

Comments 11/21/17:

- 1) Update synchro with correct PHFs & % heavy vehicles. Jewell Ave is a truck route on the City's published route map, 2% is not a reasonable assumption for the roadway. Review available adjacent data and update accordingly.
- 2) Confirm site plan matches latest submitted to planning department
- 3) Trip gen for the RV storage shall be accounted for separately from the mini-storage.
- 4) See comments throughout report

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

1082 Chimney Rock Road
 Highlands Ranch, CO 80126
 303-703-9112

Responses 12/21/17

October 16, 2017

Ms. Stephanie
 DB Endeavor
 25072 E. Dakota
 Aurora, CO

Re: Traffic
 Jewell

Dear Ms. Beggs

Aldridge Transportation
 the proposed

ATC is professional
 ATC's principal
 years, ATC has
 has provided expert witness testimony on engineering design and access issues on multi-million
 dollar interchange and highway projects in Kansas and Colorado.

1) Please review the PHF and HV% data on the traffic count reports that are attached. The PHFs on the mainline are slightly higher than .92 (one exception at .90) and so using .92 (the recommended default value in the HCM) provides a more conservative analysis (albeit negligible). The 2% heavy vehicle factor is virtually spot on. Mere tenths of percent higher in the AM and in the PM a bit lower. Nothing to quibble about and certainly nothing that would change the analysis results.

2) The site plan matches.

3) As we indicated in the study, the calculated trip generation from the existing facility with 715 RV spaces and 300 mini-storage units matches very closely to the actual counts. The trip generation table for the existing facility shows for the AM 10 in and 10 out. Actual AM counts show 8 in and 8 out. The Table for the PM trip generation shows 20 in and 20 out. Actual PM counts show 11 in and 15 out. The comparison indicates that the confidence level in the ITE observations is very high and conservative.

4) No other comments other than what was addressed above were seen.

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



need to include trip generation for this use separate from mini storage. recent studies in COA indicated much higher trip generation than Code 151. An existing facility should be counted to determine the trip gen or request a copy of recently accepted studies in COA with that data via open records.

JEWELL & E-470 RV STORAGE
Transportation Impact Study

... a two-lane minor arterial that carries ... is posted at 45 mph. S. Rome Way is an ... y 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.

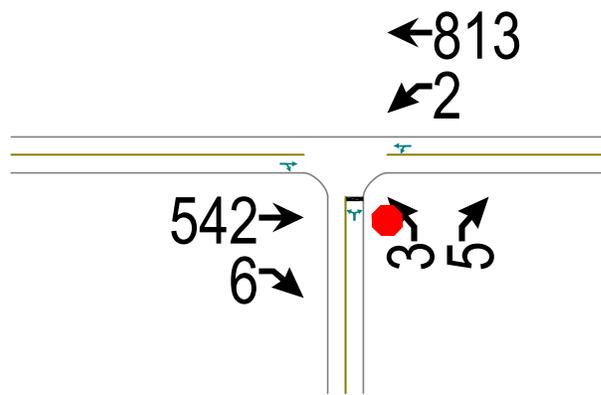


6. Conclusions/Recommendations

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



RV Storage
3:

update per count data

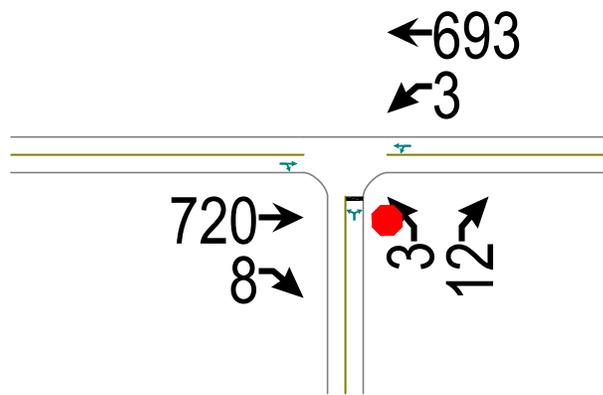
Intersection						
Int Delay, s/veh	0.1					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔		↔	
Traffic Vol, veh/h	542	6	2	813	3	5
Future Vol, veh/h	542	6	2	813	3	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	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	-

update, given that Jewell is shown as a truck route on the City's published transport permit / route map & given the location of DADS, 2% is not a reasonable assumption for Jewell Ave



Intersection

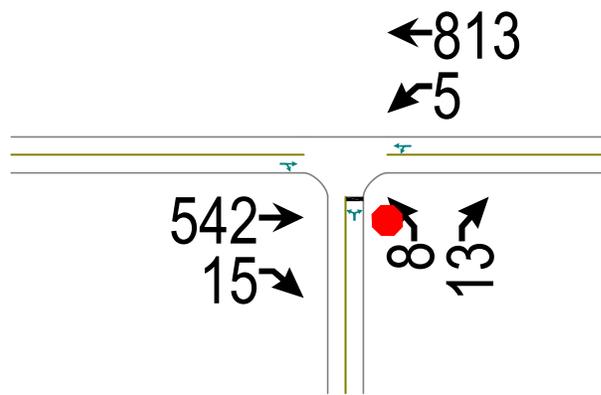
Int Delay, s/veh 0.2

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	791
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	829
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	829
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

