

TRAFFIC IMPACT STUDY

For

Bayonne 2019 Waterfront, LLC

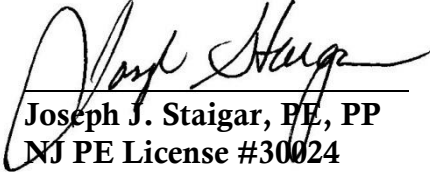
Property Located at:


**219 West 5th Street
Block 301.01 – Lots 1 & 6
City of Bayonne, Hudson County, NJ**

Prepared by:



**1904 Main Street | 245 Main Street, Suite 110
Lake Como, NJ 07719 | Chester, NJ 07930
(732) 681-0760**


Joseph J. Staigar, PE, PP
NJ PE License #30024


Corey M. Chase, PE
NJ PE License #47470

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3026-99-001TE

INTRODUCTION

It is proposed to construct a 6-story building with a mezzanine level, containing one hundred eighty (180) residential units (The Project) on a parcel of land located along West 5th Street, west of its intersection with Avenue A, in the City of Bayonne, Hudson County, New Jersey as shown on Figure 1 contained in Appendix A. The site is designated as Block 301.01 – Lots 1 and 6 on the City Tax Maps.

Dynamic Traffic, LLC has been retained to prepare this study to assess the viability of the adjacent roadway network to accommodate the additional traffic associated with the construction of The Project. This study documents the methodology, analyses, findings and conclusions of our study and includes:

- A detailed field inspection was conducted to obtain an inventory of existing roadway geometry, traffic control, and location and geometry of existing driveways and intersections.
- Projections of traffic to be generated by the proposed residential development were prepared utilizing trip generation data as published by the Institute of Transportation Engineers.
- An assessment of any applicable trip generation credits for local characteristics regarding mass transit utilization.
- A trip distribution analysis was prepared to assign the site traffic to the adjacent street system based upon the anticipated directional distribution.
- Capacity analyses were conducted for the Existing, No Build and Future Build conditions for the intersection of Avenue A and West 5th Street.
- An evaluation of adjacent intersection impacts based on published State and national standards for a significant increase in traffic.

EXISTING CONDITIONS

A review of the existing roadway conditions near the subject site was conducted to provide the basis for assessing the traffic impact of the development. This included field investigations of the surrounding roadways and intersections, collection of traffic volume data, and extensive analyses.

Existing Roadway Conditions

The following are descriptions of the roadways in the study area:

West 5th Street is a local roadway under the jurisdiction of the City of Bayonne. In the vicinity of the site the speed limit is not posted and the roadway provides one travel lane in each direction with a general east/west orientation. On-street parking is not permitted west of Avenue A and curb and sidewalk is not provided. West 5th Street provides a straight horizontal alignment and a relatively flat vertical alignment. The land uses along West 5th Street in the vicinity of The Project are a mix of industrial and residential.

Avenue A is a local roadway under the jurisdiction of the City of Bayonne. In the vicinity of the site the speed limit is not posted and the roadway provides one travel lane in each direction with a general north/south orientation. On-street parking is permitted along both sides of the roadway with curb and sidewalk provided along both sides of the roadway. East 25th Street provides a straight horizontal alignment and a relatively flat vertical alignment. The land uses along East 25th Street in the vicinity of The Project are primarily residential.

John F. Kennedy Boulevard (CR 501) is an urban minor arterial under the jurisdiction of Hudson County. In the vicinity of the site the speed limit is 25 MPH and the roadway provides two travel lanes in each direction with a general north/south orientation. On-street parking is permitted along both sides of the roadway with curb and sidewalk provided along both sides of the roadway. John F. Kennedy Boulevard provides a curved horizontal alignment as it passes under NJ Route 440 and a relatively flat vertical alignment.

North Street is an urban minor arterial under the jurisdiction of the City of Bayonne. In the vicinity of the site the speed limit is 25 MPH and the roadway provides one travel lane in each direction with a general east/west orientation. On-street parking is permitted along both sides of the roadway with curb and sidewalk provided along both sides of the roadway. North Street provides a straight horizontal alignment and a relatively flat vertical alignment. The land uses along North Street in the vicinity of The Project are primarily residential.

Existing Traffic Volumes

Manual turning movement (MTM) counts were collected by McDonough & Rea Associates, Inc. (M & R) on Tuesday, January 28, 2020 from 7:00 – 9:00 AM and from 4:00 – 6:30 PM at the intersection of Avenue A & West 5th Street. In order to establish existing 2022 traffic volumes, the collected 2020 count data was increased by applying a growth rate of 1% per year obtained from the NJDOT Annual Background Growth Rate Table for a period of two (2) years.

Review of the collected traffic data reveals that the weekday morning peak street hour (PSH) occurs between 7:45 – 8:45 AM and the weekday evening PSH occurs between 4:30 – 5:30 PM. Figure 2, located in Appendix A, shows the existing peak hour traffic volumes at the study intersection.

Existing Capacity Analysis

The methodology utilized in the capacity analyses is described in the *Highway Capacity Manual 2010*, published by the Transportation Research Board. In general, the term Level of Service (LOS) is used to provide a “qualitative” evaluation of capacity based upon certain “quantitative” calculations related to empirical values, such as traffic volume and intersection control.

At the signalized intersections, factors that affect the various approach capacities include width of approach, number of lanes, traffic signal “green time”, turning percentages, truck volumes, etc. However, delays cannot be related to capacity in a simple one-to-one fashion. For example, it is possible to have delays in the Level of Service “F” range without exceeding roadway capacity. Substantial delays can exist without exceeding capacity if one or more of the following conditions exist: long traffic signal cycle lengths; a particular traffic movement experiences a long red time; or progressive movement for a particular lane group is poor. Table I describes the Level of Service ranges for signalized intersections.

An unsignalized (STOP sign controlled) driveway or side street along a through route is seldom critical from an overall capacity standpoint, however, it may be of great significance to the capacity of the minor cross-route, and it may influence the quality of traffic flow on both. When analyzing an unsignalized intersection, it is assumed that both the major street through and right turn movements are unimpeded and have the right-of-way over all side street traffic and left turns from the major street. All other turning movements in the intersection cross, merge with, or are otherwise impeded by major street movements. Traffic delays at unsignalized intersections are determined by sequentially processing these impeded movements. Table II describes the Level of Service ranges for unsignalized (stop controlled) intersections.

**Table I
Level of Service Criteria
for Signalized Intersections**

Level of Service	Average Control Delay (seconds per vehicle)
A	0.0 to 10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	greater than 80.0

**Table II
Level of Service Criteria
for Unsignalized Intersections**

Level of Service	Average Control Delay (seconds per vehicle)
a	0.0 to 10.0
b	10.1 to 15.0
c	15.1 to 25.0
d	25.1 to 35.0
e	35.1 to 50.0
f	greater than 50.0

It should be noted that the analyses within the *Highway Capacity Manual* assume a random arrival for all the movements, which may not be the case if an adjacent traffic signal is present that platoons vehicles.

All capacity analyses were performed utilizing the Synchro 11 software package. Table III summarizes the existing Levels of Service (LOS) and delays. All capacity analysis calculation worksheets are contained in Appendix B.

**Table III
Existing Levels of Service**

Intersection	Direction/ Movement		AM PSH	PM PSH
Avenue A & West 5 th Street	EB	LTR	a (9)	b (11)
	WB	LTR	b (10)	b (10)
	NB	LTR	a (8)	a (8)
	SB	LTR	a (7)	a (7)

a (#) - Unsignalized Intersection Level of Service (seconds of delay per vehicle)

The following are discussions pertaining to each of the existing intersection analyzed. It should be noted that the existing percentage of trucks and peak hour factors obtained from the MTM counts were used in the analysis.

