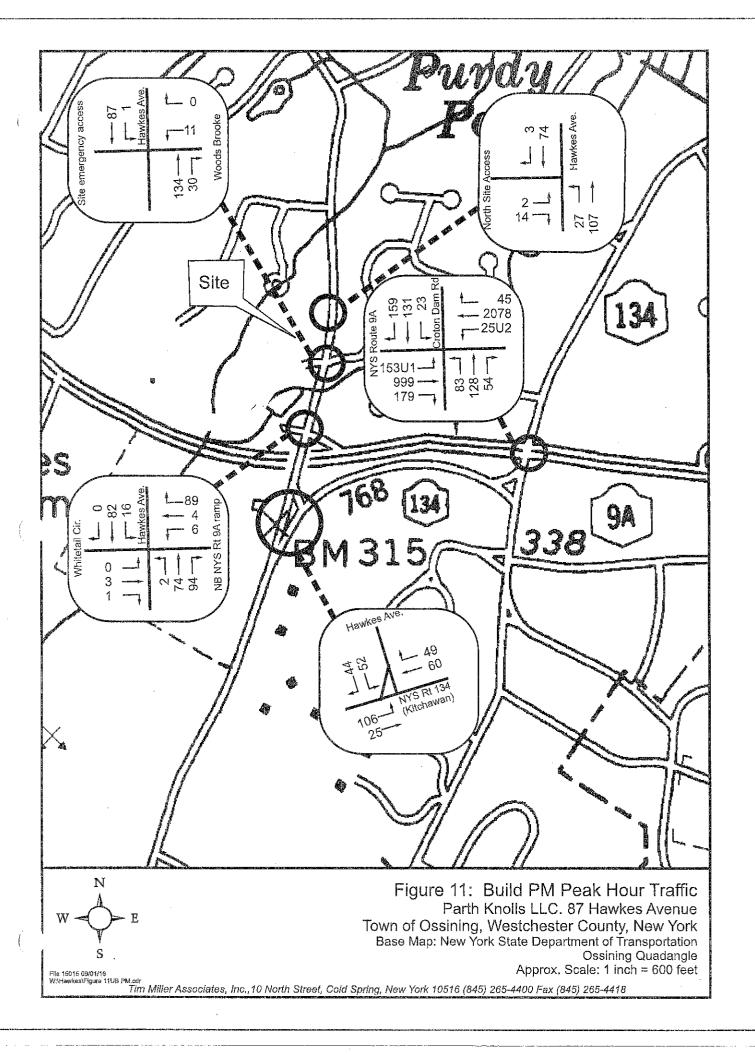












ATTACHMENT B

Level of Service Summary Table

Table B-1 Level of Service Summary All Conditions NYS Route 9A and Croton Dam Road NYS Route 134

		Levels of	Service (Dela	y in seconds p	er vehicle) V	olume to Capa	acity Ratio
	Lane Group	Week	day A.M. Peal	k Hour	Week	day PM Peak	Hour
Intersection Road	Approach Direction - -Movement	Existing No Build Build Existing		No Build	Build		
NYS Route 9A	and Croton	Dam Road (N'	YS Route 134) signalized			
NYS Route 9A	EB-L	E (72.5) 0.71	E (75.9) 0.72	E (75.9) 0.72	F (88.1) 0.78	F (89.1) 0.79	F (89.1) 0.79
	EB-T	C (21.1) 0.86	C (33.9) 0.95	C (33.9) 0.95	B (11.8) 0.42	B (12,2) 0.44	B (12.2) 0.44
	EB-R	A (8.1) 0.09	В (10.7) 0.10	B (10.7) 0.10	A (9.7) 0.15	B(10.1) 0.18	B(10.1) 0.18
NYS Route 9A	WB - L.	E (65.7) 0.17	F (102.8) 0.40	F (102.8) 0.40	E (79.9) 0.32	F (81.4) 0.37	F (81.4) 0.37
	WB-T,R*	C (22,1) 0.53	C (27.6) 0.59	C (27.7) 0.60	E* (67.3) 1.06	F (84.7) 1.10	F (87.8) 1.11
Croton Dam Rd	NB - L, T, R	F (109.8) 1.03	F (144.8) 1.16	F (155.9) 1.19	F (517.9) 2.03	F (887.3) 2.88	F (901.3) 2.91
Croton Dam Rd	SB - L, T, R	F (139.9) 1.13	F (82.3) 0.92	F (84.5) 0.94	F (171.0) 1.20	F (207.1) 1.30	F (211.0) 1.31
	Overail	D (39.7)	D (47.5)	D (49.0)	F (86.4)	F (124.2)	F (128.4)

NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound.

L = left, R = right, T = through, (e.g. WB-L = Westbound left).

^{*}Through-Right lane data shown.

^{*} By Volume to Capacity ratio this is level of service is F.

ATTACHMENT C Level of Sevice and Queuing Calculations

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Maximum vic Ratio: 1/13 Intersection Signal Delay: 39.7 Intersection Capacity Utilization 95.5% Analysis Period (min) 15

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Splits and Phases: 1: Croton Dam Road & Route 9A

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Queuing and Blocking Report Route 9A and Rt 134

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Network Summary

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Heavy Vehicles (%)	0%	0%	3%	2%	0%	5%	2%	- 5%	6%	0%	5%	9%	. 1%	3%	
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Act Effct Green (s)		17.1	100.4	100.4		6,6	85.0			25.0	1.4		25.0	100	
Actuated g/C Ratio		0.12	0.68	0.68		0.04	0.58			0.17			0.17		4
v/c Ratio		0.78	0.42	0.15		0.32	1.06			2.03		1 1 1 10 10 10 10 10 10 10 10 10 10 10 1	1.20		
Control Delay		88.1	11.8	9.7		79.9	67.3			517.9			171.0		
Queue Delay		0,0	0.0	0,0		0.0	0.0		Pala.	0,0		- 08.5	0.0	1.3.	
Total Delay		88.1	11.8	9.7		79.9	67.3			517.9			171.0		
LÖS			B	A	gran ver pr Granda sa	. ∫E	, E				Ş., 154	KEXIE	F.	7.5	
Approach Delay			20.6				67.4			517.9			171.0		
Approach LOS			C				E		gala v	- F	A%dis		F.	東區等	

