



ALDRIDGE TRANSPORTATION CONSULTANTS, LLC

Advanced Transportation Planning and Traffic Engineering

John M.W. Aldridge, PE
Colorado Licensed Professional Engineer

1082 Chimney Rock Road
Highlands Ranch, CO 80126
303-703-9112
Mobile: 303-594-4132
Email: john@atceng.com

October 16, 2017

Ms. Stephanie Beguin
DB Endeavors, LLC
25072 E. Davies Dr.
Aurora, CO 80016

Re: Traffic Impact Study
Jewell Ave. & E-470 RV Storage

Dear Ms. Beguin:

Aldridge Transportation Consultants (ATC) is pleased to present this traffic impact study regarding the proposed development of the Jewell Ave. & E-470 RV Storage.

ATC is professional service firm specializing in traffic engineering and transportation planning. ATC's principal, John M.W. Aldridge, is a Colorado licensed professional engineer. In the past 20 years, ATC has prepared over 1,000 traffic impact studies, designed over 100 traffic signals, and has provided expert witness testimony on engineering design and access issues on multi-million dollar interchange and highway projects in Kansas and Colorado.

ATC appreciates the opportunity to be of service. Please call if you have any questions. We can be reached at 303-703-9112.



Respectfully submitted,

Aldridge Transportation Consultants, LLC

John M.W. Aldridge, PE
Principal



1. Introduction/Project Description

This traffic study provides an analysis of the potential impact on traffic operations and safety of adjacent streets and intersections occasioned by the development a 600 space RV storage area and 5 acres of self-storage units located on the east side S. Rome Way approximately 4,000 feet south of Jewell Ave. Figure 1 shows the location of the site and surrounding streets and intersections.



Figure 1 Site Plan and Location



2. Existing Conditions

Jewell Ave. is an undivided two-lane minor arterial that carries approximately 14,000 ADT. It is posted at 45 mph. S. Rome Way is an undivided two-lane local roadway that carries about 250 ADT. It is a dead-end street. The intersection is two-way stop sign controlled. There are no auxiliary turn lanes.

Now the only user of intersection and S. Rome Way is a 715 space RV storage and a 300-unit self-storage facility. The trip generation rates for an RV storage and self-storage facility are provided in the *ITE Trip Generation Manual, 9th Edition* under category code 151. A table with the existing condition is presented below. Shown are the average daily and the AM/PM peak hour trip generation.

Trip Generation Worksheet								
ITE CODE	LAND USE	UNIT	QUANTITY	ADT	AM		PM	
					IN	OUT	IN	OUT
151	Mini-Storage	Space	1015	0.25	0.01	0.01	0.02	0.02
				254	10	10	20	20
Total Trips				254	10	10	20	20

Note that the trip generation of the existing facility is a close match to the actual traffic volumes in the average daily and AM/PM peak hours. The AM and PM peak hour turning movement counts were taken on Wednesday September 20, 2017. The count reports are attached for reference.

Currently the intersection operates at LOS C/C in the AM/PM peak hours, respectively. Synchro graphics and reports are attached with the existing traffic volumes.



3. Proposed Conditions

The new RV storage and self-storage facility will generate traffic at the same rate as the existing facility. The following table shows the average daily and the AM/PM peak hour trip generation.

Trip Generation Worksheet								
ITE CODE	LAND USE	UNIT	QUANTITY	ADT	AM		PM	
					IN	OUT	IN	OUT
151	Mini-Storage	Spaces	600	0.25	0.01	0.01	0.02	0.02
				150	6	6	12	12
151	Mini-Storage	Acres	5	35.43	1.16	1.42	1.79	1.79
				177	6	7	9	9
Total Trips				327	12	13	21	21

The PM peak hour is the highest time of travel on the adjacent streets and at the intersections and therefore considered the design hour volume (DHV) for operations analysis and geometric design purposes.

About distribution, the assumption is that it will split similarly to the in and out directional splits on S. Rome Way. Synchro graphics attached show the existing with site generated volumes for the AM and PM peak hours.

Note:

In their pre-app comments, the city requested that this study include an analysis of the full-build of Pioneer Hills, a property on the north side. However, this property is not owned by the owner/developer of the RV storage and self-storage facility. Furthermore, it is our understanding that there is no active development proposal and that the property is possibly up for sale.