Avenue A & West 5th Street

West 5th Street intersects Avenue A to form an unsignalized four-leg intersection with West 5th Street operating under stop control. The northbound and southbound approaches of Avenue A each provide a shared left turn/through/right turn lane. The eastbound and westbound approaches of West 5th Street each provide a shared left turn/through/right turn lane.

A review of the existing analysis reveals that the individual intersection movements operate at Level of Service “B” or better during the analyzed peak periods. See Table III for the individual movement Levels of Service and delays.

FUTURE CONDITIONS

Traffic volumes and operational analyses were developed for both the No Build and Build conditions. The No Build conditions provide a baseline for assessing the impact of the site development traffic on the roadway system. The process of developing the No Build and Build traffic volumes and the subsequent analyses is outlined below.

Regardless of whether the subject site is developed or not, traffic volumes on the surrounding roadways are expected to increase as a result of developments throughout the region. A growth rate for roadways within the study area was obtained from the NJDOT Annual Background Growth Rate Table, which indicates a growth rate of 1% per year.

Additionally, this office is aware of various adjacent developments in the area which were taken into account and are listed below:

- The Bayview Mixed-Use project, abutting the subject to the north, which consists of 385 multi-family mid-rise units, 965 multi-family high-rise units, and 55,000 SF of retail/restaurant space.
- 160,575 SF warehouse with access to Avenue A to the south of Fourth Street as detailed in Langan traffic study.
- 188,343 SF warehouse with access to West Fifth Street and to Avenue A opposite Fourth Street as detailed in Langan traffic study.
- 300 residential units and 3,215 SF of ground floor retail space as approved by the City of Bayonne on Blocks 5 and 9 within the Texaco Redevelopment Area.

Future No Build traffic volumes were developed by applying the background growth rate of 1% for two (2) years to the study area roadways existing traffic volumes and adding the traffic volumes associated with the adjacent developments. Figure 3 in Appendix A, shows the No Build traffic volumes.

Traffic Generation

Projections of future traffic volumes were developed utilizing data as published in the Institute of Transportation Engineers (ITE) publication *Trip Generation, 10th Edition* for Land Use Code (LUC) 221 – Multifamily Housing (Mid-Rise). Table I summarizes the projected trips generated by the proposed residential development utilizing the ITE data.

**Table I
Trip Generation**

Land Use	AM PSH			PM PSH		
	In	Out	Total	In	Out	Total
180 Unit Residential Development	16	45	61	48	30	78

It should also be noted that within ½ of a mile from the site there is access to New Jersey Transit bus lines 10, and 119 along John F. Kennedy Boulevard. Additionally, within ¾ of a mile from the site there is access to the 8th Street Hudson-Bergen Light Rail (HBLR) Station. Based on data published by the US Census Bureau, approximately 18% of Bayonne residents utilize public transportation as their primary means of commuting and an additional 8% walk. This would equate to a 26% reduction in the trip generation contained in Table I. Table IV summarizes the trip generation of the residential development with consideration of the mass transit and walking reductions on vehicular trip generation.

**Table IV
Trip Generation with Consideration of Mass Transit**

Land Use	AM PSH			PM PSH		
	In	Out	Total	In	Out	Total
180 Unit Residential Development	12	33	45	36	22	58

Once the magnitude of traffic to be generated by the site is known, it is necessary to assign that traffic to the adjacent street system. The distribution of site traffic to the surrounding roadways is based on the location of primary arterial roadways, major signalized intersections, and existing traffic patterns. Located in Appendix A, Figure 4 illustrates the site generated traffic distribution for The Project. The site generated volumes were distributed to the adjacent intersections during the critical peak hours, which are shown in Figure 5. The site generated volumes were added to the No Build traffic volumes to generate the Build traffic volumes, which are shown in Figure 7.

Future Intersection Impacts

Table V summarizes the peak hour traffic increases as a result of The Project at the intersections adjacent to the site with consideration of the mass transit credits. Based on *Transportation Impact Analysis for Site Development*, published by the ITE “it is suggested that a transportation impact study be conducted whenever a proposed development will generate 100 or more added (new) trips during the adjacent roadways’ peak hour or the development’s peak hour.” NJDOT has determined that the same 100 vehicle threshold is considered a “significant increase in traffic,” hence, it is not anticipated that The Project would have any perceptible impact on the traffic operation of the adjacent roadway network as the number of new trips falls well below the industry accepted standard of a significant increase in traffic of 100 trips. Located in Appendix A, Figure 6 illustrates the total site generated trips at each of the adjacent intersections and compares them to the 100-trip threshold set forth by ITE and NJDOT.

**Table V
Future Intersection Impacts**

Intersection	AM PSH		PM PSH	
	Total Site Traffic	Significant Increase	Total Site Traffic	Significant Increase
Avenue A and West 5 th Street	45	No	58	No
Avenue A and NJ Route 440 Ramps	25	No	34	No
Avenue A and North Street	7	No	8	No
JFK Boulevard and NJ Route 440 Ramps	20	No	24	No
JFK Boulevard and North Street	4	No	5	No

Avenue A and West 5th Street

With the addition of the site traffic, a maximum increase in peak hour traffic at the intersection is 58 trips which is not considered significant as it falls below the 100 trip threshold for a significant increase in traffic.

Avenue A and NJ Route 440 Ramps

With the addition of the site traffic, a maximum increase in peak hour traffic at the intersection is 34 trips which is not considered significant as it falls below the 100 trip threshold for a significant increase in traffic.

Avenue A and North Street

With the addition of the site traffic, a maximum increase in peak hour traffic at the intersection is 8 trips which is not considered significant as it falls below the 100 trip threshold for a significant increase in traffic.

JFK Boulevard and NJ Route 440 Ramps

With the addition of the site traffic, a maximum increase in peak hour traffic at the intersection is 24 trips which is not considered significant as it falls below the 100 trip threshold for a significant increase in traffic.

Avenue A and North Street

With the addition of the site traffic, a maximum increase in peak hour traffic at the intersection is 5 trips which is not considered significant as it falls below the 100 trip threshold for a significant increase in traffic.

Future Capacity Analysis

It should be noted that the Bayonne 2019 Waterfront project contains 180 units and will have single access via West 5th Street to Avenue A. The Bayview Mixed-Use project is much larger in scope and will also have access via Avenue A. The Build scenario analyzed includes an interconnection of these two (2) properties, allowing Bayview traffic to access Avenue A via West 5th Street and allowing Bayonne 2019 Waterfront traffic to access Avenue A through the Bayview property. This scenario is identified as Phase 2B in the aforementioned M & R study. Operational conditions at the intersection of Avenue A & West 5th Street were analyzed under the No Build and Build conditions for this scenario and are summarized in Table VI below.

Table VI
Future Levels of Service

Intersection	Direction/ Movement		AM PSH		PM PSH	
			No Build	Build	No Build	Build
Avenue A & West 5 th Street	EB	LTR	c (20)	c (23)	f (91)	f (150)
	WB	LTR	c (18)	c (19)	c (22)	d (26)
	NB	LTR	a (8)	a (8)	a (10)	a (10)
	SB	LTR	a (8)	a (8)	a (8)	a (8)

a (#) - Unsignalized Intersection Level of Service (seconds of delay per vehicle)

Avenue A & West 5th Street

As can be seen in Table VI above, the eastbound approach of West 5th Street is projected to operate at Level of Service “F” during the PM peak hour. As such, an analysis that includes a mitigation measure of installing a traffic signal with an 80-second cycle length as well as re-striping the northbound approach of Avenue A to provide a dedicated left turn lane and a shared through/right turn lane was performed. The results of the mitigation analysis are shown in Table VII below.

