

GARY W. DEAN, PE, PP ELIZABETH DOLAN, PE

792 CHIMNEY ROCK ROAD MARTINSVILLE, NJ 08836

732 469 0600 732 469 0663 FACSIMILE

TRAFFIC IMPACT ASSESSMENT

FOR

PROPOSED RESIDENTIAL DEVELOPMENT

BLOCK 291, LOT 15.01
BLOCK 292, LOT 2
TOWNSHIP OF CRANFORD
UNION COUNTY, NEW JERSEY

JANUARY 24, 2018

ELIZABETH DOLAN, P.E.

NJ LICENSE No. 37071

ary W. Dean, P.E., P.P. NJ License No. 33722

TRAFFIC ENGINEERING PARKING STUDIES HIGHWAY DESIGN DOT ACCESS PERMITS MUNICIPAL CONSULTING

INTRODUCTION

This study has been prepared to evaluate the traffic impacts associated with the development of 225 residential units in the Township of Cranford, Union County New Jersey. Three new mid-rise residential buildings are proposed on the southwest side of Birchwood Avenue, between Orange Avenue and Cranford Avenue. Three driveways will provide access to the new apartments, and a minimum of 416 parking spaces are proposed on site.

Dolan & Dean Consulting Engineers, LLC (D&D) has been commissioned by Garden Homes to prepare this Traffic Impact Assessment for the proposed site redevelopment. While any development of the subject property may affect traffic conditions, both the volume and characteristics of that traffic are of important consideration in the evaluation of this application.

This traffic study estimates the quantitative increase in traffic movements along the adjacent roadway network that could occur from the development of 225 apartments. The focus of this traffic impact assessment is to identify any unique characteristics of site-generated traffic, and to evaluate the overall impacts on the local street system. Also included is an evaluation of site access and on-site circulation.

EXISTING CONDITIONS

As mentioned, the subject property is located along the southwest side of Birchwood

Avenue, between Orange Avenue and Cranford Avenue. The property is designated as Block

291, Lot 15.01 and Block 292, Lot 2, and is also known as 215 and 235 Birchwood Avenue.

The site had previously been occupied by office buildings totaling 50,293 square feet. The

general site location is shown on appended Figure 1.

EXISTING ROADWAY CONDITIONS

Birchwood Avenue is a two-way roadway, connecting Orange Avenue to the northwest,

with Cranford Avenue to the southeast. Birchwood Avenue intersects Orange Avenue

opposite Birch Street, which provides access to the Orange Avenue Pool. STOP signs control

the Birchwood Avenue and Birch Street approaches to Orange Avenue.

Southeast of the site, Birchwood Avenue forms a four-leg intersection with Cranford

Avenue. STOP control is posted on the Cranford Avenue approaches.

Other land use along Birchwood Avenue includes a Verizon office building, the Cranford

Conservation Center/recycling center and the Cranford Health and Extended Care facility.

EXISTING TRAFFIC VOLUMES

D&D conducted a series of traffic counts along Birchwood Avenue in July 2010 and June of

2012. Manual turning movement counts had been performed at the Orange Avenue and

Cranford Avenue intersections, as well as at the 235 Birchwood Avenue office driveway, the

Verizon office driveways, and the Extended Care facility driveways.

PAGE 2

Recognizing that the counts were conducted several years ago, D&D performed updated counts in January 2018 during the following periods:

Birchwood Avenue & Birch Street & Orange Avenue

• Wednesday, January 3, 2018 from 7:00 to 9:00 a.m. and from 4:00 to 6:00 p.m.

Birchwood Avenue & Birch Street & Orange Avenue

• Tuesday, January 9, 2018 from 7:00 to 9:00 a.m. and from 4:00 to 6:30 p.m.

The peak hours occur from 7:45 a.m. to 8:45 a.m. and from 4:30 p.m. to 5:30 p.m. Appended Figures 2 and 3 illustrate the 2018 morning and evening peak hour volumes, respectively.

The evening peak hour volumes recently recorded were comparable to the 2012 volumes with the exception of Orange Avenue movements. The 2018 Orange Avenue northbound movements at Birchwood Avenue/Birch Street increased by approximately 50 vehicles.

TRAFFIC CHARACTERISTICS OF THE PROPOSED DEVELOPMENT

For this study, traffic projections were prepared by reviewing trip generation rates published by the Institute of Transportation Engineers (ITE) in the 10th Edition of <u>Trip Generation Manual</u>. The appropriate ITE land use for the proposed development is "Multi-Family Housing (Mid-Rise)" (Land Use Code 221). Trip generation projections are summarized in Table I.

Table I
Trip Generation Projections
225 Mid-Rise Apartments

Mo	rning Peak Ho	OUR	Ev	ening Peak Ho	UR
Enter	Exit	Total	Enter	Ехіт	Total
21	60	81	60	39	99

The anticipated arrival and departure patterns for future site generated traffic were based upon a review of the on-street traffic patterns and volumes as revealed thru the traffic count program. Site generated traffic is shown on Figures 4 and 5.

FUTURE TRAFFIC CONDITIONS

FUTURE TRAFFIC VOLUMES

It is recognized that traffic routinely fluctuates along various state and county roadways, as

well as local streets, and varies not only day-to-day, but also on a monthly and yearly basis.

Normal "background" traffic increases regularly occur as attributed to continued regional

growth and changes in driver demographics.

There may also be additional traffic generated by specific projects that will lead to increased

demands on the roadways in the site vicinity (at least to some degree), even if no changes

were to occur on the subject property. Traffic has been found to regularly increase as

development continues within Cranford and neighboring communities.

Regional traffic growth patterns as compiled by the New Jersey Department of

Transportation (NJDOT) were examined for this analysis. Based on NJDOT growth

patterns for Union County, traffic volumes annually increase by 1.0% during peak traffic

hours. A 1% growth rate was applied, compounded annually, for a two-year period, to a

2020 design year.

The resultant 2020 "no build" volumes are shown on Figures 7 and 8.

Future "build" traffic volumes were calculated by adding the new site generated traffic to the

"no build" volumes. The total future "build" traffic volumes for the morning and evening

peak hours are shown on Figures 9 and 10.

ANALYSIS OF FUTURE TRAFFIC CONDITIONS

Volume/capacity, Level of Service (LOS) analyses have been performed for the projected "no build" and "build" volumes, using the <u>Highway Capacity Manual</u> (HCM) computer software. Critical movements at the adjacent intersections will operate at acceptable LOS D or better during the peak hours, as summarized on the following tables:

TABLE III

LEVELS OF SERVICE & DELAY

BIRCHWOOD AVENUE/BIRCH STREET & ORANGE AVENUE

A DDD OA CIA	No I	Build	Bu	ILD
Approach	LOS	Delay	LOS	Delay
MORNING PEAK HOUR				
Northbound Birchwood Ave	D	26.3	D	34.4
Southbound Birch Road	В	13.6	В	13.9
Eastbound Orange Avenue Left Turn	Α	7.7	Α	7.7
Westbound Orange Avenue Left Turn	Α	8.4	A	8.4
EVENING PEAK HOUR				
Northbound Birchwood Ave	В	13.9	С	15.7
Southbound Birch Road	В	10.6	В	10.8
Eastbound Orange Avenue Left Turn	Α	7.9	Α	7.9
Westbound Orange Avenue Left Turn	Α	7.8	Α	7.9

Table IV

Levels of Service & Delay

Birchwood Avenue & Cranford Avenue

Approach	No B	BUILD	Bu	ILD
AFFROACH	LOS	Delay	LOS	Delay
MORNING PEAK HOUR				
Northbound Birchwood Ave Left Turn	Α	7.5	Α	7.5
Southbound Birchwood Ave Left Turn	Α	7.6	Α	7.6
Eastbound Cranford Avenue	В	10.6	В	10.8
Westbound Cranford Avenue	Α	9.5	A	9.6
EVENING PEAK HOUR				
Northbound Birchwood Ave Left Turn	Α	7.4	Α	7.4
Southbound Birchwood Ave Left Turn	Α	7.3	Α	7.4
Eastbound Cranford Avenue	Α	9.4	Α	9.6
Westbound Cranford Avenue	А	8.6	A	8.7

The maximum impact will occur on the northbound Birchwood Avenue approach to Orange Avenue. However, the average added delay will be only 8.1 seconds during the morning peak hour and approximately 2 seconds during the evening peak hour.

