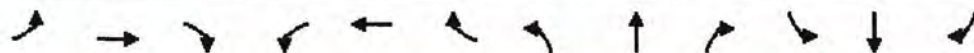


ATTACHMENT B:

***SYNCHRO* HCM CAPACITY ANALYSIS OUTPUT**

HCM Unsignalized Intersection Capacity Analysis
 1: Tyne Boulevard & Granny White Pike

Oak Hill Traffic Study
 AM Existing Conditions



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	58	220	43	87	151	121	12	383	37	27	279	14
Peak Hour Factor	0.73	0.82	0.67	0.75	0.77	0.80	0.60	0.85	0.54	0.61	0.80	0.58
Hourly flow rate (vph)	79	268	64	116	196	151	20	451	69	44	349	24

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	412	463	539	417
Volume Left (vph)	79	116	20	44
Volume Right (vph)	64	151	69	24
Hadj (s)	-0.02	-0.11	-0.03	0.02
Departure Headway (s)	9.5	9.5	9.5	9.6
Degree Utilization, x	1.09	1.22	1.43	1.11
Capacity (veh/h)	386	386	388	386
Control Delay (s)	104.8	148.1	232.5	111.0
Approach Delay (s)	104.8	148.1	232.5	111.0
Approach LOS	F	F	F	F

Intersection Summary			
Delay		154.8	
HCM Level of Service		F	
Intersection Capacity Utilization	65.1%		ICU Level of Service C
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis
 1: Tyne Boulevard & Granny White Pike

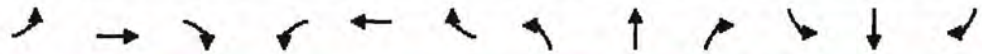
Oak Hill Traffic Study
 MD Existing Conditions



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	14	43	31	40	48	19	15	225	34	25	207	17
Peak Hour Factor	0.70	0.77	0.65	0.83	0.67	0.53	0.54	0.87	0.77	0.52	0.89	0.71
Hourly flow rate (vph)	20	56	48	48	72	36	28	259	44	48	233	24
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total (vph)	124	156	331	305								
Volume Left (vph)	20	48	28	48								
Volume Right (vph)	48	36	44	24								
Hadj (s)	-0.17	-0.04	-0.03	0.02								
Departure Headway (s)	5.7	5.8	5.2	5.2								
Degree Utilization, x	0.20	0.25	0.47	0.44								
Capacity (veh/h)	548	552	653	647								
Control Delay (s)	10.1	10.7	12.7	12.4								
Approach Delay (s)	10.1	10.7	12.7	12.4								
Approach LOS	B	B	B	B								
Intersection Summary												
Delay			11.9									
HCM Level of Service			B									
Intersection Capacity Utilization			38.9%	ICU Level of Service			A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 1: Tyne Boulevard & Granny White Pike

Oak Hill Traffic Study
 PM Existing Conditions



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		+			+			+			+	
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	22	144	42	87	162	41	35	351	43	87	335	26
Peak Hour Factor	0.55	0.72	0.70	0.66	0.65	0.60	0.67	0.92	0.67	0.66	0.86	0.81
Hourly flow rate (vph)	40	200	60	132	249	68	52	382	64	132	390	32

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	300	449	498	553
Volume Left (vph)	40	132	52	132
Volume Right (vph)	60	68	64	32
Hadj (s)	-0.06	0.00	-0.02	0.05
Departure Headway (s)	9.5	9.0	9.0	9.1
Degree Utilization, x	0.79	1.13	1.25	1.40
Capacity (veh/h)	374	396	406	406
Control Delay (s)	40.4	114.2	157.4	217.7
Approach Delay (s)	40.4	114.2	157.4	217.7
Approach LOS	E	F	F	F

Intersection Summary			
Delay		145.7	
HCM Level of Service		F	
Intersection Capacity Utilization	81.3%		ICU Level of Service D
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis
1: Tyne Boulevard & Granny White Pike