Cycle Length: 150.
Actuated Cycle Length: 147.2
Natural Cycle: 150.
Control Type: Actuated-Uncoordinated

Maximum vic Ratio 2.03 Intersection Signal Delay, 86.4 Intersection Capacity Utilization 111.0% Analysis Period (min) 15

Intersection LOS: F ICU Level of Service H

Splits and Phases: 1: Croton Dam Road & Route 9A

F 01	≂ ³i∂2		₩ø3
27 s	92 s	4 6 6	31s 366
-\$A	Anna	7,	
Ø 5	Ø6		
27 s	92 s		

Intersection: 1: Croton Dam Road & Route 9A

Movement	通标。EB指数	EB & LEB	his g EBu	WB as	» WB»	WB4	i- NB⊮	SB	
Directions Served	UL.	TT	R	UL	T	TR	LTR	LTR	
Maximum Queue (ft)	87	187 218	70	48	506	522	223	1055	
Average Queue (ft)	74	139 137	38	23	465	445	171	890	
95th Queue (ft)	91	201 226	78	51	501	515	250	1116	
Link Distance (ft)		1018 1018			1519	1519	855	1092	
Upstream Blk Time (%)					1574				
Queuing Penalty (veh)									
Storage Bay Dist (ft)	110		ં ∕190	150					
Storage Blk Time (%)		14 2	<u>.</u>		35				
Queuing Penalty (veh)		22 3		1354	. 8				

	*	_^		Y	(<u>*</u>	*	4	4	1	†	1	1	ļ	4	
e Group	EBU	M) EBL	ÉBT	EBR"	-weu-	WBL	WBT.	WBR	YENBLY	NET	NBR	ŠBL	SBT	SBR	a Tricolled - 'ear
ne Configurations	. ng je	Ä	ቀተ	74		.	↑ }	er e gaga e		4		100 220	4	on in spage	
ffic Volume (vph) ure Volume (vph)) 15	135 135		88 88	3 3	8	890 890	.44 11.2 11	58 58	202 202	83 83	32 32	107 107	162 162	
d. Flow (prot)		1538 1538		1460	ાં <u>ે</u>	1313	3408	:::::: <mark> </mark> 0::	- 0 - 0	1846		0	1700	102	A HE HE
Permitted		0.950		Sandraide of		0.950		nga nga n y a	Billioner W	0.697	* . ¿- ©.♥.	or of a de t	0.834		rates of the con-
d: Flow (perm)	0	1538		1460	0	1313	3408	0	0	1297	0.	0	1425	0	
d. Flow (RTOR)	est est to the total	on one war	- Term (0.000 0.800) (0.000) (200		Server * \$1000 Deve	norskalast	. 1	. gradenia	engan ar gert		eve en a de la	eternization		ens ingres	
nfl. Peds: (#/hr)		u 1326			Table 1		igidayi k		Million.		Maria di		in Ather		
nfl. Bikes (#/hr) ak Hour Fáctor	10.04	No no l	0.94	0.94	0.94	0.94	0.04	0.94	0.94	0.94	0.94	0.94	0.94	0.94	Kari Pala
owth Factor	100%	100%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
avy Vehicles (%)	100%	14%		8%	0%	43%	7%	.9%	0%	3%	1%	0%	1%	1%	
Blockages (#/hr)	0	0		0	0	0	0.	0	0	0	0	0	0	0	
king (#/hr)				直动装置					N. Za	1 1 2		Harry Physical Conference of the Conference of t	h will	a 18 Ti	
I-Block Traffic (%)		sign and	0%				0%			0%		W. 11	0%		
ared Lane Traffic (%) ne Group Flow (vph)	0	440	0400		i managai	10	959			365			200		
er Blocked Intersection	. No	145 No		94 No	. No	12 No	No	∷⊹Nö.	0 No	No.	No	0 No	320 No	No.	19 9 45 B
ne Allgnment	R NA	Left		Right	R NA	Left	Left	Right	Left	Left	Right	Left	Left	Right	
dlan Width(ft)										Ö.		ga¶A	0		
k Offset(ft)			0				0			0			0		
osswalk Width(ft)			16		a de mende Henrikan		. 16	Parawas		16	474	70. P. 179.	16	43-14	
o way Left Turn Lane	515 5 55.49	T 200 67 64	199932	erong 1880	an area.	STORKLANT	or and a	eri armesi		179 10 00	0.00		0.000	أممانا	ikiswa shi ilipiki ili
adway Factor ning Speed (mph)	1.03	1.03 15	1.03	7 1.03 i	1.05	1.05 15	1,05	1.05	0.96 15	0,96	0,96 9	1.02 15	1.02	1,02	
n Type	Prot			Perm	Prot	Prot	NA	ova ir	Perm	NA		Perm	NA		ar smaller
tected Phases	5	5	2	.1. 11.91111	1	1	6	12.00		3	\$1.45 Unit	, 0,1,0	3		
mitted Phases			2	2		ann gairt an She Sh		433	3	打探客	en en e Deservición	3			
tector Phase	5		2	2	1	1	6	V-1 ***	3				3	are a la company	er en en en
Itch Phase	3.0		100	400	2.0	0.0	40.0		F.0		N. 771.	V-1		Silvinii -	
nimum initial (s) nimum Spilt (s)	ان.ن 10.0	3.0 10.0	10.0 17.0	10.0 17.0	3.0 10.0	3.0 10,0	10.0 17.0	aloge.	5.0 11.0	5.0 11.0		5.0 11.0	5.0 11.0	a graja.	Maria ekonolia
al Split (s)	30.0	30.0		92.0	10.0	10.0	72.0		38.0	38.0		38.0	38,0	and the filters	****
al Split (%)	21.4%			65.7%	7.1%	7.1%	51,4%	120 wy.30	27.1%	27.1%	anny en	27.1%	27.1%	provinces	an in a
liow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0		
Red Time (s)	2,0	2.0		2.0	2.0	2,0	2.0		2.0	2.0	Lee Niger at	2.0	2.0		raj – Valstvij
st Time Adjust (s)		0.0		0.0	sijasinin 90	0.0	0.0	. Le trace	era de la composição de l La composição de la composição	0.0	rain partie		0.0		المراشين
al Lost Time (s) ad/Lag	Lead	7,0 Lead	errors and by the most	7.0	Lead	7,0 Lead	7.0	Mar M		6.0	De Marie	10.5%	6.0	٠	eriyar Xek
ad-Lag Optimize?	Yes	Yes		Lag Yes	Yes	Yes	Lag Yes		and the	1 1000	aleen.		4 4 4 2 3	5 1 30 2	4.5000
call Mode	None	None	the state of the state of the	Min	None	None	Mln	20 000	None	None		None	None	1. 14.5	4.5 Jan
Effet Green (s)		17.2	83.0	83.0	July 1	√. 3.0	62.5	ški si	era G	32.1	Section.		32.1	Mil Vid	
tuated g/C Ratio	1.155	0.13		0.63	energy of Hermania	0.02	0.47	erg en en egeler	t twite is	0,24	and the second	V .	0.24		
Ratio		0.72		0.10		0.40	0.59		100	1.16	harri e d		0.92	4.14.46%。	Maria Tillia
ntrol Delay eue Delay		75.9 0.0		10.7 0.0	1981 - 1983	102.8	27.6 0,0	a nji mpe	7	144.8	1.0-45.	4 4	82.3 0.0		1A. 3 × 5.
eue belay ial Delay	en Media est	75.9		10.7	6 S M 10 S	102.8	27.6	supplies their	r Moderna i	144.8	eren müring	1977 17	82.3	11 1 20	1973 AND AND 1
S () () () () () () () () () (\$15.6°	Ē	C	В	Highey)) Î	C	eri er jelde Militare i		F.		. E. W. T	F	J	
proach Delay			35.5				28.6			144.8			82.3		
oroach LOS			D				C	omi an To Swall link		91.4F			,F		
ersection Summary 3.1.2.4														GE HE A	
cle Length: 140	37547		y wên							pada ya					8.11 (1 kg)
tuated Cycle Length: 131.9															
tural Cycle: 150	age of the second														