As a result of this analysis, the proposed apartments will not create a negative impact on the adjacent roadway system. Ample capacity is available to accommodate site generated traffic. No signalization or other intersection improvements are warranted as a result of the site redevelopment. This conclusion is based on a conservative projection of site and street volumes, and no credit for the trips associated with the offices formerly on site.

The site driveway intersections with Birchwood Avenue were also analyzed. As shown on the appended analyses, the site driveway movements will operate at LOS A and B.

SITE ACCESS AND CIRCULATION

The site plan prepared by L2A Land Design, LLC was reviewed with regard to site access, on-

site circulation and parking supply.

Three driveways will intersect Birchwood Avenue from the south. The western driveway

will be a full-movement driveway centrally located opposite the Verizon site. The center

driveway will be a full-movement divided driveway, and the eastern driveway will be for

emergency access only. The driveways and aisle will measure 24 feet in paved width to

appropriately accommodate two-way travel, and to accommodate movements to/from the

parking spaces.

Three parking garages are proposed on site providing 296 spaces, with an additional 120 non-

garage spaces being provided adjacent to the proposed buildings. This provides a total of 416

parking spaces, which meets the Birchwood Avenue Redevelopment Area requirement of one

1.85 spaces per residential units.

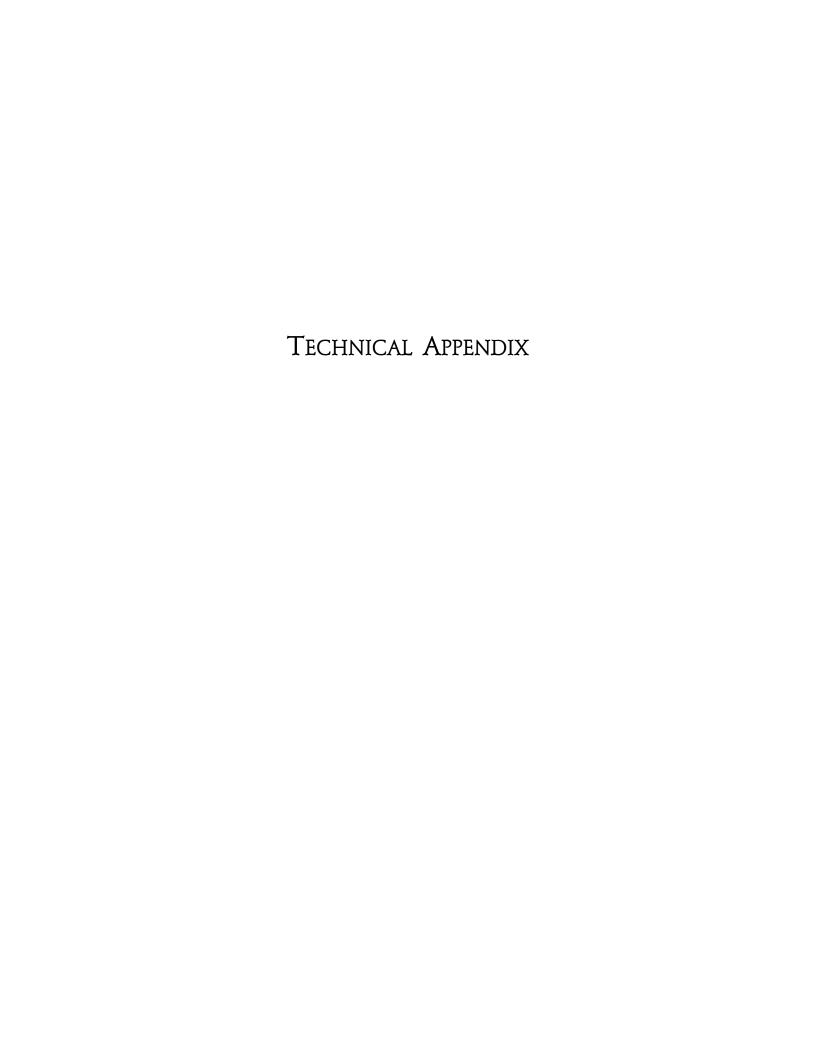
Four driveways currently serve the two lots. As a result of site redevelopment, the number

of driveways will be reduced, resulting in fewer vehicle conflict points along Birchwood

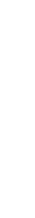
Avenue.

The site plan has been designed in accordance with recognized design guidelines, and to

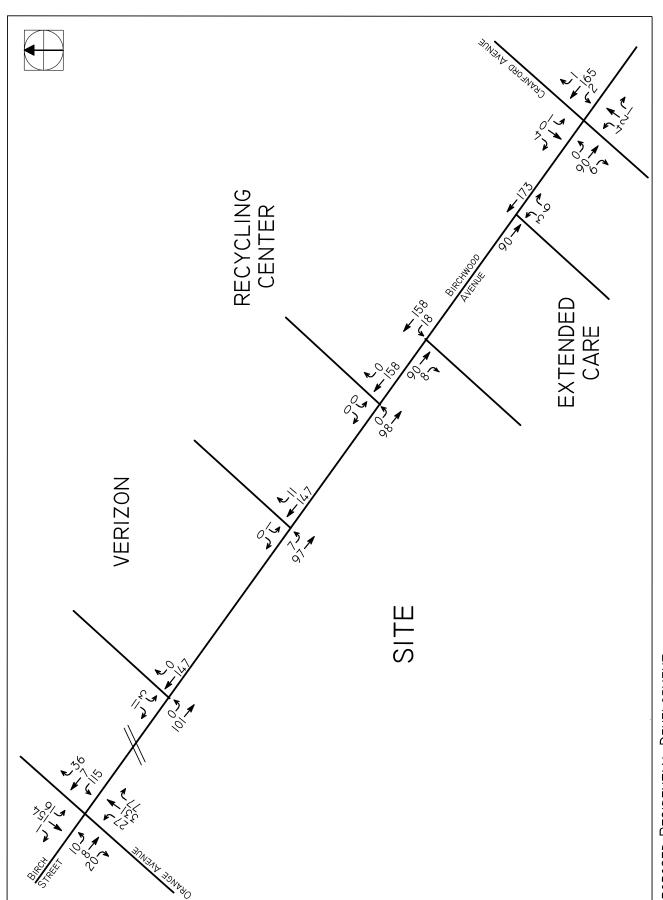
promote safe and efficient access and on-site circulation.