Oak Hill Traffic Study
AM Proposed Conditions-Left-turn

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.93		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1809		1770	1741		1770	1826		1770	1845	
Flt Permitted	0.48	1.00		0.48	1.00		0.53	1.00		0.39	1.00	
Satd. Flow (perm)	887	1809		900	1741		986	1826		720	1845	
Volume (vph)	58	220	43	87	151	121	12	383	37	27	279	14
Peak-hour factor, PHF	0.73	0.82	0.67	0.75	0.77	0.80	0.60	0.85	0.54	0.61	0.80	0.58
Adj. Flow (vph)	79	268	64	116	196	151	20	451	69	44	349	24
RTOR Reduction (vph)	0	26	0	0	85	0	0	12	0	0	5	0
Lane Group Flow (vph)	79	306	0	116	262	0	20	508	0	44	368	0
Turn Type	Perm		Perm		Perm		Perm		Perm			
Protected Phases	4		8		2		6					
Permitted Phases	4		8		2		6					
Actuated Green, G (s)	8.4	8.4		8.4	8.4		14.8	14.8		14.8	14.8	
Effective Green, g (s)	8.4	8.4		8.4	8.4		14.8	14.8		14.8	14.8	
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.47	0.47		0.47	0.47	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	239	487		242	469		468	866		342	875	
v/s Ratio Prot	c0.17		0.15		c0.28		0.20					
v/s Ratio Perm	0.09			0.13			0.02			0.06		
v/c Ratio	0.33	0.63		0.48	0.56		0.04	0.59		0.13	0.42	
Uniform Delay, d1	9.1	10.0		9.6	9.8		4.4	6.0		4.6	5.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	2.5		1.5	1.4		0.0	1.0		0.2	0.3	
Delay (s)	10.0	12.6		11.1	11.3		4.4	7.0		4.8	5.7	
Level of Service	A	B		B	B		A	A		A	A	
Approach Delay (s)	12.1		11.2		6.9		5.6					
Approach LOS	B		B		A		A					
Intersection Summary												
HCM Average Control Delay	8.9		HCM Level of Service		A							
HCM Volume to Capacity ratio	0.60											
Actuated Cycle Length (s)	31.2		Sum of lost time (s)		8.0							
Intersection Capacity Utilization	51.4%		ICU Level of Service		A							
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Tyne Boulevard & Granny White Pike

Oak Hill Traffic Study
MD Proposed Conditions-Left-turn



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.93		1.00	0.95		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1734		1770	1770		1770	1822		1770	1837	
Flt Permitted	0.69	1.00		0.69	1.00		0.60	1.00		0.58	1.00	
Satd. Flow (perm)	1280	1734		1285	1770		1118	1822		1072	1837	
Volume (vph)	14	43	31	40	48	19	15	225	34	25	207	17
Peak-hour factor, PHF	0.70	0.77	0.65	0.83	0.67	0.53	0.54	0.87	0.77	0.52	0.89	0.71
Adj. Flow (vph)	20	56	48	48	72	36	28	259	44	48	233	24
RTOR Reduction (vph)	0	40	0	0	30	0	0	9	0	0	5	0
Lane Group Flow (vph)	20	64	0	48	78	0	28	294	0	48	252	0
Turn Type	Perm			Perm			Perm			Perm		
Protected Phases	4			8			2			6		
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	7.5	7.5		7.5	7.5		27.1	27.1		27.1	27.1	
Effective Green, g (s)	7.5	7.5		7.5	7.5		27.1	27.1		27.1	27.1	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.64	0.64		0.64	0.64	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	225	305		226	312		711	1159		682	1169	
v/s Ratio Prot	0.04			c0.04			c0.16			0.14		
v/s Ratio Perm	0.02			0.04			0.03			0.04		
v/c Ratio	0.09	0.21		0.21	0.25		0.04	0.25		0.07	0.22	
Uniform Delay, d1	14.7	15.0		15.0	15.1		2.9	3.4		3.0	3.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.3		0.5	0.4		0.0	0.1		0.0	0.1	
Delay (s)	14.9	15.4		15.5	15.6		2.9	3.5		3.0	3.4	
Level of Service	B	B		B	B		A	A		A	A	
Approach Delay (s)	15.3			15.5			3.4			3.3		
Approach LOS	B			B			A			A		

Intersection Summary

HCM Average Control Delay	7.1	HCM Level of Service	A
HCM Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	42.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	36.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Tyne Boulevard & Granny White Pike

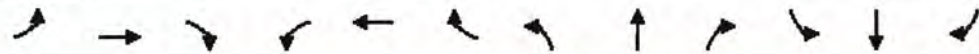
Oak Hill Traffic Study
PM Proposed Conditions-Left-turn