Maximum V/c Ratio: 1116
Intersection Signal Delay: 47.5
Intersection Capacity Utilization 104.9%
Analysis Period (min) 15

Intersection LOS: D ICU Level of Service G

Splits and Phases: 1: Croton Dam Road & Route 9A

Children and Finance; Fronton Baill Note & Notice of	
₩ 21 ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	W 23
10 學業 92 s	戀 38 s
4⁴	
2 05 06	
30.s 建聚 建 72.s	型 3

Intersection: 1: Croton Dam Road & Route 9A

Movement and the second	EB	EB	E/EBIAN	/ EB	₩WBN	WB •	WB%	#NB	₩SB		
Directions Served	UL	T	T	R.	UL	T	TR	LTR	LTR		
Maximum Queue (ft)	134	943	777	214	24	278	232	420	399	742.M	3. 3167 Jan
Average Queue (ft)	102	606	599	58	9	215	180	293	314		
95th Quetie (ft)	167	1011	882	190	28	276	254	461	429	71. 35 B	
Link Distance (ft)		1018	1018			1155	1155	559	1092		
Upstream Blk Time (%).											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	110			190	150 -						7. 123 3. 3. 3. 6
Storage Blk Time (%)	11	25	30	.,		18					
Queuing Penalty (ven)	121	- 37	28			- 2 -					