PROPOSED RESIDENTIAL DEVELOPMENT TOWNSHIP OF CRANFORD UNION COUNTY, NEW JERSEY



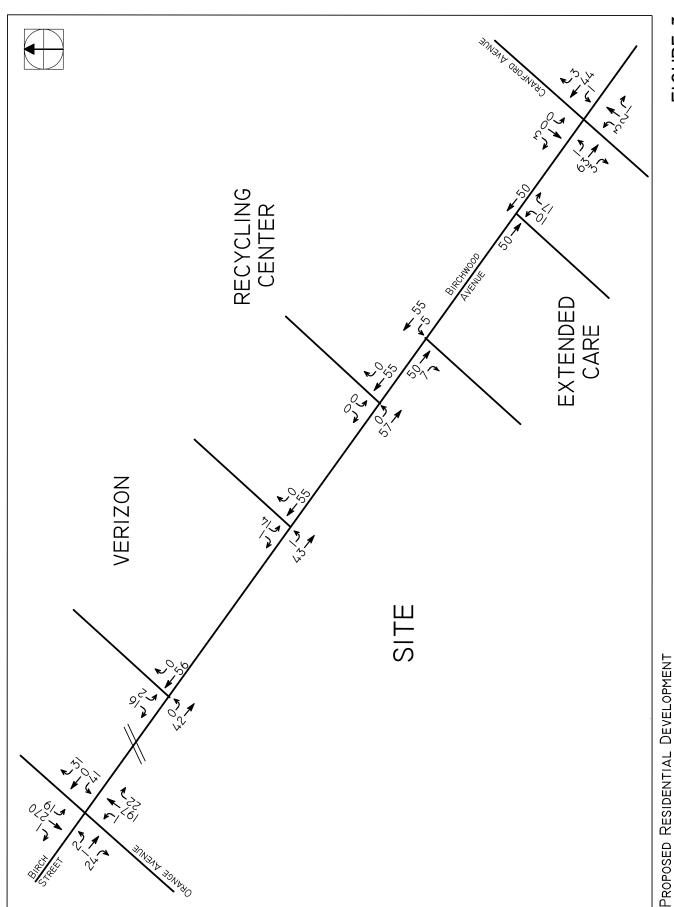




Proposed Residential Development Township of Cranford Union County, New Jersey



EXISTING TRAFFIC VOLUMES MORNING PEAK HOUR (7:45 AM TO 8:45 AM)



EXISTING TRAFFIC VOLUMES EVENING PEAK HOUR (4:30 PM TO 5:30 PM)



Proposed Residential Development Township of Cranford Union County, New Jersey



EXISTING LEVELS OF SERVICE MORNING (EVENING) PEAK HOUR

PROPOSED RESIDENTIAL DEVELOPMENT TOWNSHIP OF CRANFORD UNION COUNTY, NEW JERSEY



SITE GENERATED TRAFFIC VOLUMES MORNING PEAK HOUR (7:45 AM TO 8:45 AM)

SITE GENERATED TRAFFIC VOLUMES EVENING PEAK HOUR (4:30 PM TO 5:30 PM)



Township of Cranford Union County, New Jersey

NO-BUILD TRAFFIC VOLUMES MORNING PEAK HOUR (7:45 AM TO 8:45 AM)



TOWNSHIP OF CRANFORD UNION COUNTY, NEW JERSEY

PROPOSED RESIDENTIAL DEVELOPMENT TOWNSHIP OF CRANFORD UNION COUNTY, NEW JERSEY



NO-BUILD TRAFFIC VOLUMES EVENING PEAK HOUR (4:30 PM TO 5:30 PM)



TOWNSHIP OF CRANFORD UNION COUNTY, NEW JERSEY

BUILD TRAFFIC VOLUMES MORNING PEAK HOUR (7:45 AM TO 8:45 AM)

BUILD TRAFFIC VOLUMES EVENING PEAK HOUR (4:30 PM TO 5:30 PM)



TOWNSHIP OF CRANFORD UNION COUNTY, NEW JERSEY

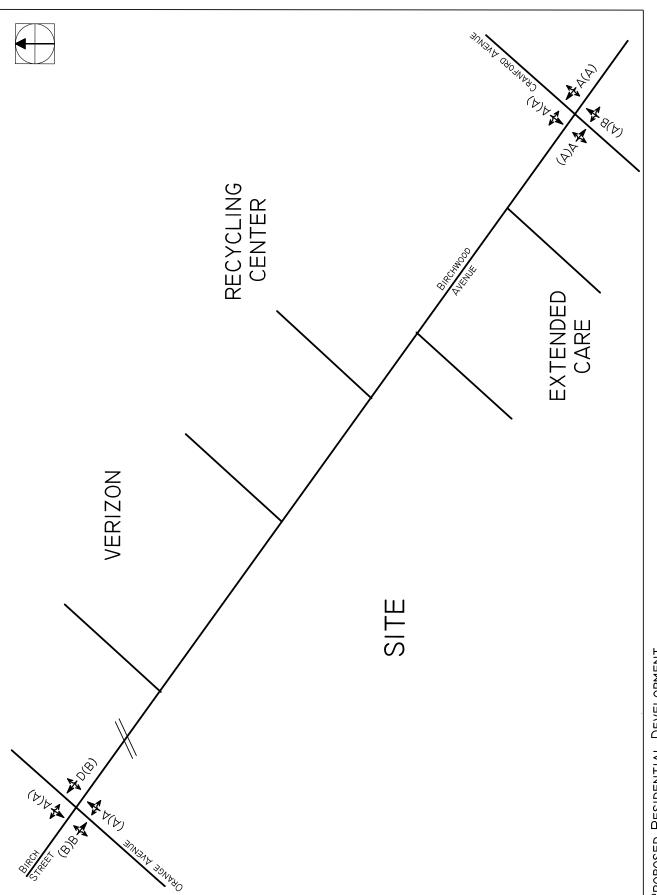
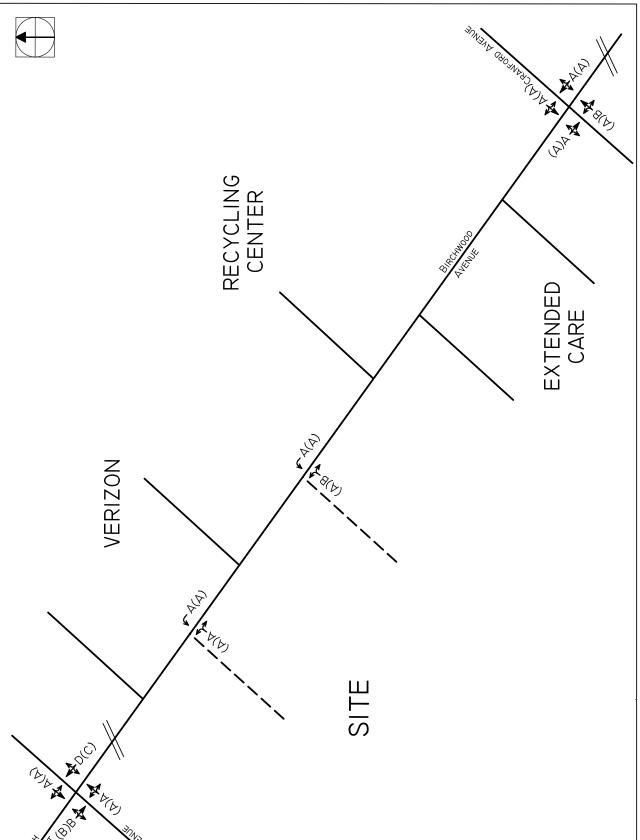