4. Operations Evaluation

ATC uses Synchro v.9 for operations analyses. The Synchro v.9 methodology is based on the Highway Capacity Manual 2010 (HCM). The Synchro HCM reports are attached for reference. LOS is letter rating from A to F. LOS A indicates free-flow traffic conditions and no delay at intersections. LOS F is heavy traffic congestion with significant delay. LOS is provided for the overall operations at signalized intersections. LOS D is generally the benchmark for acceptable signalized intersection operations during the weekday peak hours. The critical movement, not the overall, provides the LOS rating for unsignalized intersections. The critical movement is generally a left turn from the minor approach. Caution is advised when evaluating the LOS at unsignalized intersections particularly when LOS F shows. In cases of an LOS F, the HCM¹ suggests that other evaluation measures should be considered such as the volume over capacity ratio and 95th percentile queue length to make the most effective traffic control decision. LOS F at unsignalized intersections is often normal for the average weekday peak hour.

The following table provides the critical movement LOS and seconds of delay.

Intersection	Existing AM/PM	Existing plus SG AM/PM
Jewell/Rome	C/19.8 – C/18.9	D/25.3 – C/20.5

The intersection currently operates at an acceptable level of service and will continue to do so with the site generated traffic.

¹ Highway Capacity Manual 2010 page 19-40



5. Proposed Mitigation Measures

The City of Aurora requested a traffic signal warrant analysis for the intersection with the projected trip generation from the proposed use. As this is a commercial property, the generally applied warrant is #3 the Peak Hour Warrant. The 70 percent factor applies because Jewell Ave. is posted at 45 mph.

Warrant #1, the Eight-Hour Warrant requires a minimum of 525 vehicles per hour on the major approaches and 53 vehicles per hour on the minor approach for any eight hours during the day. While the 525 vehicles per hour is probably exceeded with 1,400 in the peak hour, the 36 projected vehicles per hour on the minor approach would not meet the warrant threshold.

Warrant #2, the Four-Hour Warrant requires at least 60 vehicles per hour on the minor approach for any four hours during the day. The major approaches need to be at least 750 vehicles per hour to qualify the minimum of 60 vehicles per hour. Again the 36 projected vehicles per hour on the minor approach would not meet the warrant threshold.

Warrant #3, the Peak Hour Warrant is the most liberal as it requires at least 75 vehicles per hour on the minor approach during the peak hour and at least 1050 vehicles per hour on the major approaches. COA requires the right turn movement volume discounted by 50 percent so that leaves only 22 projected vehicles per hour on the minor approach, which would not meet the warrant threshold.

Under these projected conditions, traffic signal control is not warranted. Turn lanes are also not warranted as the left turn lane is under 10 vehicles per hour in the peak hour and the right turn lane is under 25 vehicles per hour in the peak hour.

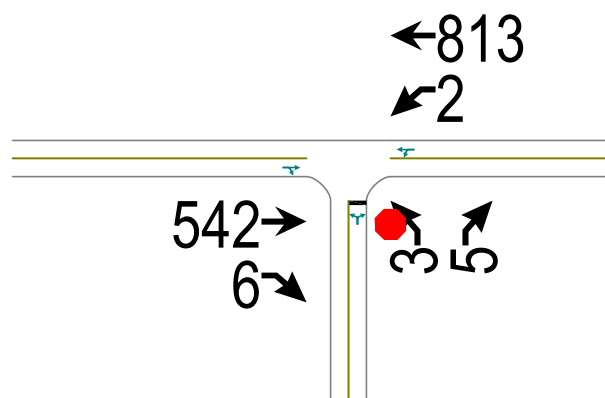





6. Conclusions/Recommendations

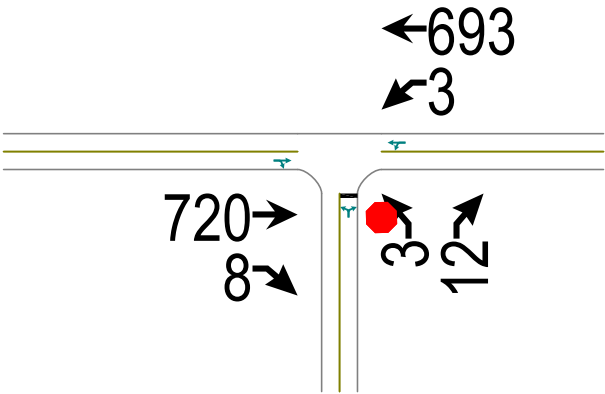
The proposed Jewell Ave. and E-470 RV Storage facility is a very low generator of traffic as such will have no significant impact on the adjacent streets and intersections. No mitigation to intersection geometry or traffic control devices are necessary to accommodate the modest increase in traffic.



