

ADELE'S ACRES SUBDIVISION

TRAFFIC IMPACT STUDY

Project Location: 1024 19 Rd
Fruita, CO

Access Locations: J 2/10 Road

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APEX Job No: 22-35

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APEX
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Contents

1. Introduction	1
2. Project Location and Description	1
3. Trip Generation	3
4. Trip Distribution & Assignment.....	3
4.1 Determination of Trip Distribution	3
4.2 Assignment of Project Traffic.....	5
5. Existing & Future Traffic Volumes.....	5
6. Study Years Traffic Volumes.....	6
7. Study Period Volumes	7
8. Auxiliary Turn Lane Evaluation.....	12
8.1 Mesa County Design Standards (MCDS)	12
8.2 Transportation Engineering Design Standards (TEDS).....	12
9. Level of Service & Capacity	13
10. Intersection Sight Distance	14
11. Summary and Recommendations.....	18

Appendix

- A. Trip Generation
- B. Traffic Count Summaries
- C. LOS Calculations

1. Introduction

APEX Consulting Engineers, LLC prepared this Traffic Assessment (Assessment) for the Adele's Acres Development (Project), located east of 19 Road and south of J 2/10 Road at 1024 19 Road, Fruita, CO. Current traffic within the Project area accesses the local road network along 19 Road. The parcel to be subdivided and included in this assessment are as follows:

- Parcel #2697-153-00-181

The Project will subdivide the approximate 15 acre parcel into 48 single family residential lots which will access the roadway network on the proposed access along J 2/10 Road. The Project is currently zoned Agricultural, Forestry, Transitional (AFT) and is surrounded by additional AFT zoning. The Project has been annexed by the City of Fruita and is planned to rezone to Residential (4-8 DU/Acre) which is consistent with the City of Fruita's future land use.

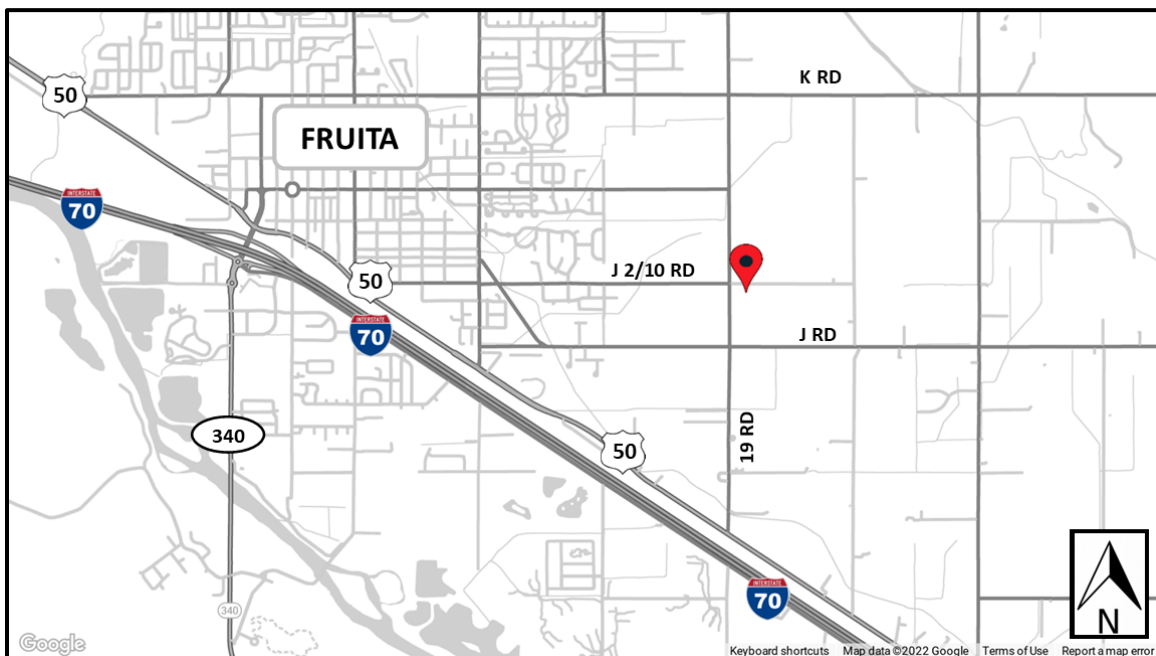
APEX did not find any evidence of any former traffic studies for the Project.