FIGURE II

PROPOSED RESIDENTIAL DEVELOPMENT TOWNSHIP OF CRANFORD UNION COUNTY, NEW JERSEY



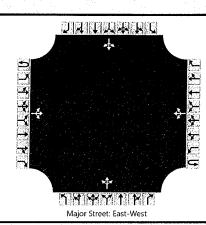


PROPOSED RESIDENTIAL DEVELOPMENT TOWNSHIP OF CRANFORD UNION COUNTY, NEW JERSEY



FIGURE 12

	HCS 2010 Two-V	Way Stop-Control Repo	rt
General Information		Site Information	
Analyst	EC	Intersection	Orange/Birchwood/Birch
Agency/Co.	DD	Jurisdiction	
Date Performed	1/9/2018	East/West Street	Orange Avenue
Analysis Year	2018	North/South Street	Birch/Birchwood Avenue
Time Analyzed	Am Existing	Peak Hour Factor	0.87
Intersection Orientation	East-West	Analysis Time Period (hrs)	0.25
Project Description			



Vehicle Volumes and Adjustments

	Eastb	ound			Westl	oound		Northbound				Southbound			
U	L	Т	R	U	L	Т	R	U	L	Т	R	U	Ĺ	Т	R
1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
0	- 0	1	0	0	0	1	0		0	1	0		0	1	0
		LTR				LTR				LTR				LTR	
	27	331	66		13	154	1		115	7	36		10	7	20
	3				3				3	3	3		3	3	3
									()			()	
	N	0			N	0			N	0			N	0	:
			Undiv	rided						•					
adwa	ys								-			· · · · · · · · · · · · · · · · · · ·			
Level	of Se	ervice										1			
	31			I	15					181				42	
	1390	1	Ť		1098		1			365		i		486	
Ì	0.02				0.01					0.50				0.09	
	0.1				0.0					2.6				0.3	
	7.6				8.3					24.1				13.1	
	Δ				Δ					7				В	
	1U 0	U L 1U 1 0 0 27 3 3 N Adways Level of Se 31 1390 0.02 0.11 7.6	1U 1 2 0 0 1 LTR 27 331 3 No No Adways Level of Service 31 1390 0.02 0.1 7.6	U L T R 1U 1 2 3 0 0 1 0 LTR 27 331 66 3	U L T R U 1U 1 2 3 4U 0 0 1 0 0 LTR	U L T R U L 1U 1 2 3 4U 4 0 0 1 0 0 0 LTR	U L T R U L T 1U 1 2 3 4U 4 5 0 0 1 0 0 0 1 LTR	U L T R U L T R 1U 1 2 3 4U 4 5 6 0 0 1 0 0 1 0 0 1 0 LTR LTR 27 331 66 13 154 1 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	U L T R U L T R U 1U 1 2 3 4U 4 5 6 0 0 1 0 0 1 0 0 1 0 LTR	U L T R U L T R U C 1U 1 2 3 4U 4 5 6 7 0 0 1 0 0 0 1 0 0 0 1 0 0 LTR LTR LTR 27 331 66 13 154 1 115 3 3 No	U L T R U L T R U L T R U L T R 0 0 1 1 1 1 2 3 4 4 4 5 6 6 7 8 8 0 0 0 1 0 0 0 0 1 0 0 0 1 1 1 1 1 1	U L T R U L T R O O O O O O O O O O O O O O O O O O	U L T R U L T R U L T R U L T R U L T R U L T R U U L T R U U U L T R U U U U U U U U U U U U U U U U U U	U L T R U L T	U L T R U L T

0.7

Approach Delay (s/veh)

Approach LOS

8.0

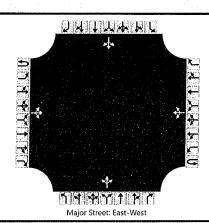
24.1

С

13.1

HCS 2010 Two-Way Stop-Control Report **General Information Site Information** Analyst EC Intersection Orange/Birchwood/Birch DD Agency/Co. Jurisdiction Date Performed 1/9/2018 Orange Avenue East/West Street Analysis Year 2018 North/South Street Birch/Birchwood Avenue Time Analyzed Pm Existing 0.87 Peak Hour Factor Intersection Orientation East-West 0.25 Analysis Time Period (hrs) **Project Description**

Lanes



Vehicle Volumes and Adjustments

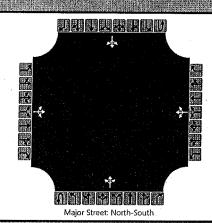
Approach		Eastbound				West	bound			North	bound		Southbound				
Movement	· U	Ĺ	T	R	U	L	Т	R	U	L	Т	R	U	L	Т	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	0	1	0	0	0	1	0		0	1	0		0	1	0	
Configuration			LTR				LTR				LTR				LTR		
Volume, V (veh/h)		1	197	18		16	270	1		38	0	28		0	0	2 :	
Percent Heavy Vehicles (%)		1	·			1				1	1	1		1	1	1	
Proportion Time Blocked													:				
Percent Grade (%)	,					-				()			()		
Right Turn Channelized		N	lo			Ν	lo			N	0			N	0		
Median Type/Storage				Undi	vided												
Critical and Follow-up	Headwa	ys										* - *					
Rase Critical Headway (sec)																	

Base Critical Headway (sec)					 			
Critical Headway (sec)								
Base Follow-Up Headway (sec)								
Follow-Up Headway (sec)								

Delay, Queue Length, and Level of Service

Delay, Quede Length, and	Level Of Service			
Flow Rate, v (veh/h)	1	18	76	2
Capacity, c (veh/h)	1255	1324	523	732
v/c Ratio	0.00	0.01	0.15	0.00
95% Queue Length, Q ₉₅ (veh)	0.0	0.0	0.5	0.0
Control Delay (s/veh)	7.9	7.8	13.1	9.9
Level of Service, LOS	А	А	В	А
Approach Delay (s/veh)	0.0	0.5	13.1	9.9
Approach LOS			В	А

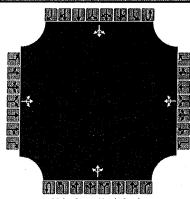
HCS 2010 Two-Way Stop-Control Report **General Information** Site Information Analyst EC Intersection Birchwood & Cranford Agency/Co. DD Jurisdiction Date Performed 1/10/2018 East/West Street Cranford Avenue Analysis Year 2018 Birchwood Avenue North/South Street Time Analyzed Am Existing Peak Hour Factor 0.87 Intersection Orientation North-South 0.25 Analysis Time Period (hrs) **Project Description**



Vehicle Volumes and Ad	justm	ents														
Approach .		Eastl	oound			West	bound			North	bound			South	bound	o consistente de la constante d
Movement	Ü	L	l T	R	יטייי	L	j, T	R	Ü	J., L	i, t	R	U,	l i L	Т	R
Priority		10	- 11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0,		0.1	1	0	0	0.1	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		4	2	1.1		1	0	4		2	165	11		0	90	6
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		(0				0									
Right Turn Channelized		- N	lo 🔛			N	lo			. N	0			I I N	lo "	
Median Type/Storage				Undi	vided			-			- M&					
Critical and Follow-up He	eadwa	ıys														
Base Critical Headway (sec)													Second From the Bearing	279000000000000000000000000000000000000		20.050.000.000.000.000
Critical Headway (sec)																
Base Follow-Up Headway (sec)															HANNE OF PERSONS	TO THE REAL PROPERTY OF THE
Follow-Up Headway (sec)																
Delay, Queue Length, and	l Leve	l of S	ervice)												
Flow Rate, v (veh/h)			8				6			2				0		
Capacity, c (veh/h)			659				806			1472				1375		
v/c Ratio			0.01				0.01			0.00				0.00		
95% Queue Length, Q ₉₅ (veh)			0.0				0.0			0.0				0.0		
Control Delay (s/veh)			10.5				9.5			7.4		200000000000000000000000000000000000000	TATOMO PANÍS	7.6		
Level of Service, LOS			В				Α			A				A		
Approach Delay (s/veh)		10.	5			9.5	5			0.1		A THE PARTY OF THE	- COMPANIONS	0.0)	XVIII-VERKI CORC
Approach LOS	ANGER 10								71.20						ilesaeri ile	38, 28, 281