APPENDIX






Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	542	6	2	813	3	5
Future Vol, veh/h	542	6	2	813	3	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	589	7	2	884	3	5
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	596	0	1480	592
Stage 1	-	-	-	-	592	-
Stage 2	-	-	-	-	888	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	980	-	138	506
Stage 1	-	-	-	-	553	-
Stage 2	-	-	-	-	402	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	980	-	137	506
Mov Cap-2 Maneuver	-	-	-	-	137	-
Stage 1	-	-	-	-	553	-
Stage 2	-	-	-	-	400	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		19.8	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	252	-	-	980	-	
HCM Lane V/C Ratio	0.035	-	-	0.002	-	
HCM Control Delay (s)	19.8	-	-	8.7	0	
HCM Lane LOS	C	-	-	A	A	
HCM 95th %tile Q(veh)	0.1	-	-	0	-	



Intersection

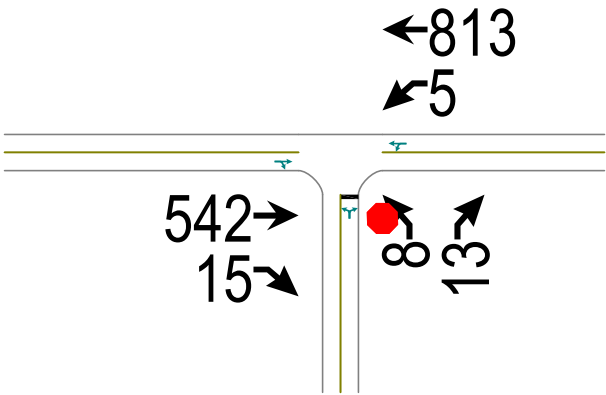
Int Delay, s/veh 0.2




Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	720	8	3	693	3	12
Future Vol, veh/h	720	8	3	693	3	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	783	9	3	753	3	13

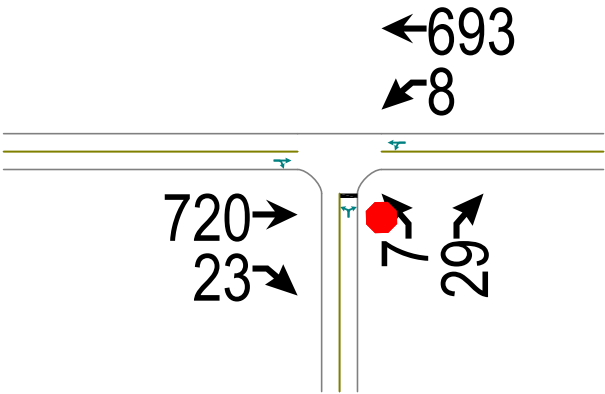
Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	1547
Stage 1	-	-	787
Stage 2	-	-	760
Critical Hdwy	-	4.12	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	2.218	3.518
Pot Cap-1 Maneuver	-	829	126
Stage 1	-	-	449
Stage 2	-	-	462
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	829	125
Mov Cap-2 Maneuver	-	-	125
Stage 1	-	-	449
Stage 2	-	-	459




Approach	EB	WB	NB
HCM Control Delay, s	0	0	18.9
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	275	-	-	829	-
HCM Lane V/C Ratio	0.059	-	-	0.004	-
HCM Control Delay (s)	18.9	-	-	9.4	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-



Intersection						
Int Delay, s/veh	0.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	542	15	5	813	8	13
Future Vol, veh/h	542	15	5	813	8	13
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	589	16	5	884	9	14
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	605	0	1492	597
Stage 1	-	-	-	-	597	-
Stage 2	-	-	-	-	895	-
Critical Hdwy	-	-	4.12	-	7.12	6.22
Critical Hdwy Stg 1	-	-	-	-	6.12	-
Critical Hdwy Stg 2	-	-	-	-	6.12	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	973	-	102	503
Stage 1	-	-	-	-	490	-
Stage 2	-	-	-	-	335	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	973	-	101	503
Mov Cap-2 Maneuver	-	-	-	-	101	-
Stage 1	-	-	-	-	490	-
Stage 2	-	-	-	-	332	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.1		25.3	
HCM LOS					D	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	200	-	-	973	-	
HCM Lane V/C Ratio	0.114	-	-	0.006	-	
HCM Control Delay (s)	25.3	-	-	8.7	0	
HCM Lane LOS	D	-	-	A	A	
HCM 95th %tile Q(veh)	0.4	-	-	0	-	