Table VII
Future Levels of Service - Mitigated

Intersection	Direction/ Movement		AM PSH		PM PSH	
			Build	Build w/ Mit.	Build	Build w/ Mit.
Avenue A & West 5 th Street	EB	LTR	c (20)	C (35)	f (91)	C (34)
	WB	LTR	c (18)	C (22)	c (22)	B (20)
	NB	L	-	A (6)	-	A (8)
		TR	-	A (6)	-	A (6)
		LTR	a (8)	-	a (10)	-
	SB	LTR	a (8)	A (6)	a (8)	A (8)
	Overall			-	B (15)	-

A (#) - Signalized Intersection Level of Service (seconds of delay per vehicle)

Note: The threshold for Level of Service E for unsignalized intersections is 50 secs, whereas it is 80 secs for signalized intersections. As can be seen in Table VII above, with the proposed mitigation measured the intersection can operate at overall Level of Service “B” or better with the individual intersection movements operating at Level of Service “C” or better.

FINDINGS & CONCLUSIONS

Findings

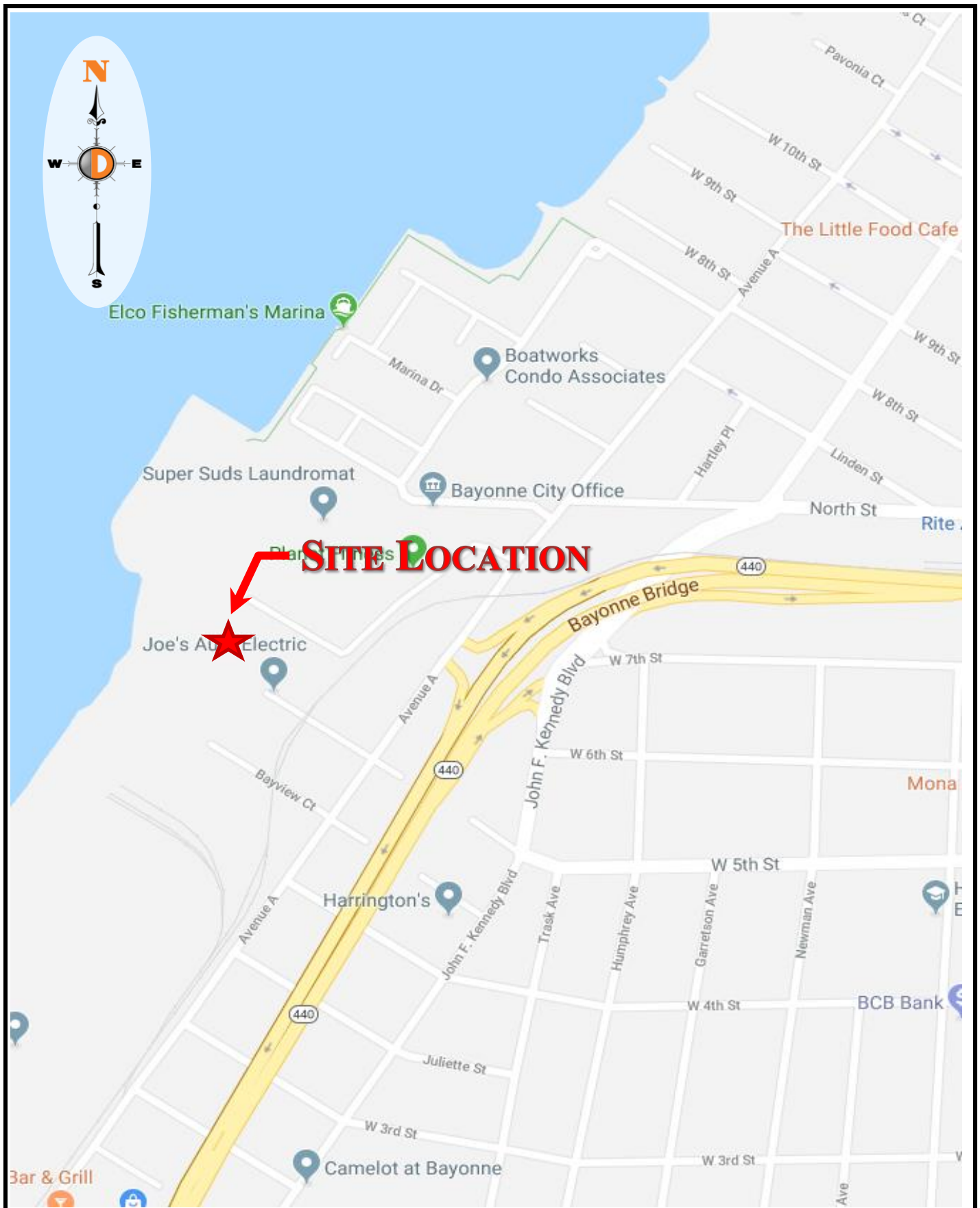
Based upon the detailed analyses as documented herein, the following findings are noted:

- The proposed 180 residential units are projected to generate 12 entering trips and 33 exiting trips during the morning peak hour and 36 entering trips and 22 exiting trips during the evening peak hour with consideration of the mass transit credit.
- The Project is located within $\frac{3}{4}$ mile of the Hudson-Bergen Light Rail Station on 8th Street and within $\frac{1}{2}$ mile of the NJ Transit bus stops on John F. Kennedy Boulevard.
- With the addition of the site generated traffic, none of the adjacent intersections will experience a significant increase in traffic (100 or more trips) during either of the weekday morning or evening peak hours.
- With an increase of less than 100 trips per hour, which is defined as a recognized threshold of potential impact to the surrounding roadway network, it can be concluded that aside from the intersection of Avenue A and West 5th Street, no off-site traffic improvements are necessary to offset and mitigate any potential negative traffic impacts.
- With the addition of the adjacent development traffic as well as the site generated traffic, it is anticipated that the eastbound approach of West 5th Street at its intersection with Avenue A will operate at Level of Service “F” during the PM peak hour. However, this approach could operate at Level of Service “C” during both peak hours with the installation of a traffic signal.

Conclusions

Based upon our Traffic Impact Study as detailed in the body of this report, it is the professional opinion of Dynamic Traffic, LLC that the adjacent street system of the City of Bayonne will not experience any significant degradation in operating conditions with the construction of The Project and the implementation of the proposed mitigation measures. Further, the proposed residential development will not generate a significant increase in traffic as defined by the ITE and NJDOT.