HCS 2010 Two-Way Stop-Control Report **General Information** Site Information Analyst EC Birchwood & Cranford Intersection Agency/Co. DD Jurisdiction Date Performed 1/10/2018 East/West Street Cranford Avenue Analysis Year 2018 North/South Street Birchwood Avenue Time Analyzed Pm Existing Peak Hour Factor 0.87 Intersection Orientation North-South Analysis Time Period (hrs) 0.25 **Project Description**

Lanes

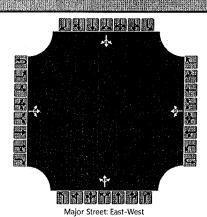


Major Street: North-South

Vehicle Volumes and Adj	ustm	ents												er / 25.		
Approach		Eastb	ound			West	bound			North	bound			South	bound	
Movement	Ú	L	Ť	R	Ü	L	T	R	Ü	Ĺ	Т,	R	U.	L	, T.,	R
Priority ·		10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes		0	1	0.0		0.	- 1	0	0	.0	1.	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		3	2	11		- 0	0	.3		1.	44.	3		1	63	3
Percent Heavy Vehicles (%)		1	1	1		1	1	1		1				1		
Proportion Time Blocked						1100										
Percent Grade (%)		()			()									
Right Turn Channelized		Ņ	0			i i i N	0			, v	0			Ņ	lo	
Median Type/Storage				Undi	vided								•			
Critical and Follow-up He	eadwa	ys.														
Base Critical Headway (sec)							·									
- Critical Headway (sec)																
Base Follow-Up Headway (sec)							·									
Follow-Up Headway (sec)																
Delay, Queue Length, and	l Leve	l of S	ervice													
Flow Rate, v (veh/h)			6				3			1				1		
Capacity, c (veh/h)			831				1018			1530				1557		
v/c Ratio			0.01				0.00			0.00				0.00		
95% Queue Length, Q ₉₅ (veh)			0.0				0.0			0.0				0.0		
Control Delay (s/veh)			9.4				8.5			7.4				7.3	٠	
Level of Service, LOS			A				A			A				Ä		
Approach Delay (s/veh)	9.4					8.	5		0.1 0.1				1	-		
Approach LOS		A				A										

HCS 2010 Two-Way Stop-Control Report **General Information** Site Information Analyst EC Orange/Birch/Birchwood Intersection Agency/Co. DD Jurisdiction Date Performed 1/9/2018 East/West Street Orange Avenue Analysis Year 2018 Birch/Birchwood Avenue North/South Street Time Analyzed Am NoBuild 0.87 Peak Hour Factor Intersection Orientation East-West 0.25 Analysis Time Period (hrs) **Project Description**

Lanes



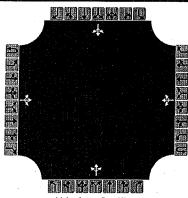
ehicle Volumes and Adj	ustments	
Approach	Eastbound	Westbound

Approach	Eastbound				T	West	bound		Northbound				Southbound				
Movement	U.	L	T	R.	'.U	C	i t	R	U	L	Ţ	R	U	ĻĻ	T	R	
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12	
Number of Lanes	0	0	1	0	0	0	1.	0		0	1	0		0	1	0	
Configuration			LTR				LTR				LTR				LTR	·	
Volume, V (veh/h)		28	338	. 79		16	157	1		117	7	37		10	8 :-	20 ⊬	
Percent Heavy Vehicles (%)		3				3				3	3	3		3	3	3	
Proportion Time Blocked																	
Percent Grade (%)					<u> </u>					. ()			(0		
Right Turn Channelized		N	0			N	lo:			: N	o ii			Ň	lo		
Median Type/Storage		i entending in Kris	NEW SECTION AND DESIGNATION OF THE PERSON AND DESIGNATION OF THE P	Undi	vided	maria de como d	tai en participa de la constante			and or properties		at Continuent and the	s i znesinej	vandensensi kalunniin	nesii wa masa	and sale proposed in the	
Critical and Follow-up He	adwa	ys		0.00													
Base Critical Headway (sec)			-														
Critical Headway (sec)																	
Base Follow-Up Headway (sec)																	
Follow-Up Headway (sec)																	
Delay, Queue Length, and	l Leve	l of S	ervice														
Flow Rate, v (veh/h)		32				18					185				43		
Capacity, c (veh/h)		1387				1076					350				463		
v/c Ratio		0.02				0.02					0.53				0.09		
95% Queue Length, Q ₉₅ (veh)		0.1				0.1					2.9				0.3		
Control Delay (s/veh)		7.7				8.4					26.3				13.6		
Level of Service, LOS		Α				A			11.12		D		***		В		
Approach Delay (s/veh)	0.7					0.	9			26	.3		13.6				

Approach LOS

Ď.

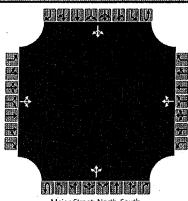
HCS 2010 Two-Way Stop-Control Report **General Information** Site information Analyst EC Intersection Orange/Birchwood/Birch Agency/Co. DD Jurisdiction Date Performed 1/9/2018 East/West Street Orange Avenue Analysis Year 2018 North/South Street Birch/Birchwood Avenue Time Analyzed Pm NoBuild Peak Hour Factor 0.87 Analysis Time Period (hrs) Intersection Orientation East-West 0,25 **Project Description**



Major	Street	East-Wes
iviajoi	oneer.	EG21-AAG2

Vehicle Volumes and Adj	ustm	ents				2										
Approach		Eastl	oound			West	bound			North	bound			South	bound	erand documents and
Movement	Ü	L	T	R .	, U	l L	T	∦R∗ii	Ü	i.L	т	R	Ü	Ĺ	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	1	O .	0	# O. F	11	0 %		0	1	0		0.1	1	0
Configuration			LTR				LTŔ				LTR				LTR	
Volume, V (veh/h)		1	201	22		19	275	1		42	0	32		2	1.1	24
Percent Heavy Vehicles (%)	·	1				1				1	1	1		1	1	1
Proportion Time Blocked																
Percent Grade (%)								-		(0)	
Right Turn Channelized		N	lo 🗀			N	lo i			١. ١	lo 💮			, N	0	
Median Type/Storage				Undi	vided											
Critical and Follow-up He	adwa	ys 👚												1		
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)		·	·						-							
Follow-Up Headway (sec)				ille le le												
Delay, Queue Length, and	Leve	l of S	ervice													
Flow Rate, v (veh/h)		1				22	7				85				31	
Capacity, c (veh/h)		1248				1314					491				668.	
v/c Ratio		0.00				0.02	·				0.17				0.05	
95% Queue Length, Q ₆₅ (veh)		0.0				0.1					0.6				0.1	
Control Delay (s/veh)		7.9				7.8					13.9				10.6	
Level of Service, LOS		A				A					В				В	
Approach Delay (s/veh)		0.0	0			0.	7			13.	.9			10	6	
Approach LOS										В				В		