Network Summary

Network wide Queuing Penalty: 188

	5	_A		· >	Ę	*	4	A.,	*	1	<i>p</i>	1/20	ļ	4	
Lane Group	WEBU!	EBL	WEBT	EBR.	WBU.	WBI.	WBT	WBR	T NBL	NBT)	NBR	SBL	SBT.	✓ SBR	
Lane Configurations		Ž.	<u>ት</u> ት	P		Ä	ት ነ			45			4		
Traffic Volume (vph)	- 1	153	999	176	2	25	2063	45	83	128	46	23	131	159	
Future Volume (vph)	1	153	999	176	2	25	2063	45	83	128	46	23	131	159	
Satd, Flow (prot)	0	1762	3602	1546	0	1659	3570	0	0	1834	0	0	1681	0	
Flt Permitted		0.950				0.950				0,307			0.908		
Satd, Flow (perm)	0	1762	3602	1546	0	1659	3570	-0	0	572	0	0	1533	. 0	
Satd. Flow (RTOR)							2								
Confl. Peds. (#/hr)							1-11					2 4 M	14.	1	
Confl. Bikes (#/hr)										·					•
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	0%	3%	2%	0%	5%	. 2%	5%	6%	0%	5%	9%	1%	3%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Parking (#/hr)															
Mid-Block Traffic (%)			0%				0%			0%			0%		
Shared Lane Traffic (%)		- Alex			- 1250 - 1250	\$. T P				ender in de la composition della composition del					
Lane Group Flow (vph)	0	166	1074	189	. 0	29	2266	0	0	276	0	0	337	. 0	
Enter Blocked Intersection	No	No	No	No	Ņo	No	No	No	No	No	No	No	No	No	
Lane Alignment	RNA	Left	Left	Right	RNA	Left	Left	Right	Left	Left	Right	Left	Left	Right	
Median Width(ft)	Linu i		: 11:		V. 11.4		. 11			0			. 0		
Link Offset(ft)		0.2 10 6	0				0			. 0			0		
Crosswalk Width(ft)	144		. 16				16		Zagita	16	100		16		
Two way Left Turn Lane				A14-5 (14.5)											
Headway Factor	1.03	1.03	1.03	1.03	1.05	1.05	1,05	1.05	0.96	0,96	0.96	1.02	1.02	1.02	
Turning Speed (mph)	9	15		9	9	15		9	. 15		9	15		. 9	
Turn Type	Prot	Prot	NA	Perm	Prot	Prof	NA		Perm	NA		Perm	NA		
Protected Phases	5	5	2		1	1	6						. 3		
Permitted Phases	J. Mari			2	경우다	4人生亡。			3	Vetek.		3	41-41	f	
Detector Phase	5	5	2	2	1	1	6		. 3			3	. 3		
Switch Phase		100					物質値				Server."		1000		
Minimum Initial (s)	3.0	3.0	10.0	10.0	3.0	3.0	10.0		5.0	5.0		5.0	5.0		
Minimum Split (s)	10.0	10.0	17.0	17.0	10.0	10.0	17.0		11.0	11.0		.11.0	11.0	dili sa	a at Triba Mean
Total Split (s)	27.0	27.0	92.0	92.0	27.0	27.0	92.0	5 to 2 1 months	31.0	31.0		31.0	31.0		
Total Split (%)	18.0%	18.0%		61.3%	18.0%	18.0%	61.3%		20.7%	20.7%		20.7%	20.7%	والمسامة	
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0	25.5	entropy of the control
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		waith that
Lost Time Adjust (s)	residence de la comp	0.0	0.0	0.0	45	0.0	0.0	nganeko era ya	January 1	0.0	4		0.0	5 21	er er er er
Total Lost Time (s)	# 3.0	7.0	7.0	7.0	Children v	7.0	7.0		15 1 A. K.	6.0			6.0	Lange	7.542 W. 24
Lead/Lag	Lead	Lead	Lag	Lag	Lead	Lead	Lag	ery erica e	and the contract of				and the		
Lead Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes			san Sparit	11.429		Safga sea	and the	Secretary of the second
Recall Mode	None	None	Min	Min	None	None	MIn	المعارية والمحراة	None	None	9	None	None		
Act Effct Green (s)	3.	17,6	100.6	100.6	and their	7.0.	85.1		physic is	25.0	100	1.	25.0		
Actuated g/C Ratlo		0.12	0.68	0.68	. 1 m at	0.05	0.58	Decimal and the	and the	0.17	13555 V		0.17		and the state of the state of
V/c Ratio	A 10	0.79	0.44	0.18	1.5	0.37	1.10		\$55 YE	2.88	part of Fig.	9.54	1.30	100	i vanka si
Control Delay	a.s. 7564	89.1	12.2	10.1	y ji waa s	81.4	84.7	n gri svikala	i agricia	887.3	ar .	1000	207.1		and the great such
Queue Delay	1 1 1 2 2 2	0.0	0.0	0.0		0.0	0.0	47.45	Och uk	0.0	Spirit		0.0		Extra company
Total Delay	5. 5 - 5.2	89.1	12.2	10.1	anggapens	81.4	84.7			887.3	e .	na verver i e	207.1		er en verser
LOS	il sight	Cad∜t"	B	В	or Theory	E F	F	3.50	August 1	, F	t ar ter et "	F1	F 007.4	n ti	
Approach Delay	govern w	erozopia i s	20.9	18 1 to 54 M	s sakulasia	राष्ट्र एक्टब्रहर ५०	84,7	especial control		887.3	4	es a v	207.1	12 15 63	and the second
Approach LOS	084 C	58497	54 550/	4102 (A) M.			ract.		Bellin, I	S. A. Wife		Silve to	- 1.5 ^[1]	te telilil	Barantan da

Cycle Length 150

Natural Cycle: 150
Control Type: Actuated Uncoordinated
Maximum via Para and co

Maximum vic Ratio; 2.88 Intersection Signal Delay: 124.2 Intersection LOS: F

Intersection Capacity Utilization 120.7% ICU Level of Service H

Analysis Perlod (mln) 15

Intersection LOS: F

Intersection Scientific (1997)

Splits and Phases: 1: Croton Dam Road & Route 9A

1 01		v Fø3
27 s 超磁	92 s	7 31 s
3 6 ø5	- 3 ∮mu. Ø6	
27 s 學家業	92.5	15.7

Intersection: 1: Croton Dam Road & Route 9A

Movement of the first of the second	Swot EB Mile	BEB	anEBN 7	EΒ	aWB∰	#WB#	WB	WWNBW	SB		
Directions Served	UL.	T	T	R	UL	Т	TR	LTR	LTR		
Maximum Queue (ft)	134	506	435	214	174	1534	1534	769	914	160 132 178 2 6 G 73 142 5 4 8 1	
Average Queue (ft)	124	349	303	131	46	1241	1231	550	819		
95th Queue (ft)	150	548	499	238	153	1557	1543	776	965		
Link Distance (ft)		1018	1018			1519	1519	855	1092		
Upstream Blk Time (%)						9	5				
Queuing Penalty (veh)						0	0				
Storage Bay Dist (ft)	110		Version)	190	150						
Storage Blk Time (%)	54	13	6	0		43					
Queuing Penalty (veh)	. 287	. 21	111	0		12					