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

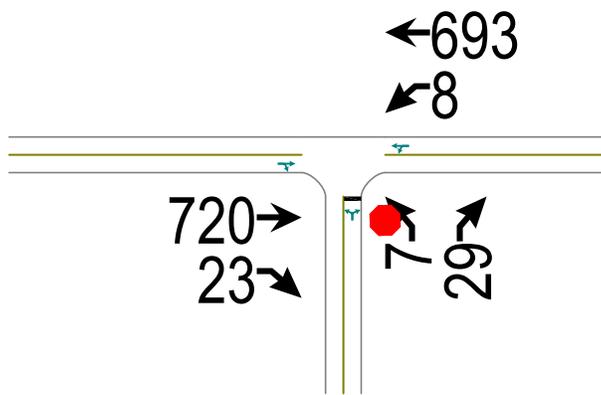
Int Delay, s/veh 0.4

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
Stage 1	-	-	597
Stage 2	-	-	895
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	6.12
Critical Hdwy Stg 2	-	-	6.12
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	973
Stage 1	-	-	490
Stage 2	-	-	335
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	973
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	1566
Stage 1	-	-	795
Stage 2	-	-	771
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	-	817	122
Stage 1	-	-	445
Stage 2	-	-	456
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	817	120
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

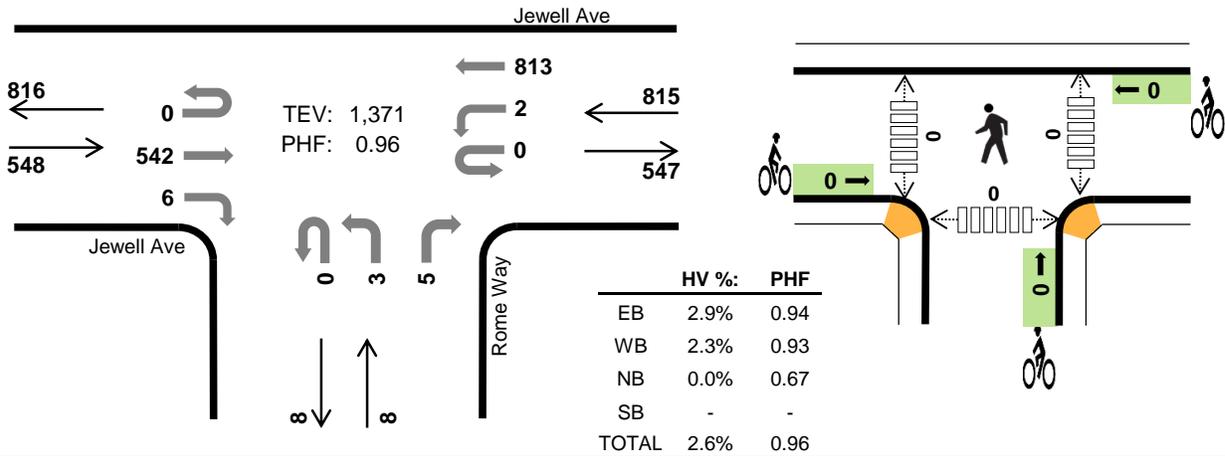
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	271	-	-	817	-
HCM Lane V/C Ratio	0.144	-	-	0.011	-
HCM Control Delay (s)	20.5	-	-	9.5	0
HCM Lane LOS	C	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0	-

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				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		
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.

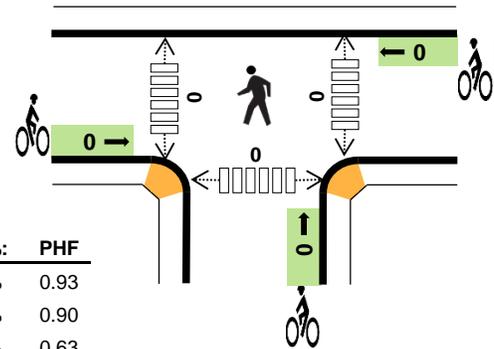
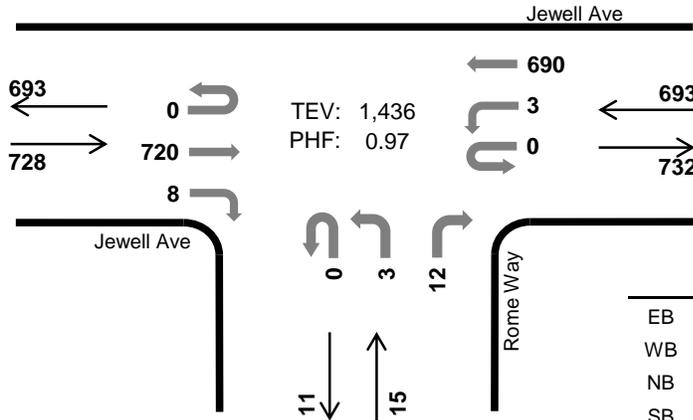
Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
7:00 AM	2	5	0	0	7	0	0	0	0	0	0	0	0	0	0
7:15 AM	6	3	0	0	9	0	0	0	0	0	0	0	0	0	0
7:30 AM	4	6	0	0	10	0	0	0	0	0	0	0	0	0	0
7:45 AM	4	5	0	0	9	0	0	0	0	0	0	0	0	0	0
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