HCS 2010 Two-Way Stop-Control Report **General Information** Site Information Analyst Birchwood & Cranford Intersection Agency/Co. DD Jurisdiction Date Performed 1/10/2018 East/West Street Cranford Avenue Analysis Year 2018 Birchwood Avenue North/South Street Time Analyzed Am NoBuild Peak Hour Factor Intersection Orientation North-South Analysis Time Period (hrs) **Project Description**

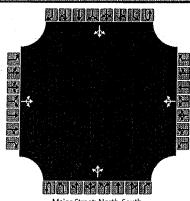


Major Street: North-South

Vehicle Volumes and Ad	justm	ents														
Approach		Eastl	ound			West	bound			North	bound			South	nbound	
Movement	U		T	i: R	Ü	Mil	T	R	, U	Li	T.	R.	U	L.	T.	R.
Priority		10	11	12		7	8 .	9	1U	1, .	2	3	4U	4	5	6
Number of Lanes		. 0	1	Ö.		0		0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR	·			LTR	
Volume, V (veh/h)		4	2.	11		1	0	4		2	168	1		0	92	. 6
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3 -				3		
Proportion Time Blocked																
Percent Grade (%)		. ()	-			0									
Right Turn Channelized		N	o			N	lo			, K	lo 🗼			۱	Vo.	
Median Type/Storage				Undi	ivided											
Critical and Follow-up Ho	eadwa	ıys														
Base Critical Headway (sec)																
Critical Headway (sec)			4													
Base Follow-Up Headway (sec)												·				
Follow-Up Headway (sec)																
Delay, Queue Length, and	l Leve	l of S	ervice													
Flow Rate, v (veh/h)			8				6			`2				0		
Capacity, c (veh/h)			653				801			1468				1372		
v/c Ratio			0.01				0.01			0.00				0.00		
95% Queue Length, Q ₉₅ (veh)			0.0				0.0			0.0				0.0		
Control Delay (s/veh)			10.6			·	9.5			7.5				7.6		
Level of Service, LOS			В				A			A				Α		
Approach Delay (s/veh)		10.	6			9.	5			0.	1			0.	0	
Approach LOS		B				A										

HCS 2010 Two-Way Stop-Control Report **General Information** Site Information Analyst Birchwood & Cranford Intersection DD Agency/Co. Jurisdiction 1/10/2018 Date Performed East/West Street Cranford Avenue Analysis Year 2018 North/South Street Birchwood Avenue Pm NoBuild Time Analyzed Peak Hour Factor 0.87 Intersection Orientation North-South Analysis Time Period (hrs) 0.25 Project Description

Lanes

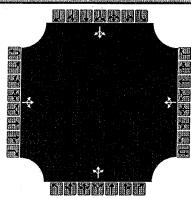


Major Street: North-South

Vehicle Volumes and Adj	ustm	ents														
Approach		East	oound			West	bound			North	bound			South	bound	
Movement	ΰ	l L	T	R	įÜ	Ĺ	Т.,	R	ָ ט	L	l T	R	U	L	T	R
Priority		10	11	12	Ī	7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	(0)	0	. 1	. 0	0	0	1	ij0
Configuration	-		LTR		•		LTR				LTR				LTR	
Volume, V (veh/h)		3	2	1.		0	0	3			45	3			64	3
Percent Heavy Vehicles (%)		1	1	1		. 1	1	1		1			*	1		
Proportion Time Blocked																
Percent Grade (%)		()				0									
Right Turn Channelized		N	0			Ň	lo "			N	lo			113	lo	
Median Type/Storage				Undi	vided							-				
Critical and Follow-up He	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and	l Leve	lof S	ervice													
Flow Rate, v (veh/h)			6				3			1				1		
Capacity, c (veh/h)			829				1016			1528				1556		
v/c Ratio			0.01				0.00			0.00		A CONTRACTOR OF THE CONTRACTOR		0.00		
95% Queue Length, Q ₉₅ (veh)			0.0				0.0			0.0				0.0		
Control Delay (s/veh)			9.4				8.6			7.4				7.3		
Level of Service, LOS			Α.				. А			Α				Ä		
Approach Delay (s/veh)		9.4	1			8.	6			0.	1			0.		
	SHARRAN	giating assessed	919999977856	NAMES OF STREET	ROME HARES	PRESIDENT OF THE	101603 21215-1	mendas i	SHAME	100000000	as apparign	0.00X85.00	CONTRACTOR OF STREET	4.0000000000	ORDERN MARK	and square

Approach LOS

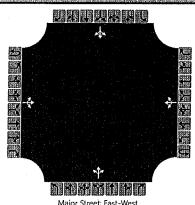
	HCS 2010 T	wo-Way Stop-Control Repo	rt i i i i i i i i i i i i i i i i i i i
General Information -		Site Information	
Analyst	EC	Intersection	Orange/Birch/Birchwood
Agency/Co.	DD 2 And 1 A	Jurisdiction	
Date Performed	1/9/2018	East/West Street	Orange Avenue
Analysis Year	2018	North/South Street:	Birch/Birchwood Avenue
Time Analyzed	Am Build	Peak Hour Factor	0.87
Intersection Orientation	East-West	Analysis Time Period (hrs).	0.25
Project Description			



Major Street: East-West

Vehicle Volumes and Adju	ustme	ents														
Approach		Eastk	oound			West	bound			North	bound -			South	bound	
Movement	Ü	L	Т	R	U	L	Т	R	U	L	T.	R	U	L	T	R
Priority	1U	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0	0	11	0	Ö	0	1	0		0	1	0		0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		28	338	88		20	157	. 1		144	7	49		10	8	20
Percent Heavy Vehicles (%)	·	- 3				3				3	3	3		3	3	3
Proportion Time Blocked																
Percent Grade (%)										() .)	
Right Turn Channelized		N	o i			N	ο			, N	o 📗 🔻			- i, i i	lo	
Median Type/Storage				Undi	/ided											
Critical and Follow-up He	adwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and	Leve	l of Se	ervice													100
Flow Rate, v (veh/h)		32	1			23					230				43	
Capacity, c (veh/h)		1387				1067					343				447	
v/c Ratio		0.02				0.02					0.67				0.10	
95% Queue Length, Q ₉₅ (veh)		0.1				0.1					4,6				0.3	
Control Delay (s/veh)		7.7				8.4					34.4				13.9	
Level of Service, LOS		A				Α					(D)				В	
Approach Delay (s/veh)		0.7	7			1.	1			34.	4			13	.9	
Approach LOS										D				В		

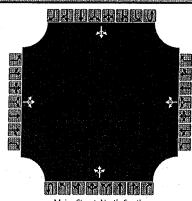
HCS 2010 Two-Way Stop-Control Report Site Information **General Information** Analyst EC Orange/Birchwood/Birch Intersection Agency/Co. DD Jurisdiction Date Performed 1/9/2018 East/West Street Orange Avenue Analysis Year 2018 Birch/Birchwood Avenue North/South Street Time Analyzed Pm Build 0.87 Peak Hour Factor Intersection Orientation East-West Analysis Time Period (hrs) 0.25 **Project Description**



		major se	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
1	\$500 to the Particular Annual Conference of the Particular Superior Enterprise Conference and the Conference of the Conf		2000
ı	Vehicle Volumes and Adjustments		
ı	強くこ [6 [5] (6] 1 [6] [7] [6] [7] [7] [7] [7]		M
J		es and a second of the second of the second	and