This Traffic Assessment is prepared in accordance with the 2020 Mesa County Design Standards.

2. Project Location and Description

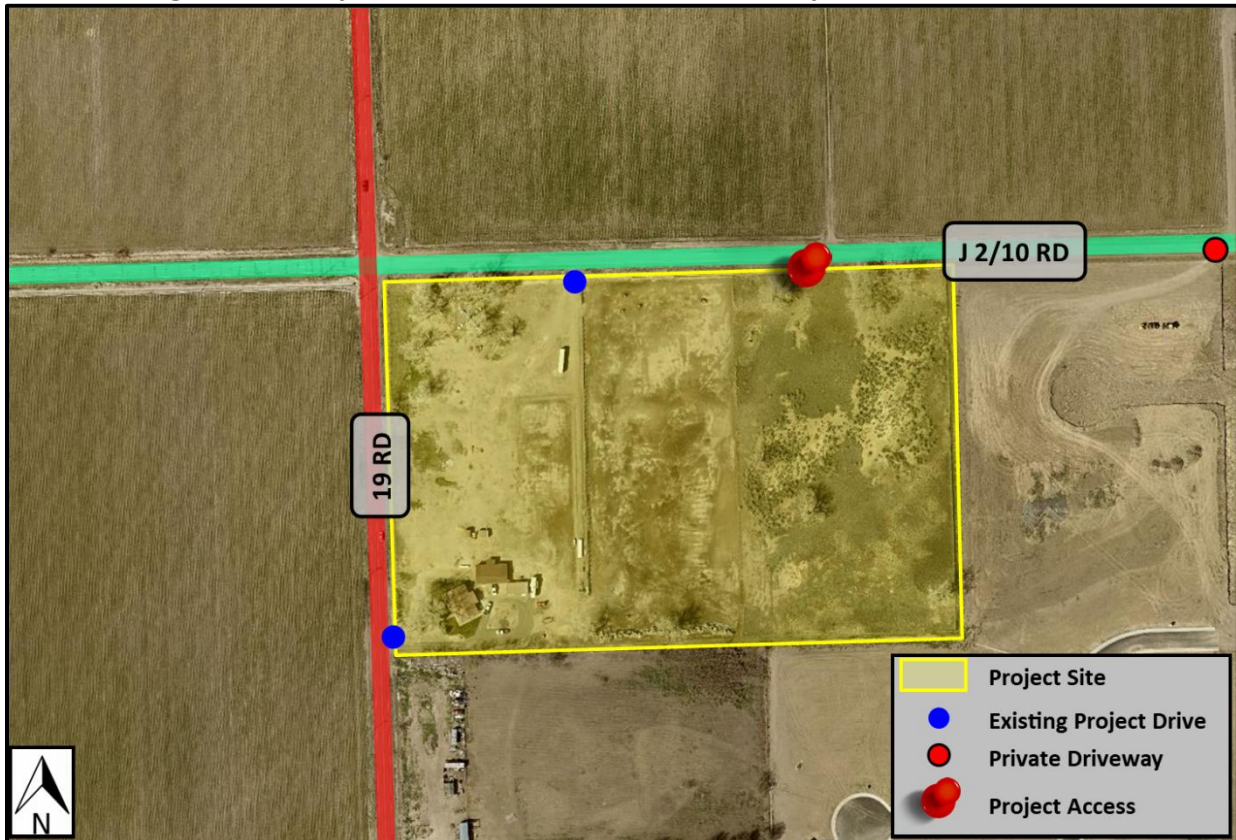
As shown in Figure 1, the Project is located east of 19 Road and south of J 2/10 Road at 1024 19 Road, Fruita, CO. The Project site currently contains one single family home, and the proposed land use will include 48 single family residential lots. The Project is expected to be completed in 2025.