Intersection						
Int Delay, s/veh	0.5					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	720	23	8	693	7	29
Future Vol, veh/h	720	23	8	693	7	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	783	25	9	753	8	32
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	808	0	1566	795
Stage 1	-	-	-	-	795	-
Stage 2	-	-	-	-	771	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	817	-	122	388
Stage 1	-	-	-	-	445	-
Stage 2	-	-	-	-	456	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	817	-	120	388
Mov Cap-2 Maneuver	-	-	-	-	120	-
Stage 1	-	-	-	-	445	-
Stage 2	-	-	-	-	447	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0.1		20.5	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT	
Capacity (veh/h)	271	-	-	817	-	
HCM Lane V/C Ratio	0.144	-	-	0.011	-	
HCM Control Delay (s)	20.5	-	-	9.5	0	
HCM Lane LOS	C	-	-	A	A	
HCM 95th %tile Q(veh)	0.5	-	-	0	-	

Rome Way Jewell Ave

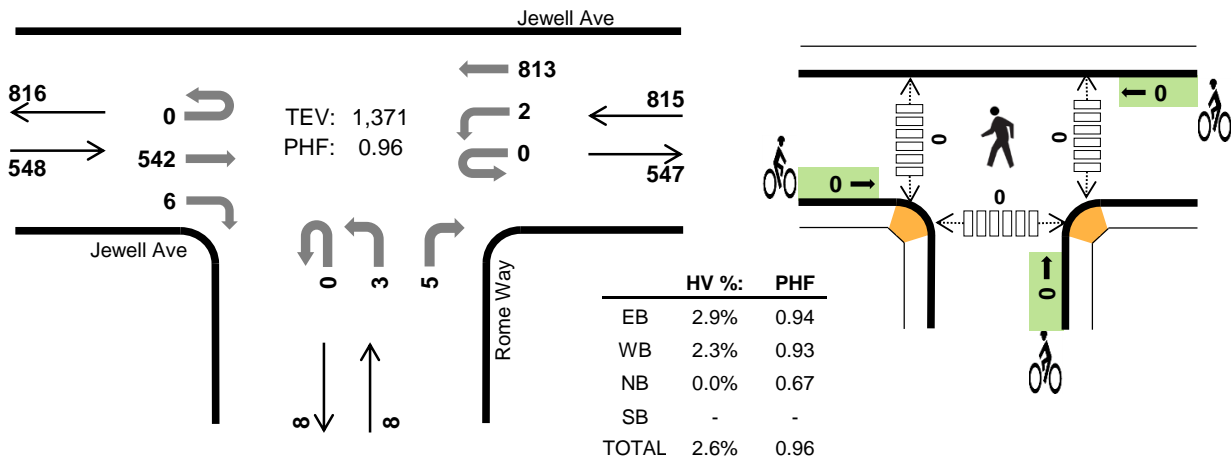


Peak Hour

Date: Thu, Sep 21, 2017

Count Period: 7:00 AM to 9:00 AM

Peak Hour: 7:00 AM to 8:00 AM



Two-Hour Count Summaries

Interval Start	Jewell Ave Eastbound				Jewell Ave Westbound				Rome Way Northbound				0 Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
7:00 AM	0	0	145	1	0	1	202	0	0	1	0	2	0	0	0	0	352	0
7:15 AM	0	0	129	3	0	0	191	0	0	0	0	0	0	0	0	0	323	0
7:30 AM	0	0	132	2	0	0	201	0	0	1	0	2	0	0	0	0	338	0
7:45 AM	0	0	136	0	0	1	219	0	0	1	0	1	0	0	0	0	358	1,371
8:00 AM	0	0	115	0	0	2	147	0	0	0	0	2	0	0	0	0	266	1,285
8:15 AM	0	0	93	1	0	0	141	0	0	1	0	0	0	0	0	0	236	1,198
8:30 AM	0	0	75	0	0	1	110	0	0	1	0	1	0	0	0	0	188	1,048
8:45 AM	0	0	71	0	0	3	90	0	0	0	0	0	0	0	0	0	164	854
Count Total	0	0	896	7	0	8	1,301	0	0	5	0	8	0	0	0	0	2,225	0
Peak Hour	0	0	542	6	0	2	813	0	0	3	0	5	0	0	0	0	1,371	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	2	5	0	0	7	0	0	0	0	0	0	0	0	0	0
7:15 AM	6	3	0	0	9	0	0	0	0	0	0	0	0	0	0
7:30 AM	4	6	0	0	10	0	0	0	0	0	0	0	0	0	0
7:45 AM	4	5	0	0	9	0	0	0	0	0	0	0	0	0	0
8:00 AM	6	2	0	0	8	0	0	0	0	0	0	0	0	0	0
8:15 AM	5	7	0	0	12	0	0	0	0	0	0	0	0	0	0
8:30 AM	4	3	0	0	7	0	0	0	0	0	0	0	0	0	0
8:45 AM	2	3	0	0	5	0	0	0	0	0	0	0	0	0	0
Count Total	33	34	0	0	67	0	0	0	0	0	0	0	0	0	0
Peak Hr	16	19	0	0	35	0	0	0	0	0	0	0	0	0	0