Appendix A
Traffic Volume Figures



Proposed Residential Development
 Traffic Impact Study - Rev 1
 3026-99-001TE

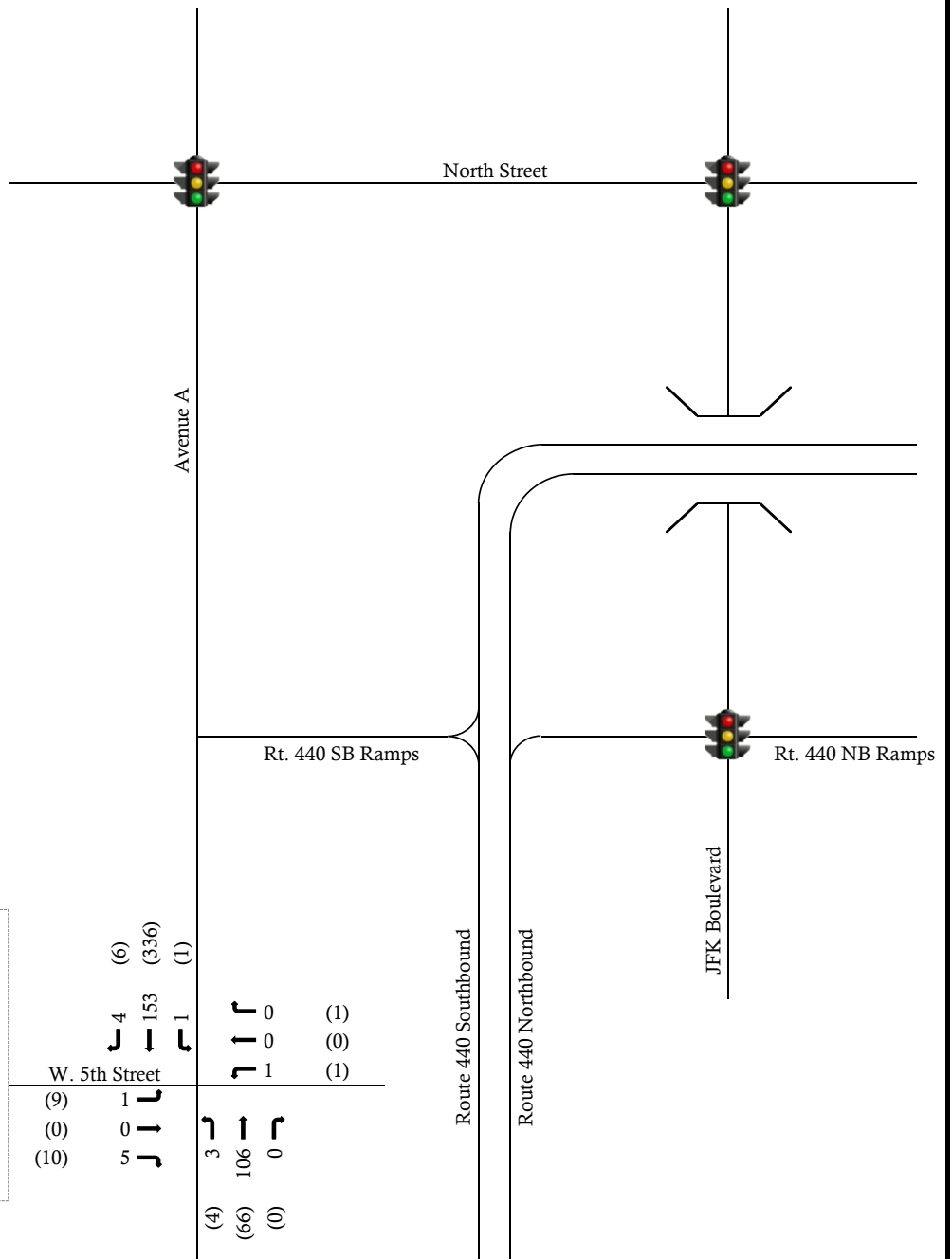
Figure 1

Site Location Map



LEGEND

- Existing Roadway
- Proposed Roadway
- AM (PM)
- Signalized Intersection




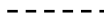


Proposed Residential Development
 Traffic Impact Study - Rev 1
 3026-99-001TE

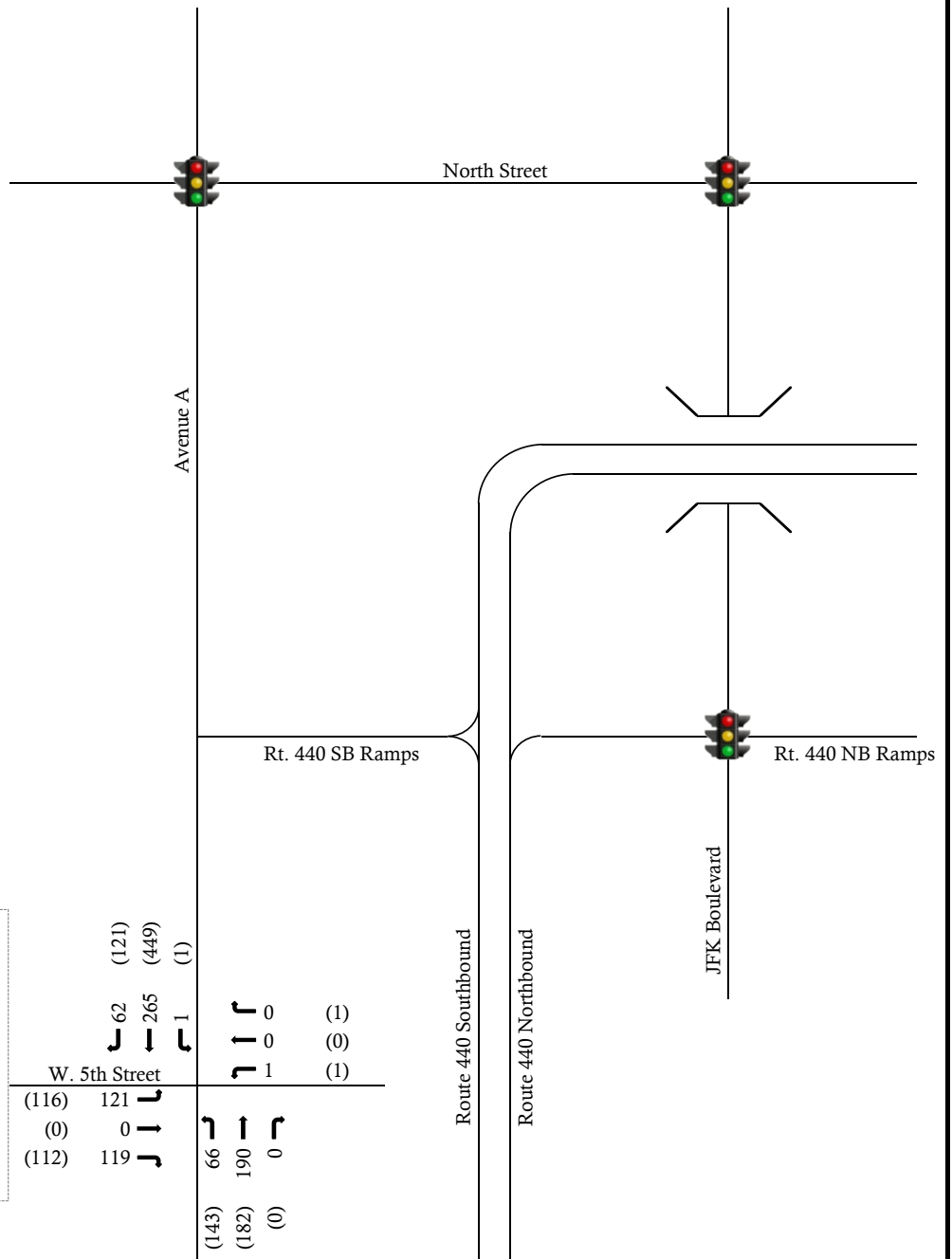
Figure 2

Existing Traffic Volumes



LEGEND

-  Existing Roadway
-  Proposed Roadway
-  AM (PM)
-  Signalized Intersection



	62	(121)				
	265	(449)				
	1	(1)				
W. 5th Street						
(116)	121					
(0)	0					
(112)	119					
	66					
	(182)					
	(0)					