Approach			oound				bound				bound			منطبق منطب المراجع بدراج	bound	
Movement	U	L	Т.	R	Ú	L	T	R	U	L	T.	R	U	L	Ť	R
Priority	10	1	2	3	4U	4	5	6		7	8	9		10	11	12
Number of Lanes	0 .	0.0	1	0	0.	0	1	0		0	1	į 0 į		0,	1	0
Configuration			LTR				LTR				LTR				LTR	
Völume, V (veh/h)		1	201	50		31	275	11		60	0	40		2	1.1	24
Percent Heavy Vehicles (%)		1				1				1	1	1		1	1	1
Proportion Time Blocked																
Percent Grade (%)				. •		·				()				0	
Right Turn Channelized			lo			ì	Vo .			::::: N	o li			11 LEN	lo 💮	
Median Type/Storage				Undi	vided											
Critical and Follow-up H	eadwa	ys														
Base Critical Headway (sec)																
Critical Headway (sec)																
Base Follow-Up Headway (sec)								·			·					-
Follow-Up Headway (sec)																
Delay, Queue Length, an	d Leve	l of S	ervice) = - : : :												
Flow Rate, v (veh/h)		1				36					115			,	31	***************************************
Capacity, c (veh/h)		1248				1279					450			Might	657	
v/c Ratio		0.00				0.03					0.26				0.05	
95% Queue Length, Q ₉₅ (veh)		0.0				0.1					1.0				0.1	
Control Delay (s/veh)		7.9				7.9					15.7				10.8	
Level of Service, LOS		A				A	100				C				В	i misiik
Approach Delay (s/veh)		0.0	0			1.	0			15.	.7			10	.8	
Approach LOS										Ċ						

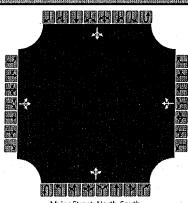
HCS 2010 Two-Way Stop-Control Report **General Information** Site Information Analyst EC Intersection Birchwood & Cranford Agency/Co. DD Jurisdiction Date Performed 1/10/2018 East/West Street Cranford Avenue Analysis Year 2018 North/South Street Birchwood Avenue Time Analyzed Am Build Peak Hour Factor 0.87 Intersection Orientation North-South Analysis Time Period (hrs) 0.25 Project Description



Maior	Street:	North-South

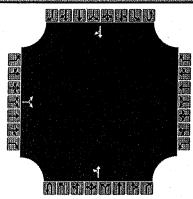
Vehicle Volumes and Adj	ustm	ents														
Approach		Easth	oound			West	bound			North	bound			South	bound	
Movement	U	Lin	Ţ	R	U	L	T	R	U	L	T	· R	Ü	L	Ti	R
Priority		10	11	12		7	8	9	10	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0 1	1	0	0	0 /	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		4	2	1		111	.0	4		2	176			0	113	6
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)		• (0				0									
Right Turn Channelized		. N	lo			N.	lo 💮			N	lo			l N	lo:	
Median Type/Storage				Undi	vided			-								
Critical and Follow-up He	eadwa	iys 👎														
Base Critical Headway (sec)									·							
Critical Headway (sec)																
Base Follow-Up Headway (sec)																
Follow-Up Headway (sec)																
Delay, Queue Length, and	Leve	l of S	ervice													
Flow Rate, v (veh/h)			8				6			2				0		
Capacity, c (veh/h)			625				786	1000		1439				1361		
v/c Ratio			0.01				0.01			0.00				0.00		
95% Queue Length, Q ₉₅ (veh)			0.0				0.0			0,0				0.0		
Control Delay (s/veh)			10.8				9.6		,	7.5				7.6		
Level of Service, LOS			В				Α.			A				A		
Approach Delay (s/veh)		10.	.8			9.6	5			0.	1			0.	0	
Approach LOS		В				A			alle se							

HCS 2010 Two-Way Stop-Control Report **General Information** Site Information EC Birchwood & Cranford Analyst Intersection Jurisdiction Agency/Co. DD Date Performed 1/10/2018 East/West Street Cranford Avenue Analysis Year Birchwood Avenue 2018 North/South Street Time Analyzed Pm Build 0.87 Peak Hour Factor Intersection Orientation North-South Analysis Time Period (hrs) 0.25 **Project Description**



Vehicle Volumes and Adj	ustm	ents														
Approach		East	oound			West	bound			North	bound			South	bound	
Movement	U	L'	LT	R	U	Ľ	Ť	R	Ü	Ļ	T	R	U	L	Ť	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0.	. 0	0	11	0
Configuration			LTR			<u> </u>	LTR				LTR	<u> </u>		<u></u>	LTR	
Volume, V (veh/h)		3,	2	11		0	0 .	3		1	67	3		11	77	3
Percent Heavy Vehicles (%)		1	1	1		1	1	1		1				1	<u> </u>	<u> </u>
Proportion Time Blocked																
Percent Grade (%)		0 0 No												Service New York Constitution		
Right Turn Channelized		Ņ	lo			:	lo			N	0				lo.	
Median Type/Storage	Undi	vided	iodelani voi mineri				Jahnsonister (1984)	a a caracter treatment			est described and an original		eneriment än ti			
Critical and Follow-up He	adwa	ys														
Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6,2		4.1				4.1		
Critical Headway (sec)		7.11	6.51	6.21		7.11	6.51	6.21		4.11				4,11		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3,5	4.0	3.3		2.2				2,2		
Follow-Up Headway (sec)		3,51	4.01	3.31		3.51	4.01	3,31		2.21				2.21		
Delay, Queue Length, and	l Leve	l of S	ervice													
Flow Rate, v (veh/h)			6				3			1			***********	1		
Capacity, c (veh/h)			788				985			1509				1524		
v/c Ratio			0.01		ì		0.00			0.00				0.00		
95% Queue Length, Q ₉₅ (veh)			0.0				0.0			0.0				0.0		
Control Delay (s/veh)			9.6				8.7			7.4				7.4		
Level of Service; LOS			A				A			Α				Α		
Approach Delay (s/veh)		9.	6			8.	7			0.	1			0.	1	
Approach LOS		A	(illinii			P	(

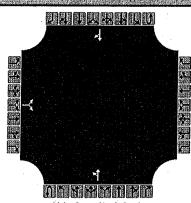
HCS 2010 Two-Way Stop-Control Report **General Information** Site Information Analyst EC Birchwood & North Site Intersection Agency/Co. DĎ Jurisdiction Date Performed 1/16/2018 East/West Street North Site Driveway Analysis Year 2018 North/South Street **Birchwood Avenue** Time Analyzed Am Build 0.87 Peak Hour Factor Intersection Orientation North-South Analysis Time Period (hrs) 0.25 **Project Description**



Major Street: North-South

Vehicle Volumes and Adj	ustm	ents														
Approach		Eastk	oound			West	bound [*]			North	bound			South	bound	
Movement	Ü	L	T	R	Ü	L	Т	R	"U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	0	0		0	0	0	0	0	1	0	0	0	1	0
Configuration	-		LR							LT						TR
Volume, V (veh/h)		7.1		. 5						31.5	182				117	2
Percent Heavy Vehicles (%)		3		3						3						
Proportion Time Blocked																
Percent Grade (%)		()													
Right Turn Channelized		Ņ	o (1)			l N	о	J. Bar		1 1 1	lo 💮			1	lo 💮	
Median Type/Storage				Undi	vided											
Critical and Follow-up He	eadwa	ys														
Base Critical Headway (sec)									·							
Critical Headway (sec)					i i											
Base Follow-Up Headway (sec)													·			
Follow-Up Headway (sec)																
Delay, Queue Length, and	l Leve	l of S	ervice													
Flow Rate, v (veh/h)			14							3 .						
Capacity, c (veh/h)			736							1440						
v/c Ratio			0.02							0.00						
95% Queue Length, Q ₉₅ (veh)			0.1							0.0						
Control Delay (s/veh)			10.0							7.5						
Level of Service, LOS			A							А						
Approach Delay (s/veh)		10.	0							0.	1					
Approach LOS		A										4 1 1 1 2 3				