Network Summary

Network wide Queuing Penalty: 332

	७	æ		***	Ģ	*	4	4	***/	1	/	100	1	4	
ne Group	W EBUN	EBLY	EBT	EBR	WBU.	WBE	TWBT.	- WBR	W. NBL	NBT	NBR	*SBL	SBT	SBR	Personal Control
ne Configurations		Ä	ት ት	7	271 27117	ă	ተቡ			4			€\$>		
affic Volume (vph)		135	2005	88	3	8	893	11	58	202	95	32	107	162	
ture Volume (vph)	1	135	2005	88	3	8	893	11	58	202	95	32	107	162	
td. Flow (prot)	0	1538	3567	1460	0	1313	3408	0	0	1841	0	0	1700	0	
Permitted		0.950		- 1, 41		0,950				0.704			0.824		
td. Flow (perm)	0	1538	3567	1460	0	1313	3408	0	0	1307	0	0	1408	0	i granda
td. Flow (RTOR)			*				1		•						
nfl: Peds. (#/hr)		200		o jigas	1111/11	0.000		1357					for the Section	. 1	n Miller et et w
nfl. Bikes (#/hr)								- 111 11111							
ak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	现物提供的
owth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
avy Vehicles (%)	100%	14%	4%	8%	0%	43%	7%	9%	0%	3%	1%	0%	1%		
s Blockages (#/hr)	0	0	0	0	0	0	0	0	0		0	0	0	0	(a) 2 1 1 4 4 1
rking (#/hr)				WENT 1			. <u> </u>		95.2A	type fil	r ee wiis	a de de	ge, such		Jan Berg
d-Block Traffic (%)	7	The state of the s	0%			17 a 27 a 34 a	0%	90, 23 No. 10 S N	A LARENCE LA	0%	10 100 mm	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0%		The Carlot of the Carlot
ared Lane Traffic (%)	· 特·维.	為 医药	au Fili		0.80	The section		1.4 114	14 TO		1. 74.144	715 H.		35 mg/	Mac Royal
ne Group Flow (vph)	0	145	2133	94	0	12	962		0	378	0	0	320	O	server server
ter Blocked Intersection	No		No	No	. No	No.	. No	No	No	No	No	No	No	No	markaret e
ne Alianment	R NA	Left	Left	Rìght	RNA	Left	Left	Right	Left	Left	Right	Left	Left	Right	
dian Width(ft)	13 13/2	LOIL	11	ixigiit	17 1307	Len	11.	rigitt	LOIL	rair	Ligin	Len	Len 0	Night	e suseries en a
k Offset(ft)	15.13.65	6 () ()	. 1:17	N Silaha	100	7777	0	1.15	1.20	0	5.50	Open Res	u	100	And Assessment
osswalk Width(ft)	11 KM (a)	N. E. 1986	10	ger a salar	12.50%	5 4 2000		war ang	de Maria	16	981 E.C.	50% -		4. 4	ang tip kayet luurig d
	Seattle Seattle	41 118 58	0,	翻译的 医皮肤		er til ser for	. 16	9.4.4		10	Office of	Williams	16	100 Mile	s it was the first
o way Left Turn Lane	S 12/66/20	77. 45 66 -	ere hanaan	2 ma 48 c	r cravker.	selements	51 41 6 m	o Service Address		e riwar		e seegigg		or an angles	a and the second
adway Factor	1.03	1.03	1.03	1.03	1.05	1.05_	1.05	1.05	0.96	0,96	0.96	1 02	1.02	1.02	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
rning Speed (mph)	9	15	n en eggges	9	9	15	eroer Las	9	15	1 11 11 11 11 11 11 11 11 11 11 11 11 1		15	55.05	9	n with thirty start and start
m,Type	Prot	Prof	NA.	Perm	Prot	Prot	, NA		Perm	NA.		Perm	. NA	224	性的人的特色
tected Phases	5	5 .	2	a mega			6								e i la titore la vese la
mitted Phases				2	1.75	48 J.H.		走出的	3			3	in all t		
tector Phase	5	5	2	2	1	1	6	,	. 3			3	3		
itch Phase	al maraganan Amaragan		100								Tage (Till)				1.2.1
nimum Initlal (s)	3.0	3,0	10.0	10.0	3.0	3.0	10.0		5,0	5.0		5.0	5.0		
nimum Split (s)		10,0	17.0	17.0	10.0	10.0	17.0		11.0	11.0		11:0	11:0		
al Split (s)	30.0	30.0	92.0	92.0	10.0	10.0	72.0		38.0	38.0		38.0	38.0		
al Split (%)	21.4%	21.4%	65.7%	65.7%	7.1%	7.1%	51.4%	100	27.1%	27.1%	5. · · · · · · · · · · · · · ·	27.1%	27.1%		gama (k.V.)
low Time (s)	5,0	5.0	5.0	5.0	5.0	5.0	5.0		4.0	4.0		4.0	4.0		
Red Time (s)	2.0	2.0	~ 2.0	2.0	2.0	2.0	2.0		2.0	2.0		2.0	2.0		선생이 있다.
st Time Adjust (s)		0.0	0,0	0.0		0.0	0.0			0.0			0,0		
tal Lost Time (s)	dalaka	7,0	7.0	7.0	Alle Services	7.0	7.0	话之类	2.76	6,0	1.0		6.0	Salah (1)	
ad/Lag	Lead	Lead	Lag	Lag	Lead	Lead	Lag								
ad-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes			1 12	5 5457				
call Mode	None	None	Mln	Min	None	None	Min	Verille I contaction	None	None	an a Suarra a	None	None	1.10.00000	4 1 7
Effct Green (s)		17.2	83.0	83.0		3.0	62.5	1.15		32.1	AND FIE		32.1		Company of the Compan
uated g/C Ratio	and a norther	0.13	0.63	0.63	Stan Carrier	0,02	0.47	mai sasiff	on grater, the	0.24	10.000000000000000000000000000000000000	700 Y	0.24	and the same	e en Medical Const.
Ratio	مارين مارين فلماري	0.72	0.95	0.10		0.40	0.60	The state of the s	0.80	1.19		The state of the s	0.94	II. 5 7	SERBELLE :
ntrol Delay	#11.65%T.F	75.9	33.9	10.7	aft table	102.8	27.7	1	masa 1755	155.9	4 E. M. W.	1 - 500	84.5	17 (11.15	A MORE THE STATE OF
eue Delay	39.50	0.0	0.0	0.0	1. 1911.74	0.0	0.0	1.15 950	art en e	0.0	24.22	er er en er	0.0	900 200	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
tal Delay	100 100 100 100	75,9	33.9	10.7	s of David S	102.8		12.1	\$ 100.00		W 168 - 1	e ji z e sketi	84.5	3 4 3 1	n Arman Miller
	-3.9350	10,9		4.1	groyerni.	IUZ.8	27.7		1.7.	155.9	2 11 5 6	. 1.19819	84.5	g max	ne e jakasange
	or AET Date		1,00	В	. W. 66 .		Ç	45.00		F	4	1.5	, F	T 17	
			35,5				28.6			155.9			84.5		
proach Delay proach LOS	A Company No.	to the second	and the second	and the second of	· • • • · · · · · · · · · · · · · · · ·	r gar ere a ann a	付き ボールード		A 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4				tara da 1986		and the second second