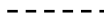


Proposed Residential Development
 Traffic Impact Study - Rev 1
 3026-99-001TE

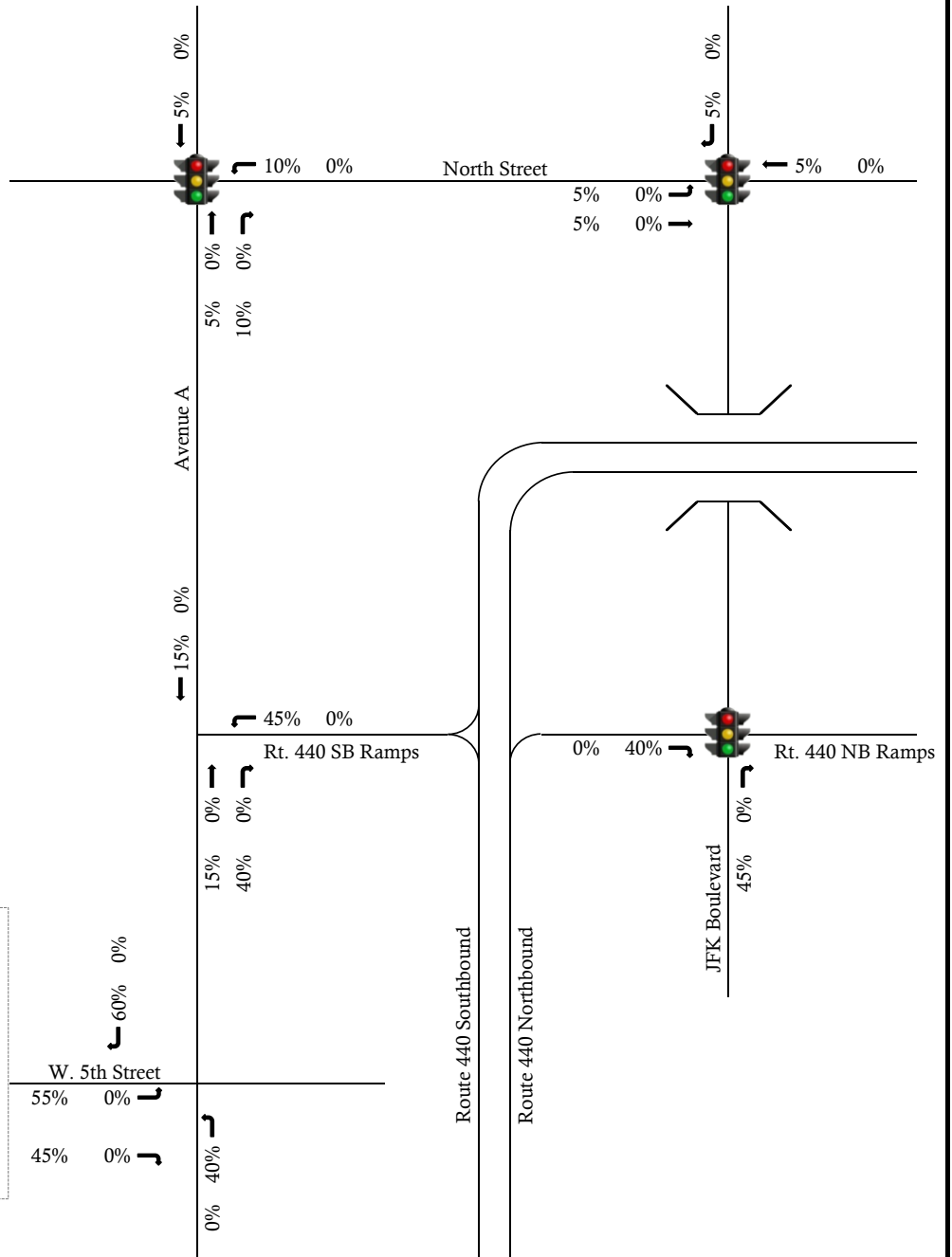
Figure 3

No Build Traffic Volumes




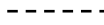


LEGEND

-  Existing Roadway
-  Proposed Roadway
-  IN (OUT)
-  Signalized Intersection





LEGEND

-  Existing Roadway
-  Proposed Roadway
-  AM (PM)
-  Signalized Intersection

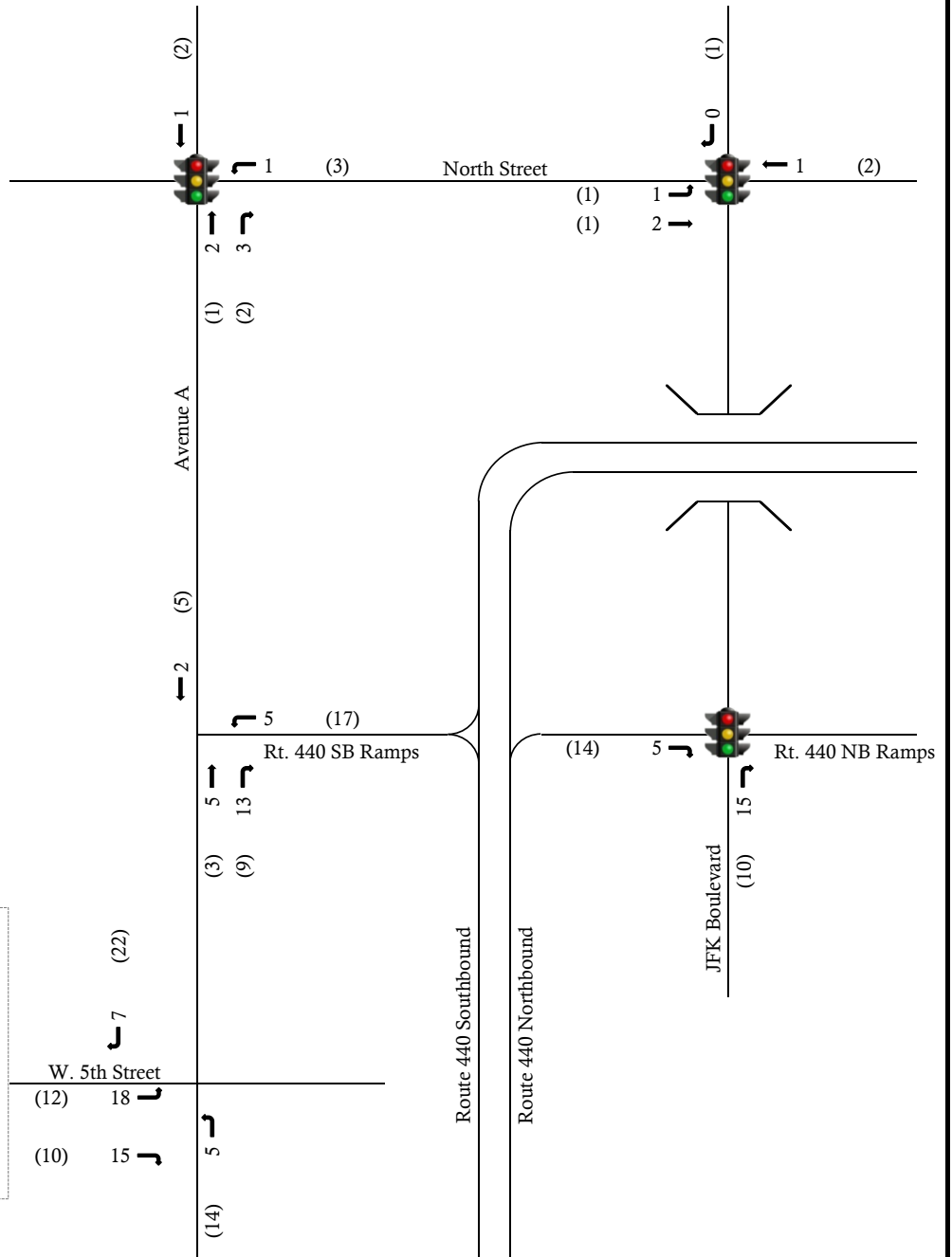
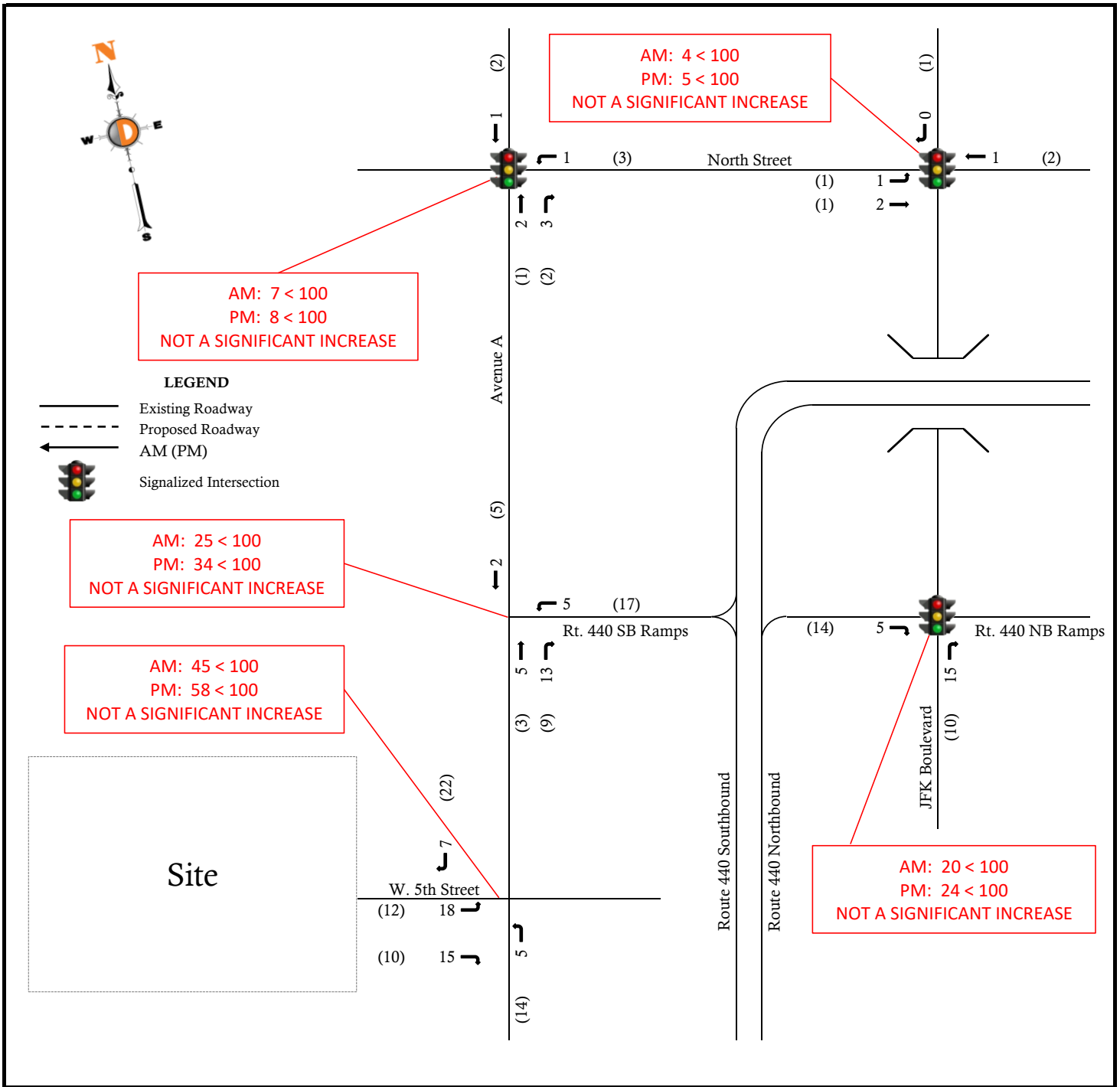