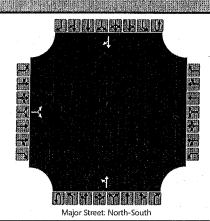
	HCS 2010 Two-Way	/ Stop-Control Repor	t
General Information		Site Information	
Analyst	EC	Intersection	Birchwood & North Site
Agency/Co.	DD	Jurisdiction	
Date Performed	1/16/2018	East/West Street	North Site Driveway
Analysis Year	2018	North/South Street	Birchwood Avenue
Time Analyzed	Pm Build	Peak Hour Factor	0.87.
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description			



Major Street: North-South

Vehicle Volumes and Adj	ustm	ents									lere g								
Approach		Easti	oound		T	Wes	tbound			North	bound			South	bound				
Movement	U	L L	Т	R	ناقا	Ļ	ТТ	R	Ü	Ľ	T	R	Ü	L	Ť	R			
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6			
Number of Lanes		0 .:	0	0		0	0	.0	0	0	1	0	.0	0	1	0			
Configuration		·	LR							LT						TR			
Volume, V (veh/h)		5		3						5	78				77	7			
Percent Heavy Vehicles (%)		1		1						1									
Proportion Time Blocked																			
Percent Grade (%))																
Right Turn Channelized		ili ili	o :			J	٧o			N	o 💮			l N	o i				
Median Type/Storage				Und	vided														
Critical and Follow-up He	adwa	ys 💮																	
Base Critical Headway (sec)																			
Critical Headway (sec)							16411.20												
Base Follow-Up Headway (sec)																			
Follow-Up Headway (sec)																			
Delay, Queue Length, and	Leve	l of S	ervice	•															
Flow Rate, v (veh/h)			9							6									
Capacity, c (veh/h)			843							1502									
v/c Ratio			0.01							0.00									
95% Queue Length, Q ₉₅ (veh)			0.0							0.0									
Control Delay (s/veh)			9.3							7.4									
Level of Service, LOS			A							Α.									
Approach Delay (s/veh)	9.3					Commission					5		·						
Approach LOS		A A								i i				li il					

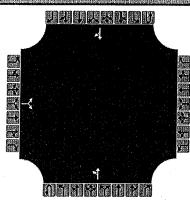
	HCS 2010 Two-Way Stop-Control Report											
General Information ===		Site Information										
Analyst	EC	Intersection	Birchwood & South Site									
Agency/Co.	DD	Jurisdiction										
Date Performed	1/16/2018	East/West Street	South Site Driveway									
Analysis Year	2018	North/South Street	Birchwood Avenue									
Time Analyzed	Am Build	Peak Hour Factor	0.87									
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25									
Project Description												



ķ	ă	ij	ì	e e	ñ	ø	ŝ	Ř.	¥.			S	ľ		ì	1	ŀ	8	þ	R	6.			ŝ		Į,				빨	3		3	護	i,	e	7				ž.		ä	3	H	Ŗ
		V	ſ	е	I	1	l	9	ı	Е	k	i.	Ų,	C	ı	1	ě	H	Ì	ì	ľ	Е	Þ	á	å	П	r	e	1	200	۲.	1	I	U	ı	i	Ŀ	П	É	H	э	á	ŧ	Ĺ,	Я	K

Approach			ound			West	bound			North	bound		Southbound					
Movement	U	L	T	R	U	L	т	R	±U.	L.	Т	R	U	ı L	T	R		
Priority		10	11	12		7.	8	9	10	1	2	3	4U	4	5	6		
Number of Lanes		0 1	0	0		0	0.	0	0	0.	1	0	0	Ö	1	0		
Configuration			LR						:	LT			·			TR		
:Volume, V (veh/h)		32		- 16						5	164				105	11		
Percent Heavy Vehicles (%)		3		3						3			,					
Proportion Time Blocked																		
Percent Grade (%)		()															
Right Turn Channelized		N	0			N	0			, N	Ö.			l	lo .			
Median Type/Storage				Undi	/ided													
Critical and Follow-up He	adwa	ys																
Base Critical Headway (sec)					cia de la companya d													
Critical Headway (sec)																		
Base Follow-Up Headway (sec)																		
Follow-Up Headway (sec)																		
Delay, Queue Length, and	Leve	l of Se	ervice															
Flow Rate, v (veh/h)			55							6								
Capacity, c (veh/h)			728							1443								
v/c Ratio			0.08							0,00								
95% Queue Length, Q ₉₅ (yeh)			0.2							0.0								
Control Delay (s/veh)			10.3							7.5								
Level of Service, LOS			В							A								
Approach Delay (s/veh)	. 10.3										3							
Approach LOS		В																

	HCS 2010 Two-Way Stop-Control Report										
General Information		Site Information									
Analyst	EC	Intersection	Birchwood & South Site								
Agency/Co:	DD C	Jurisdiction									
Date Performed	1/16/2018	East/West Street	South Site Driveway								
Analysis Year	2018	North/South Street	Birchwood Avenue								
Time Analyzed	Pm Build	Peak Hour Factor	0.87								
Intersection Orientation	North-South	Analysis Time Period (hrs)	1.025								
Project Description											



Major Street: North-South

·																		
Vehicle Volumes and Ad	justm	ents		1000 1000 1000 1000						10.02					- Unesan			
Approach		East	bound	Maccol Miles Control Miles		West	bound			North	nbound	***************************************	Southbound					
Movement	Ü	JUL:	Ť	R	Ü	III.L	T	R	U.	L.	Įπ	R.	Ü	L	T	R		
Priority		10	11	. 12		7	8	9	10	1	2	3.	4U	4	5	6		
Number of Lanes		0	0	Ö		0	0	0	0./	0,	1	0	0.0	0	1	0		
Configuration			LR							LT						TR		
Volume, V (veh/h)		21		10						16	61				79	1.		
Percent Heavy Vehicles (%)		1		1						1								
Proportion Time Blocked																		
Percent Grade (%)			0			,												
Right Turn Channelized		, l	Vo				lo .			١ ١	lo .				lo .			
Median Type/Storage				Undi	vided													
Critical and Follow-up Ho	eadwa	ys																
Base Critical Headway (sec)																		
Critical Headway (sec)																		
Base Follow-Up Headway (sec)																		
Follow-Up Headway (sec)																		
Delay, Queue Length, and	d Leve	l of S	ervice															
Flow Rate, v (veh/h)			35							18								
Capacity, c (veh/h)			833							1509								
v/c Ratio			0.04				AMORAIL SINGAN LITTAN			0.01								
95% Queue Length, Q ₉₅ (veh)			0.1							0.0								
Control Delay (s/veh)			9.5							7.4				A SET - SOMESE				
Level of Service, LOS			A							Α								
Approach Delay (s/veh)		9.	5							1.	6	33,000						
Approach LOS	1681111	Δ										41000						