Cycle Length: 140 Actuated Cycle Length: 131.9 Natural Cycle: 150% Control Type: Actuated-Uncoordinated

Maximum v/c Ratio, 1 19 Intersection Signal Delay: 49.0

Intersection Capacity Utilization 105.6% Analysis Period (min) 15

Intersection LOS: D ICU Level of Service G

Splits and Phases: 1: Croton Dam Road & Route 9A	
₩01 - 02	₩ 03
10 (92 s	過終 38 s 2 2 2 3 3 3 3 3 3 3 3 3 3
3	
30 s 72 s	

Intersection: 1: Croton Dam Road & Route 9A

Movements (1944)	(rEB)	WEB 184	VÆB #	EB	#WB#	MWB)#	in NBW	(r)SB⊪	
Directions Served	UL	Т	T	R	T	TR	LTR	LTR	-
Maximum Queue (ft)	134	373	366	215	293	- 305	346	456	Unican Charles Transfer in All Co.
Average Queue (ft)	109	310	291	105	223	227	288	381	
95th Queue (ft)	174	390	392	253	301	300	367	498	
Link Distance (ft)		1018	1018		1155	1155	559.	1092	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	110			190					
Storage Blk Time (%)	30	23	13	0	25				
Queuing Penalty (veh)	322	34	12 -	0	. ∴ 8 :				

Network Summary

Network wide Queuing Penalty, 371

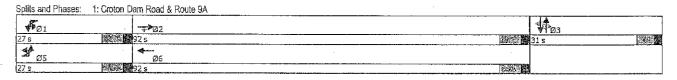
	a			``	Ģ	8	4-	Ą.	*	†	<i>/</i> *	-	ļ	4	decidalization (message as a second selection and selectio
Lane Group	EBU:	EBL	EBT	THE BR	.WBU	WBL	WBT	∛WBR′	STANDER	NBT	NBR#	SBL*	SET	SBR"	WWW.TY-TENT
Lane Configurations	ries Professorie Vanderie	Ä	ተተ	7	·····	Ž.	♠ ₽	***************************************		4			4		
Traffic Volume (vph)		153	999	179	2	25	2078	45	83	128	54	23	131	159	
Future Volume (vph)	1	153	999	179	2	25	2078	45	83	128	. 54	23	131	159	
Satd. Flow (prot)	. 0	1762	3602	1546	0	1659	3570	0	0	1829	0.	0	1681	0	
Fit Permitted	n e desen a d	0.950	15 6666	T CAETAS	n ingernamen	0.950		enantin wit	er a arrentar	0.314			0.902	est Striket	
Satd: Flow (perm) Satd. Flow (RTOR)	soryyy, u .	1762	3602	1546	J. 17 V .	1659	3570	egg, sa U Ç.	U	583	0.0	on the U	1523	v U	Services of the services
Confl. Peds. (#/hr)	SELVA	C Red a		10.15-11-	यानु जा	n as such		ti sara us	esament	o depopolar	115	14,7512	Postects	aresta.	arrang san
Confl. Bikes (#/hr)	4.9 (12,211)	1 Huan A. T	al fren saleria	Militar ult	17 4 7 3	3 4 (31)	444.7	it e . i i i e		to the first		1 75 1.4	114.	una di dina	12 12 14
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0:93	0.93	0.93	0.93	0.93	0.93	
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
Heavy Vehicles (%)	0%	0%	3%	2%	0%	5%	2%	5%	6%	0%	5%	9%	1%	3%	
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0	0	. 0	
Parking (#/hr)	tarah Mad	W. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	ali iga	Sec. 5042-13				Applications		- W		To Sense Live	a service		
Mid-Block Traffic (%)	11.11.11.11.11.11.11.11.11.11.11.11.11.	entaco montos	0%	:2001 tyd905	v 3407009	jasanja Havy	0%	er grajer na	a many	0%	1111140	J. 1984	0%		15 - J. 11 19 JSE
Shared Lane Traffic (%) Lane Group Flow (vph)	0	166	1074	192	0	20	2282		0	285	0	14,344.1	337		e North John Felling
Enter Blocked Intersection	. No	No.	No.	No No	No-	29 No	2202 No	No	. No	Z00 No	No	. No	JJ1 No	. No	and the second
Lane Alignment	R NA	Left	Left	Right	R NA	Left	Left	Right	Left	Left	Right	Left	Left	Right	TN - Burton County
Median Width(ft)			Salii)	1000	1319	COIL			2011	0	rugin		0	- Ngiit	78 S. E. E. S.
Link Offset(ft)	************	2 4 62 34	0	are a la la Tre Labore	giác sesa 10.	nere Cress	0	· · · · · · · · · ·		0		4			and the second
Crosswalk Width(ft)			16		HANGE		16			16			16		2.1.1
Two way Left Turn Lane															
Headway Factor	1.03	1.03	1.03	1.03	1.05	1.05	1.05	1.05	0.96	0.96	0.96	1.02	1.02	1.02	eldi ali te
Turning Speed (mph)	9	15	n restructivity us	9	9	15	ere e eeste	9	15		9	15		9	and the second second
Turn Type	Prot	Prot	NA.	Perm	Prot	Prot	NA.		Perm	NA.	April 194	Perm	. NA		
Protected Phases Permitted Phases	5	. 5 2020-0-52		5052 . 6 1	1 12 1 19 14 15	1 : 33:50.56	6 575 (1.47)	aran aras	ver . a .	3	35 1 K	21 11. 61	3		1 - 1 mar 1 - 9 1 1 1
Detector Phase	antilitation (13 5	2-tuni (16) 5	rdin diji	(69255€1 1	3,715754 1	a	POPULSALA	્ં.ઝ.ં 3	3	geren.	3 (13) 3	3		uk liber 1 - St
Switch Phase	:SKA	AL MASS	ana ay ƙ		rydela	awa b	เมาะองสมั	S. 13 - 4.40	are io		rayryrym	von erio	green j	1 587 5.1	a light that.
Minimum Initial (s)	3.0	3.0	10.0	10.0	3,0	3.0	10.0	Maria de de	5.0	5.0	1	5.0	5.0	F + + 1 - 1 - 1	a lining and a second con-
Minimum Split (s)	10.0	< 10.0	17:0	17.0	10.0	10:0	17.0	1.57-1.63	11.0	11.0		11.0	11.0	1974)	rising production
Total Split (s)	27.0	27.0	92.0	92.0	27.0	27.0	92.0	12-11-11-14-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11-12-11	31.0	31.0		31.0	31.0		- 45
Total Split (%)	18.0%	18.0%			18.0%	18.0%	61.3%		20,7%	20.7%	ar boy E	20.7%	20.7%		
Yellow Time (s)	5.0	5,0	5.0	5.0	5.0	5.0	5.0	e estre a constitue de la cons	4.0	4.0	e	4.0	4.0		
All-Red Time (s)	2.0	2.0	2,0	2.0	2.0	2.0	2.0		2.0	2.0	North	2.0	2.0	d day	
Lost Time Adjust (s)	et i se	0.0 7.0	0,0	0.0	1.00	0.0	0.0	1 4 4 4		0.0	4 4.5		0.0		
Total Lost Time (s) Lead/Lag	Lead	Lead	7.0 Lag	7.0 Lag	Lead	7.0 Lead	7.0 Lag	12.11.32	in a lain.	6.0	substitut 5	- 1500	6.0	1.41.1	Station Served with
Lead-Lag Optimize?	Yes	Yes	Yes	Y.es	Yes	Yes	Yes		12 5 4 5	1. 313	er a se	7.35		24	40134616119
Recall Mode	None	None	وورد المرازة Min	Mln	None	None	Min	and the contract of	None	None	CHR THE	None	None	1 1 H 2 C 44	a a di Santa de Sa
Act Effet Green (s)		17.6	100.6	100.6	4 4 74 10	7.0	85.1	faring.	HONG	25.0	angan dan sa Managan	110110	25.0	Light Ch	garante de la companya della companya de la companya de la companya della companya de la companya della companya de la companya della company
Actuated g/C Ratio	or secure her full f	0.12	0.68	0.68	a see sees the	0.05	0.58	Aug. 21 11 1	and the fire	0.17			0.17	e 11 - 11	and the second second
v/c Ratio		0.79	0.44	0.18	45.00	0.37	1,11	97. K. 915. Janes H. J.		2.91	ran est. Tantos est.	r Majikis it Alvoritis	1.31		
Control Delay		89.1	12.2	10.1	****	81.4	87.8			901.3			211.0		
Queue Delay		0.0	0.0	0.0		0.0	0.0			0.0			0.0		
Total Delay	and the	89.1	12.2	10.1		81.4	87.8		1.00	901.3	1, 9, 98, 176, 1		211.0	en i jegovice se	en en etne
LOS Approach Dolay		i E	. B	В	MO1.19	F	67.7	V-447E	will be the	F.) F		
Approach Delay Approach LOS	r figur ta	435 44 75	20.8	94-0a - 51 1-		<i>5</i> 0 (2)	87.7	148 SUB SY4	Maria Salah	901.3	g sagalaga.	5/5/22	211.0	100	nvalence men
OPPIORON LOOP STORESTONES	ay da and	-34 134	Short M	and Color	0.00 M		. 1 3 - 6	The second	SHAP.	Г.:	nja-krain is		segi milja	u ka 1, 234	THE SHARE