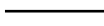
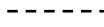


Figure 3

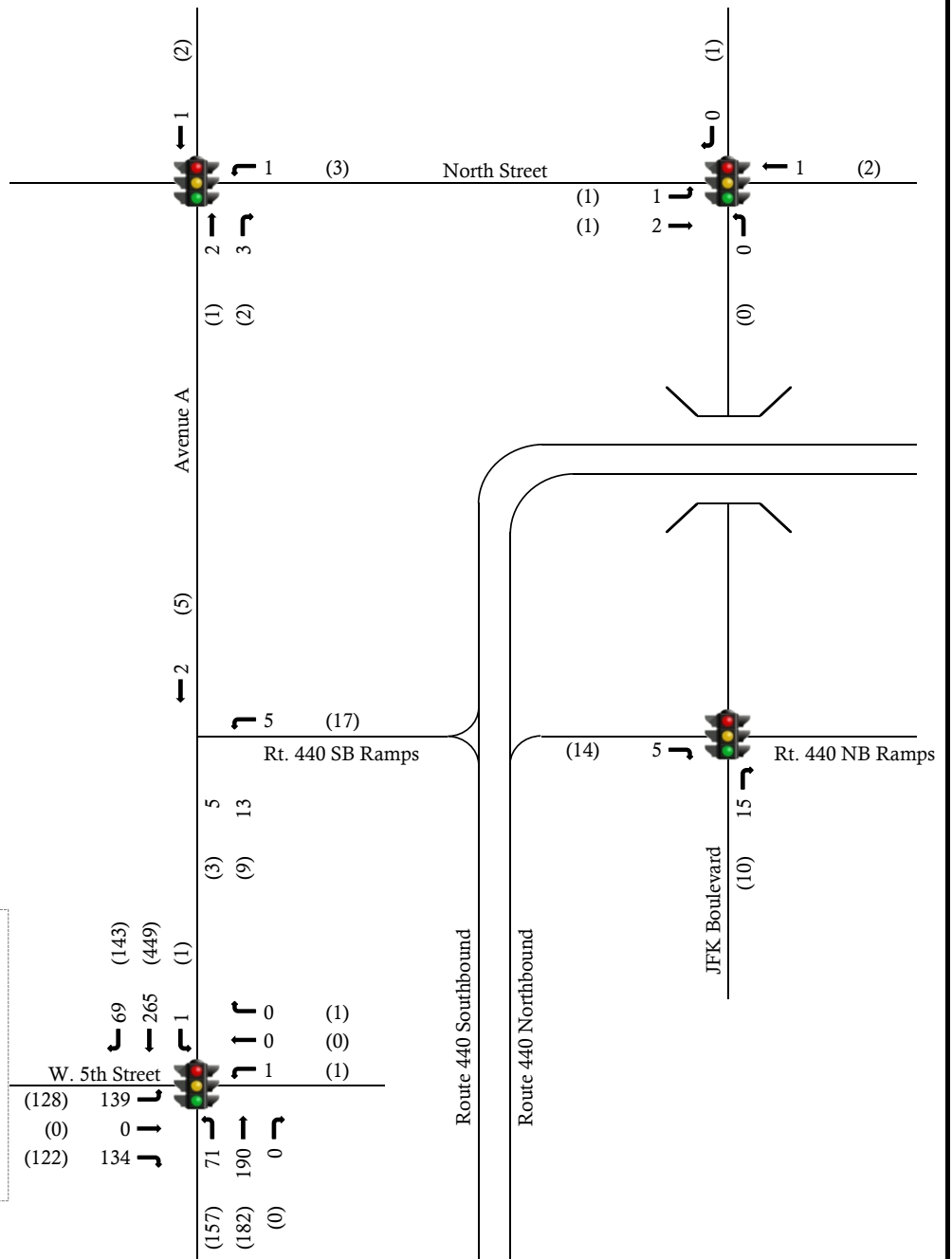
Site Generated Trips





LEGEND

-  Existing Roadway
-  Proposed Roadway
-  AM (PM)
-  Signalized Intersection



Appendix B
Capacity Analysis

Intersection												
Int Delay, s/veh	0.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	5	1	0	0	3	106	0	1	153	4
Future Vol, veh/h	1	0	5	1	0	0	3	106	0	1	153	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	1	0	5	1	0	0	3	109	0	1	158	4