Figure 1 - Site Location Map



The existing Project extents, site access location, and adjacent private driveways are shown in Figure 2.

Figure 2 – Project Site Access Locations and Adjacent Access Points



Roadway classification, speed limits, travel lanes, and approval authority are listed below.

- J 2/10 Road (East) – Rural Local, 35 mph, 2-lane, Mesa County & City of Fruita
- J 2/10 Road (West) – Minor Collector, 35 mph, 2-lane, Mesa County
- 19 Road (North) – Enhanced Travel Corridor, 45 mph, 2-lane, Mesa County
- 19 Road (South) – Enhanced Travel Corridor, 45 mph, 2-lane, City of Fruita

J 2/10 Road is expected to be a Minor Collector with the completion of the Project as the roadway will improve from gravel to asphalt for the length of the subdivision.

3. Trip Generation

Land Use Code 210, Single Family Residential, from the ITE Trip Generation Manual 10th Edition, was used in trip generation calculations with an independent variable of Dwelling Units. In all peak hour cases, the higher of “either peak hour of roadway” or “peak hour of generator” is used, providing a conservative assessment. In this case, peak hour of generator is used. Trip generation traffic calculations from the ITETripGen Web-based App are attached in Appendix A. Table 1 provides the Project peak hour traffic in vehicles per hour (VPH) and average daily trips (ADT).

Table 1 –Project Peak Hour Traffic Volumes (VPH)

	Period	AM	PM	ADT
LUC 210 - Proposed (48 Dwelling Units)	Ins	10	34	264
	Outs	31	19	265
TOTAL		41	53	529

4. Trip Distribution & Assignment

4.1 Determination of Trip Distribution

All traffic is assumed to be passenger vehicles due to the rural nature of the area and additional modes of transport are not evaluated. Pedestrian traffic is not evaluated since pedestrian pathways are not planned for the Project area and neighboring areas do not include any.

The Project site only contains a single home. Project trip distribution is assigned using the distributions from turning movement counts at the intersections of J 2/10 Road & 19 Road and J 2/10 Road & Park Street.

The TIS assumes all project traffic at the Project access will travel west towards 19 Road. From that point, the overall site distribution will be determined from turning movement count data at the intersection of J 2/10 Road & 19 Road for the to/from north and south and J 2/10 Road & Park Street for the east and west. However, since all traffic will head west to J 2/10 Road & 19 Road, both the southbound and eastbound traffic will use the south leg of the intersection. The naming convention for each intersection related to the distribution is listed below.