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.97		1.00	0.98		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	1798		1770	1803		1770	1823		1770	1842	
Flt Permitted	0.51	1.00		0.60	1.00		0.48	1.00		0.46	1.00	
Satd. Flow (perm)	952	1798		1115	1803		896	1823		852	1842	
Volume (vph)	22	144	42	87	162	41	35	351	43	87	335	26
Peak-hour factor, PHF	0.55	0.72	0.70	0.66	0.65	0.60	0.67	0.92	0.67	0.66	0.86	0.81
Adj. Flow (vph)	40	200	60	132	249	68	52	382	64	132	390	32
RTOR Reduction (vph)	0	33	0	0	30	0	0	13	0	0	6	0
Lane Group Flow (vph)	40	227	0	132	287	0	52	433	0	132	416	0
Turn Type	Perm		Perm		Perm		Perm		Perm		Perm	
Protected Phases	4		8		2		6		6		6	
Permitted Phases	4		8		2		6		6		6	
Actuated Green, G (s)	8.3	8.3		8.3	8.3		14.6	14.6		14.6	14.6	
Effective Green, g (s)	8.3	8.3		8.3	8.3		14.6	14.6		14.6	14.6	
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.47	0.47		0.47	0.47	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	256	483		299	484		423	861		403	870	
v/s Ratio Prot		0.13			c0.16			c0.24			0.23	
v/s Ratio Perm	0.04			0.12			0.06			0.15		
v/c Ratio	0.16	0.47		0.44	0.59		0.12	0.50		0.33	0.48	
Uniform Delay, d1	8.6	9.5		9.4	9.8		4.6	5.6		5.1	5.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.3	0.7		1.0	2.0		0.1	0.5		0.5	0.4	
Delay (s)	8.9	10.2		10.4	11.8		4.7	6.1		5.6	6.0	
Level of Service	A	B		B	B		A	A		A	A	
Approach Delay (s)		10.0			11.4			6.0			5.9	
Approach LOS		B			B			A			A	
Intersection Summary												
HCM Average Control Delay			8.0	HCM Level of Service				A				
HCM Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			30.9	Sum of lost time (s)				8.0				
Intersection Capacity Utilization			54.2%	ICU Level of Service				A				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 1: Tyne Boulevard & Granny White Pike

Oak Hill Traffic Study
 AM Proposed Conditions - Roundabout



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Volume (veh/h)	58	220	43	87	151	121	12	383	37	27	279	14
Peak Hour Factor	0.73	0.82	0.67	0.75	0.77	0.80	0.60	0.85	0.54	0.61	0.80	0.58
Hourly flow rate (vph)	79	268	64	116	196	151	20	451	69	44	349	24
Approach Volume (veh/h)		412			463			539			417	
Crossing Volume (veh/h)		509			550			392			332	
High Capacity (veh/h)		927			897			1017			1067	
High v/c (veh/h)		0.44			0.52			0.53			0.39	
Low Capacity (veh/h)		748			722			829			874	
Low v/c (veh/h)		0.55			0.64			0.65			0.48	
Intersection Summary												
Maximum v/c High											0.53	
Maximum v/c Low											0.65	
Intersection Capacity Utilization				65.1%			ICU Level of Service					C

HCM Unsignalized Intersection Capacity Analysis
 1: Tyne Boulevard & Granny White Pike

Oak Hill Traffic Study
 MD Proposed Conditions-Roundabout



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Right Turn Channelized													
Volume (veh/h)	14	43	31	40	48	19	15	225	34	25	207	17	
Peak Hour Factor	0.70	0.77	0.65	0.83	0.67	0.53	0.54	0.87	0.77	0.52	0.89	0.71	
Hourly flow rate (vph)	20	56	48	48	72	36	28	259	44	48	233	24	
Approach Volume (veh/h)	124			156			331			305			
Crossing Volume (veh/h)	329			306			124			148			
High Capacity (veh/h)	1070			1089			1257			1234			
High v/c (veh/h)	0.12			0.14			0.26			0.25			
Low Capacity (veh/h)	876			893			1045			1024			
Low v/c (veh/h)	0.14			0.17			0.32			0.30			
Intersection Summary													
Maximum v/c High	0.26												
Maximum v/c Low	0.32												
Intersection Capacity Utilization	38.9%			ICU Level of Service					A				

HCM Unsignalized Intersection Capacity Analysis
 1: Tyne Boulevard & Granny White Pike

Oak Hill Traffic Study
 PM Proposed Conditions-Roundabout



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Volume (veh/h)	22	144	42	87	162	41	35	351	43	87	335	26
Peak Hour Factor	0.55	0.72	0.70	0.66	0.65	0.60	0.67	0.92	0.67	0.66	0.86	0.81
Hourly flow rate (vph)	40	200	60	132	249	68	52	382	64	132	390	32
Approach Volume (veh/h)	300			449			498			553		
Crossing Volume (veh/h)	653			474			372			433		
High Capacity (veh/h)	825			953			1034			984		
High v/c (veh/h)	0.36			0.47			0.48			0.56		
Low Capacity (veh/h)	659			772			844			800		
Low v/c (veh/h)	0.46			0.58			0.59			0.69		
Intersection Summary												
Maximum v/c High	0.56											
Maximum v/c Low	0.69											
Intersection Capacity Utilization	81.3%		ICU Level of Service				D					