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	277	277	160	280	279	109	162	0	0	109	0	0
Stage 1	162	162	-	115	115	-	-	-	-	-	-	-
Stage 2	115	115	-	165	164	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	673	629	882	670	627	942	1411	-	-	1475	-	-
Stage 1	838	762	-	887	798	-	-	-	-	-	-	-
Stage 2	887	798	-	835	761	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	672	627	882	665	625	942	1411	-	-	1475	-	-
Mov Cap-2 Maneuver	672	627	-	665	625	-	-	-	-	-	-	-
Stage 1	836	761	-	885	796	-	-	-	-	-	-	-
Stage 2	885	796	-	829	760	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.3		10.4		0.2		0	
HCM LOS	A		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1411	-	-	838	665	1475	-	-
HCM Lane V/C Ratio	0.002	-	-	0.007	0.002	0.001	-	-
HCM Control Delay (s)	7.6	0	-	9.3	10.4	7.4	0	-
HCM Lane LOS	A	A	-	A	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0	0	0	-	-

Intersection												
Int Delay, s/veh	0.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	9	0	10	1	0	1	4	66	0	1	336	6
Future Vol, veh/h	9	0	10	1	0	1	4	66	0	1	336	6
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	10	0	11	1	0	1	4	72	0	1	365	7

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	452	451	369	456	454	72	372	0	0	72	0	0
Stage 1	371	371	-	80	80	-	-	-	-	-	-	-
Stage 2	81	80	-	376	374	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	516	502	674	513	500	987	1181	-	-	1522	-	-
Stage 1	647	618	-	926	826	-	-	-	-	-	-	-
Stage 2	925	826	-	643	616	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	513	499	674	503	498	987	1181	-	-	1522	-	-
Mov Cap-2 Maneuver	513	499	-	503	498	-	-	-	-	-	-	-
Stage 1	644	617	-	922	823	-	-	-	-	-	-	-
Stage 2	920	823	-	632	615	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	11.4		10.4		0.5		0	
HCM LOS	B		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1181	-	-	587	666	1522	-	-
HCM Lane V/C Ratio	0.004	-	-	0.035	0.003	0.001	-	-
HCM Control Delay (s)	8.1	0	-	11.4	10.4	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.1	0	0	-	-

Intersection												
Int Delay, s/veh	6.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	121	0	119	1	0	0	66	190	0	1	265	62
Future Vol, veh/h	121	0	119	1	0	0	66	190	0	1	265	62
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	125	0	123	1	0	0	68	196	0	1	273	64

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	639	639	305	701	671	196	337	0	0	196	0	0
Stage 1	307	307	-	332	332	-	-	-	-	-	-	-
Stage 2	332	332	-	369	339	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	387	393	732	352	376	843	1217	-	-	1371	-	-
Stage 1	701	659	-	679	643	-	-	-	-	-	-	-
Stage 2	679	643	-	649	638	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	368	368	732	279	352	843	1217	-	-	1371	-	-
Mov Cap-2 Maneuver	368	368	-	279	352	-	-	-	-	-	-	-
Stage 1	657	658	-	636	602	-	-	-	-	-	-	-
Stage 2	636	602	-	540	637	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	19.7		18		2.1		0	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1217	-	-	488	279	1371	-
HCM Lane V/C Ratio	0.056	-	-	0.507	0.004	0.001	-
HCM Control Delay (s)	8.1	0	-	19.7	18	7.6	0
HCM Lane LOS	A	A	-	C	C	A	A
HCM 95th %tile Q(veh)	0.2	-	-	2.8	0	0	-

Intersection												
Int Delay, s/veh	19.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	116	0	112	1	0	1	143	182	0	1	449	121
Future Vol, veh/h	116	0	112	1	0	1	143	182	0	1	449	121
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	126	0	122	1	0	1	155	198	0	1	488	132

Major/Minor	Minor2		Minor1			Major1			Major2			
Conflicting Flow All	1065	1064	554	1125	1130	198	620	0	0	198	0	0
Stage 1	556	556	-	508	508	-	-	-	-	-	-	-
Stage 2	509	508	-	617	622	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	199	222	530	181	203	841	956	-	-	1369	-	-
Stage 1	514	511	-	546	537	-	-	-	-	-	-	-
Stage 2	545	537	-	476	477	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	171	181	530	120	166	841	956	-	-	1369	-	-
Mov Cap-2 Maneuver	171	181	-	120	166	-	-	-	-	-	-	-
Stage 1	420	510	-	447	439	-	-	-	-	-	-	-
Stage 2	445	439	-	366	477	-	-	-	-	-	-	-

Approach	EB		WB			NB			SB		
HCM Control Delay, s	90.5		22.3			4.2			0		
HCM LOS	F		C								

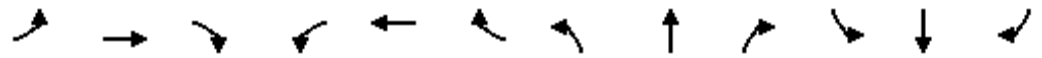
Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	956	-	-	256	210	1369	-
HCM Lane V/C Ratio	0.163	-	-	0.968	0.01	0.001	-
HCM Control Delay (s)	9.5	0	-	90.5	22.3	7.6	0
HCM Lane LOS	A	A	-	F	C	A	A
HCM 95th %tile Q(veh)	0.6	-	-	9.1	0	0	-

Intersection												
Int Delay, s/veh	7.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	139	0	134	1	0	0	71	190	0	1	265	69
Future Vol, veh/h	139	0	134	1	0	0	71	190	0	1	265	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	97	97	97	97	97	97	97	97	97	97	97	97
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	143	0	138	1	0	0	73	196	0	1	273	71