Rome Way Jewell Ave

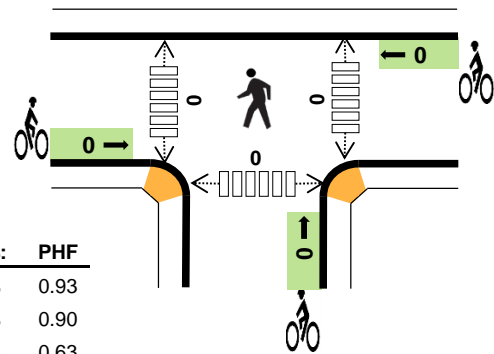
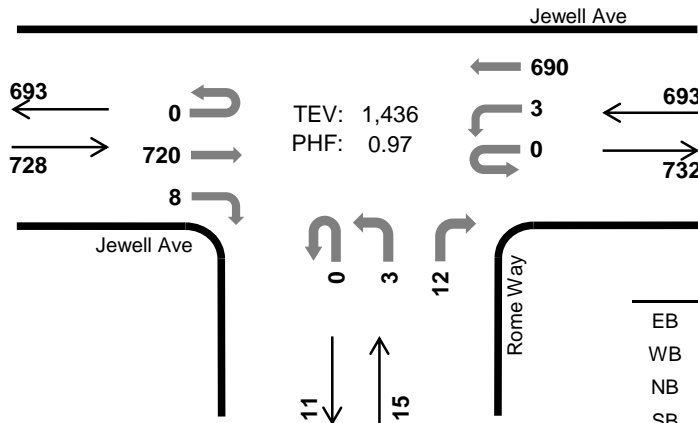


Peak Hour

Date: Wed, Sep 20, 2017

Count Period: 4:00 PM to 6:00 PM

Peak Hour: 4:30 PM to 5:30 PM



	HV %:	PHF
EB	1.1%	0.93
WB	1.9%	0.90
NB	6.7%	0.63
SB	-	-
TOTAL	1.5%	0.97

Two-Hour Count Summaries

Interval Start	Jewell Ave Eastbound				Jewell Ave Westbound				Rome Way Northbound				Rome Way Southbound				15-min Total	Rolling One Hour
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	0	170	2	0	1	137	0	0	1	0	2	0	0	0	0	313	0
4:15 PM	0	0	188	2	0	2	153	0	0	1	0	2	0	0	0	0	348	0
4:30 PM	0	0	183	4	0	1	155	0	0	1	0	5	0	0	0	0	349	0
4:45 PM	0	0	193	2	0	1	163	0	0	1	0	4	0	0	0	0	364	1,374
5:00 PM	0	0	155	1	0	0	193	0	0	1	0	2	0	0	0	0	352	1,413
5:15 PM	0	0	189	1	0	1	179	0	0	0	0	1	0	0	0	0	371	1,436
5:30 PM	1	0	169	1	0	2	160	0	0	3	0	1	0	0	0	0	337	1,424
5:45 PM	0	0	155	1	0	0	164	0	0	1	0	1	0	0	0	0	322	1,382
Count Total	1	0	1,402	14	0	8	1,304	0	0	9	0	18	0	0	0	0	2,756	0
Peak Hour	0	0	720	8	0	3	690	0	0	3	0	12	0	0	0	0	1,436	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	7	0	0	0	7	0	0	0	0	0	0	0	0	0	0
4:15 PM	2	5	0	0	7	0	0	0	0	0	0	0	0	0	0
4:30 PM	6	5	0	0	11	0	0	0	0	0	0	0	0	0	0
4:45 PM	1	2	1	0	4	0	0	0	0	0	0	0	0	0	0
5:00 PM	1	2	0	0	3	0	0	0	0	0	0	0	0	0	0
5:15 PM	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0
5:45 PM	1	3	0	0	4	0	0	0	0	0	0	0	0	0	0
Count Total	18	22	1	0	41	0	0	0	0	0	0	0	0	0	0
Peak Hr	8	13	1	0	22	0	0	0	0	0	0	0	0	0	0