Intersection Summery 2 Cycle Length; 150 Actuated Cycle Length: 147.7 Natural Cycle: 150 Control Type: Actuated-Uncoordinated

Maximum v/c Ratio; 2.91 Intersection Signal Delay; 128.4 Intersection LOS; F

Intersection Signal Delay: 128.4 Intersection LOS: F
Intersection Capacity Utilization 1216% ICU Level of Service H

Analysis Period (min) 15



Intersection: 1: Croton Dam Road & Route 9A

Vioxement contraction of the mexical contraction of the contraction of	BAN	K EB	WEBE!	EB	e We a	WB [#]	WB _W	ia NB†	SBL		
Directions Served	UL	Т	Ţ	R	UL	T	TR	LTR	LTR		
Maximum Queue (ft)	134	264	245	72	46	1553	1553	668	1107		
Average Queue (ft)	109	165	152	34	11	1509	1507	575	974	The product of the State of Con-	- 110 - 140,000 10 - 100,000
95th Queue (ft)	145	259	232	∵87⁄∀	40	1615	1612	-754	1244		All Mark To Taken
Link Distance (ft)		1018	1018			1519	1519	855	1092		
Upstream Blk Time (%)						38	- 38	71 P. M. T.	42		
Queuing Penalty (veh)						0	0		0	Carrier and an artist	The state of the s
Storage Bay Dist (ft)	110			190	150						
Storage Blk Time (%)	16	8	3			43	100 m to 20 at 100 100 100 100 100 100 100 100 100 10		\$ 1.721.1 P. \$ 1. \$ 1.01.1 BE \$ 4.0	appropriate and the 1994 for the section	AMERICAN AND THE STREET
Queuing Penalty (veh)	88	13	6	e de la composición del composición de la compos		12					

Network Summary

Network wide Queuing Penalty: 120

ATTACHMENT D Level of Service Criteria

<u>Traffic: Performance Measures</u>

Introduction

The <u>Highway Capacity Manual</u> and the *Synchro 8 Software*² procedures document the methodology used for modeling levels of service, average vehicle delay, and volume -to-capacity ratios at both signalized and unsignalized intersections. Level of service is a measure of the operational quality of an intersection; level of service A is the highest, most efficient level, and level of service F is the lowest level. The operational quality of an intersection for the automobile mode is based on the average amount of time vehicles are delayed. Levels of service are examined by 'lane group', the set of lanes allowing common movement(s) on an approach.