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	653	653	309	722	688	196	344	0	0	196	0	0
Stage 1	311	311	-	342	342	-	-	-	-	-	-	-
Stage 2	342	342	-	380	346	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	379	385	729	341	368	843	1209	-	-	1371	-	-
Stage 1	697	656	-	671	636	-	-	-	-	-	-	-
Stage 2	671	636	-	640	634	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	359	358	729	262	343	843	1209	-	-	1371	-	-
Mov Cap-2 Maneuver	359	358	-	262	343	-	-	-	-	-	-	-
Stage 1	650	655	-	625	593	-	-	-	-	-	-	-
Stage 2	625	593	-	518	633	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	22.8		18.8		2.2		0	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1209	-	-	478	262	1371	-
HCM Lane V/C Ratio	0.061	-	-	0.589	0.004	0.001	-
HCM Control Delay (s)	8.2	0	-	22.8	18.8	7.6	0
HCM Lane LOS	A	A	-	C	C	A	A
HCM 95th %tile Q(veh)	0.2	-	-	3.7	0	0	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↗	↘			↕	
Traffic Volume (vph)	139	0	134	1	0	0	71	190	0	1	265	69
Future Volume (vph)	139	0	134	1	0	0	71	190	0	1	265	69
Ideal Flow (vphpl)	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Fr _t		0.934										0.972
Fl _t Protected		0.975			0.950		0.950					
Satd. Flow (prot)	0	1857	0	0	1937	0	1937	2039	0	0	1982	0
Fl _t Permitted		0.839			0.547		0.572					
Satd. Flow (perm)	0	1598	0	0	1115	0	1166	2039	0	0	1982	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		59										30
Link Speed (mph)		25			25			25				25
Link Distance (ft)		437			123			372				400
Travel Time (s)		11.9			3.4			10.1				10.9
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	281	0	0	1	0	73	196	0	0	345	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2				6
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Total Split (s)	26.0	26.0		26.0	26.0		54.0	54.0		54.0	54.0	
Total Split (%)	32.5%	32.5%		32.5%	32.5%		67.5%	67.5%		67.5%	67.5%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effect Green (s)		15.3			15.3		49.2	49.2			49.2	
Actuated g/C Ratio		0.21			0.21		0.66	0.66			0.66	
v/c Ratio		0.75			0.00		0.09	0.15			0.26	
Control Delay		34.8			22.0		6.1	5.9			6.0	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		34.8			22.0		6.1	5.9			6.0	
LOS		C			C		A	A			A	
Approach Delay		34.8			22.0			5.9			6.0	
Approach LOS		C			C			A			A	
Queue Length 50th (ft)		96			0		11	30			52	
Queue Length 95th (ft)		176			4		30	65			106	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		357			43			292			320	
Turn Bay Length (ft)							100					
Base Capacity (vph)		494			315		769	1346			1318	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.57			0.00		0.09	0.15			0.26	

Intersection Summary

Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	74.5
Natural Cycle:	40
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.75
Intersection Signal Delay:	15.0
Intersection LOS:	B
Intersection Capacity Utilization	50.9%
ICU Level of Service	A
Analysis Period (min)	15

Splits and Phases: 10: Avenue A & 5th Street

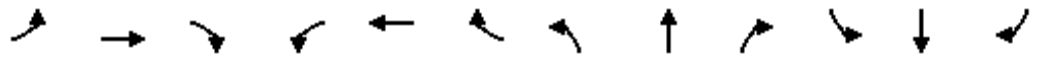


Intersection												
Int Delay, s/veh	32.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	128	0	122	1	1	1	157	182	0	1	449	143
Future Vol, veh/h	128	0	122	1	1	1	157	182	0	1	449	143
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	3	3	3	3	3	3	3	3	3	3	3	3
Mvmt Flow	139	0	133	1	1	1	171	198	0	1	488	155

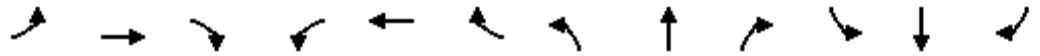
Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	1109	1108	566	1174	1185	198	643	0	0	198	0	0
Stage 1	568	568	-	540	540	-	-	-	-	-	-	-
Stage 2	541	540	-	634	645	-	-	-	-	-	-	-
Critical Hdwy	7.13	6.53	6.23	7.13	6.53	6.23	4.13	-	-	4.13	-	-
Critical Hdwy Stg 1	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.13	5.53	-	6.13	5.53	-	-	-	-	-	-	-
Follow-up Hdwy	3.527	4.027	3.327	3.527	4.027	3.327	2.227	-	-	2.227	-	-
Pot Cap-1 Maneuver	186	209	522	168	188	841	937	-	-	1369	-	-
Stage 1	506	505	-	524	520	-	-	-	-	-	-	-
Stage 2	523	520	-	466	466	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	155	166	522	106	149	841	937	-	-	1369	-	-
Mov Cap-2 Maneuver	155	166	-	106	149	-	-	-	-	-	-	-
Stage 1	402	504	-	417	413	-	-	-	-	-	-	-
Stage 2	414	413	-	347	466	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	149.5		26.2		4.5		0	
HCM LOS	F		D					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	937	-	-	236	173	1369	-
HCM Lane V/C Ratio	0.182	-	-	1.151	0.019	0.001	-
HCM Control Delay (s)	9.7	0	-	149.5	26.2	7.6	0
HCM Lane LOS	A	A	-	F	D	A	A
HCM 95th %tile Q(veh)	0.7	-	-	12.6	0.1	0	-



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕		↕	↕			↕	
Traffic Volume (vph)	128	0	122	1	1	1	157	182	0	1	449	143
Future Volume (vph)	128	0	122	1	1	1	157	182	0	1	449	143
Ideal Flow (vphpl)	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100
Storage Length (ft)	0		0	0		0	100		0	0		0
Storage Lanes	0		0	0		0	1		0	0		0
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.934			0.955							0.968
Flt Protected		0.975			0.984		0.950					
Satd. Flow (prot)	0	1857	0	0	1916	0	1937	2039	0	0	1974	0
Flt Permitted		0.838			0.930		0.408					
Satd. Flow (perm)	0	1596	0	0	1811	0	832	2039	0	0	1974	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		58			1							37
Link Speed (mph)		25			25			25				25
Link Distance (ft)		437			123			372				400
Travel Time (s)		11.9			3.4			10.1				10.9
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Heavy Vehicles (%)	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	272	0	0	3	0	171	198	0	0	644	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Detector Phase	4	4		8	8		2	2		6	6	
Switch Phase												
Minimum Initial (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Minimum Split (s)	12.0	12.0		12.0	12.0		12.0	12.0		12.0	12.0	
Total Split (s)	26.0	26.0		26.0	26.0		54.0	54.0		54.0	54.0	
Total Split (%)	32.5%	32.5%		32.5%	32.5%		67.5%	67.5%		67.5%	67.5%	
Yellow Time (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
All-Red Time (s)	2.0	2.0		2.0	2.0		2.0	2.0		2.0	2.0	
Lost Time Adjust (s)		0.0			0.0		0.0	0.0			0.0	
Total Lost Time (s)		5.0			5.0		5.0	5.0			5.0	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	None	None		None	None		Max	Max		Max	Max	
Act Effect Green (s)		15.0			15.0		49.2	49.2			49.2	
Actuated g/C Ratio		0.20			0.20		0.66	0.66			0.66	
v/c Ratio		0.74			0.01		0.31	0.15			0.49	
Control Delay		34.1			20.0		8.2	5.8			8.1	
Queue Delay		0.0			0.0		0.0	0.0			0.0	
Total Delay		34.1			20.0		8.2	5.8			8.1	
LOS		C			B		A	A			A	
Approach Delay		34.1			20.0			6.9			8.1	
Approach LOS		C			B			A			A	
Queue Length 50th (ft)		92			1		29	30			119	
Queue Length 95th (ft)		171			7		75	65			236	



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Internal Link Dist (ft)		357			43			292			320	
Turn Bay Length (ft)							100					
Base Capacity (vph)		494			515		551	1351			1320	
Starvation Cap Reductn		0			0		0	0			0	
Spillback Cap Reductn		0			0		0	0			0	
Storage Cap Reductn		0			0		0	0			0	
Reduced v/c Ratio		0.55			0.01		0.31	0.15			0.49	

Intersection Summary

Area Type:	Other
Cycle Length:	80
Actuated Cycle Length:	74.2
Natural Cycle:	40
Control Type:	Semi Act-Uncoord
Maximum v/c Ratio:	0.74
Intersection Signal Delay:	13.3
Intersection LOS:	B
Intersection Capacity Utilization	70.3%
ICU Level of Service	C
Analysis Period (min)	15

Splits and Phases: 10: Avenue A & 5th Street