- Intersection A : J 2/10 Rd & 19 Rd
- Intersection B : J 2/10 Rd & Park Street

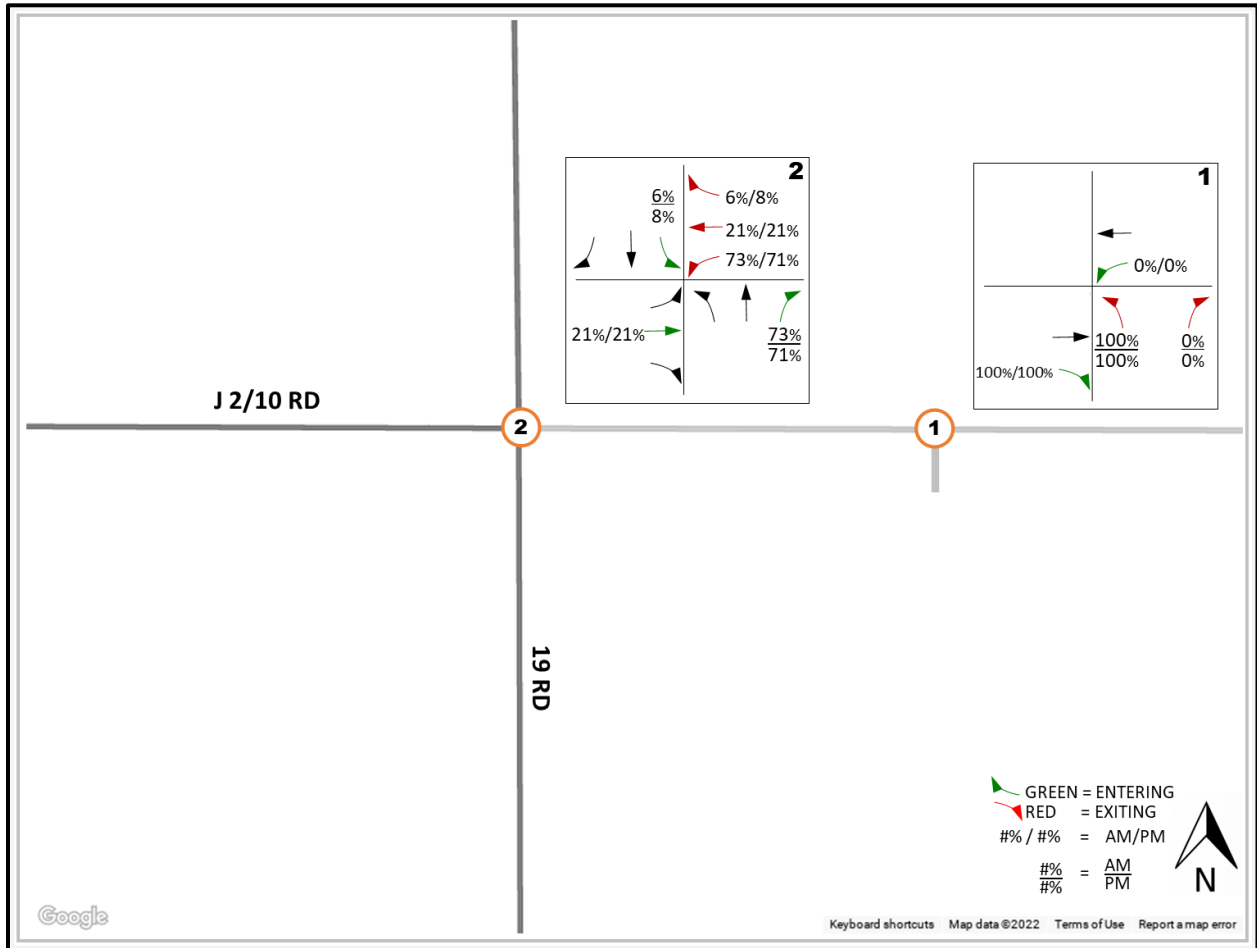
The overall site distribution and its components from the given intersections listed above will be determined as described in the following bulleted list.

- Intersection Distribution
 - To/From the North (N%) is determined from
 - Eastbound to Northbound (Int A)
 - Southbound to Westbound (Int A)
 - To/From the South (S%) is determined from
 - Eastbound to Southbound (Int A)
 - Northbound to Westbound (Int A)

- To/From the East (E%) is determined from
 - Southbound to Eastbound (Int B)
 - Westbound to Northbound (Int B)
- To/From the West (W%) is determined from
 - Southbound to Westbound (Int B)
 - Eastbound to Northbound (Int B)

The detailed Project trip distribution is shown in Figure 3.