The Synchro 8 Software modeled results apply to peak hour periods only. During off peak periods, which is the majority of the time, drivers typically will find operations better than the modeled peak hour periods. During peak periods the experience of individual drivers can vary, because the model calculates average delay.

Level of Service Criteria Signalized Intersections

When analyzing activity at signalized intersections, an understanding of the definition of level of service for the Automobile mode is essential:

Automobile Mode

Level of service can be characterized for the entire intersection, each intersection approach, and each lane group. Control delay alone is used to characterize level of service for the entire intersection or an approach. Control delay and volume-to-capacity ratio are used to characterize level of service for a lane group. Delay quantifies the increase in travel time due to traffic signal control. It is also a surrogate measure to driver discomfort and fuel consumption. The volume-to-capacity ratio quantifies the degree to which a phase's capacity is utilized by a lane group. The following paragraphs describe each level of service.

Level of service A describes operations with a control delay of 10 seconds per vehicle or less and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is exceptionally favorable or the cycle length is very short. If it is due to favorable progression, most vehicles arrive during the green indication and travel through the intersection without stopping.

Level of service B describes operations with control delay between 10 and 20 seconds per vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is low and either progression is highly favorable or the cycle length is short. More vehicles stop than with Level of service A.

Level of service C describes operations with control delay between 20 and 35 seconds per vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when progression is favorable or the cycle length is moderate. Individual cycle failures (i.e., one or more queued vehicles are not able to depart as a result of depart as a result of insufficient capacity during the cycle) may begin to appear at this level. The number of vehicles stopping is significant, although many vehicles still pass through the intersection without stopping.

Level of service D describes operations with control delay between 35 and 55 seconds per vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned

¹ Transportation Research Board of the National Academies, <u>Highway Capacity Manual</u>, Washington D.C., 2010.

² Synchro 8, Computer software, Trafficware, Sugar Land, Texas, 2011.

when the volume-to-capacity ratio is higher and either progression is ineffective or the cycle length is long. Many vehicles stop and individual cycle failures are noticeable.

Level of service E describes operations with control delay between 55 and 80 seconds per vehicle and a volume-to-capacity ratio no greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is high, progression is unfavorable, and the cycle length is long. Individual cycle failures are frequent.

Level of service F describes operations with control delay exceeding 80 seconds per vehicle or a volume-to-capacity ratio greater than 1.0. This level is typically assigned when the volume-to-capacity ratio is very high, progression is very poor, and the cycle length is long. Most cycles fail to clear the queue.

A lane group can incur a delay less than 80 seconds per vehicle when the volume-to-capacity ratio exceeds 1.0. This condition typically occurs when the cycle length is short, the signal progression is favorable, or both. As a result, both the delay and volume-to-capacity ratio are considered when lane group level of service is established. A ratio of 1.0 or more indicates that cycle capacity is fully utilized and represents failure from a capacity perspective (just as delay in excess of 80 seconds per vehicle represents failure from a delay perspective).

Exhibit 18-4 lists the level of service thresholds established for the automobile mode at a signalized intersection.³

Signalized I Level of Service Criteria Auto	ntersections mobile Mode For Lane	Groups
Average Control Delay (Seconds Per Vehicle)	Volume-to-capacity Ratio less than or equal to one	Volume-to-capacity Ratio greater than one
	Level of Service	Level of Service
less than or equal to 10	А	E
greater than 10 and less than or equal to 20	В	F
greater than 20 and less than or equal to 35	С	F
greater than 35 and less than or equal to 55	D	F
greater than 55 and less than or equal to 80	<u> </u>	F
greater than 80	F	<u> </u>

¹ From Transportation Research Board of the National Academies, <u>Highway Capacity Manual</u>, Washington D.C., Volume 3 page 18-6, Exhibit 18-4, 2010. Abbreviations and mathematical symbols have been replaced for reader clarity. Table limited to lane groups (lane or group of lanes sharing a common movement).

The New York State Department of Transportation (NYS DOT) generally seeks in urban areas for a level of service D or better (delay of 55 seconds or less for a signalized intersection) for all lane groups however:

In some cases, it may be necessary to accept level of service E or F on individual lane groups due to unreasonable costs or impacts associated with improving the level of service.⁴

abbreviations replaced for reader clarity.

From Transportation Research Board of the National Academies, <u>Highway Capacity Manual</u>, Washington D.C.,
 Volume 3 page 18-6, 2010. Abbreviations and mathematical symbols have been replaced for reader clarity.
 From NYS DOT, <u>Highway Design Manual</u>, Revision 62, April 13, 2011, (page 5-103) with

ATTACHMENT E

Queueing Summary

Table E-1 Queuing Summary All Conditions NYS Route 9A and Croton Dam Road NYS Route 134

		Queue in Feet										
	Lane Group	Weeko	lay A.M. Peal	Hour	Weekday PM Peak Hour							
Intersection Road Approach Direction - Movement		Existing No Build		Build	Existing	No Build	Build					
NYS Route 9A a	and Croton Da	m Road (NY	S Route 134) signalize	1							
NYS Route 9A	EB-L	135	167	174	91	149	190					
	EB-T	737	1011	390*	201	269	318					
	EB-T	672	882	392*	226	238	306					
	EB-R	282	190	253	78	131	131					
NYS Route 9A	WB - L	17	28	0	51	154	152					
	WB-T,	284	276	301	501	1854	1667					
	WB - T, R	251	254	300	515	1839	1492					
Croton Dam Rd	NB - L, T, R	466	461	367	250	661	537					
Croton Dam Rd	SB-L,T,R	978	429	498	1116	1131	969					

NB = Northbound, SB = Southbound, EB = Eastbound, WB = Westbound.

L = left, R = right, T = through, (e.g. WB-L = Westbound left).

^{*} based on Synchro analysis these should be comparable to No Build Condition.