Figure 3 – Project Trip Distribution

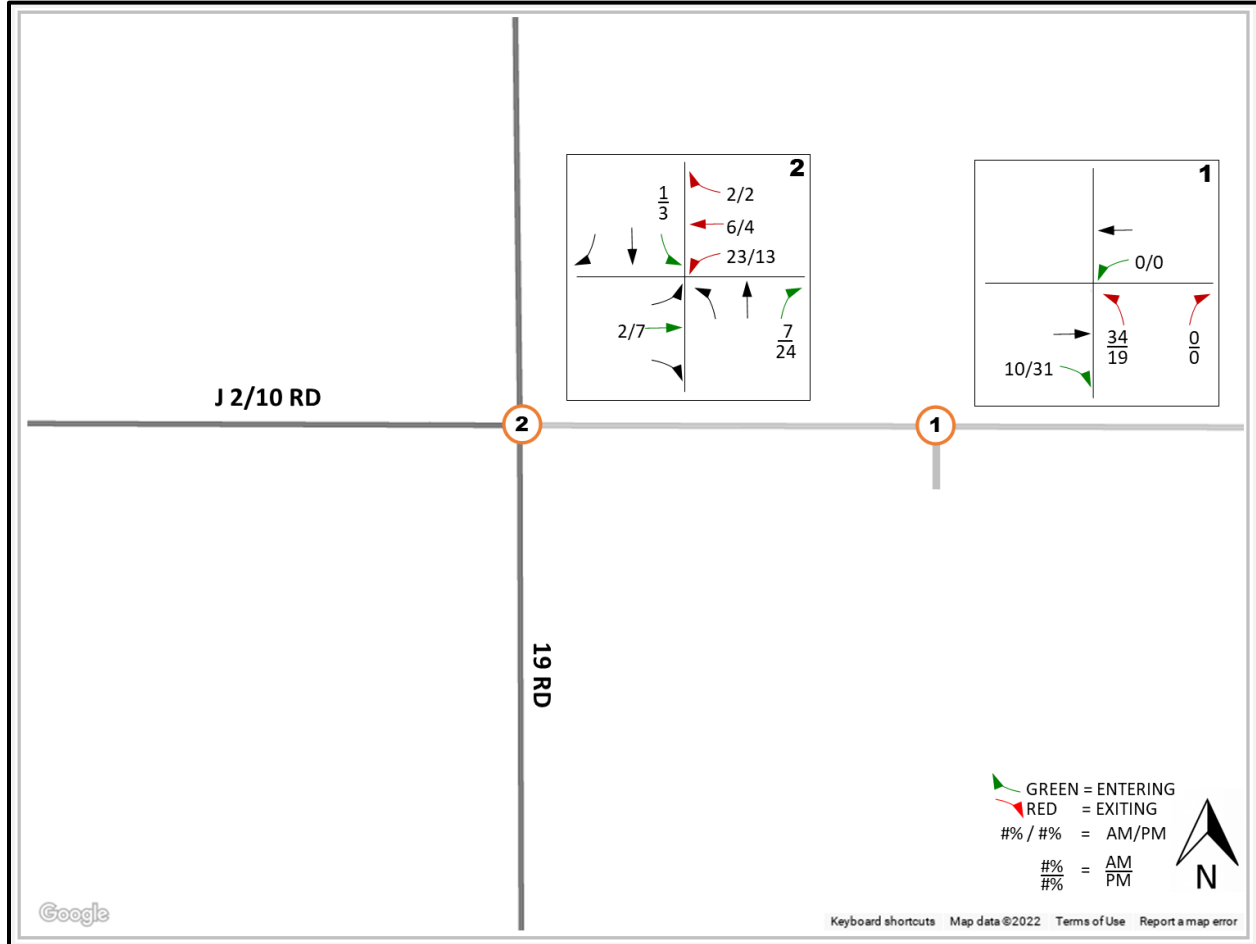


4.2 Assignment of Project Traffic

Project traffic determined from the trip generation calculation is assigned to the existing traffic network using the distributions from Figure 3.

The trip assignment is determined by applying the trip distributions presented in Figure 3 to the peak hour traffic volumes in Table 1. The resulting Project trip assignment is shown in Figure 4.

Figure 4 – Project Peak Hour Trip Assignment (VPH)

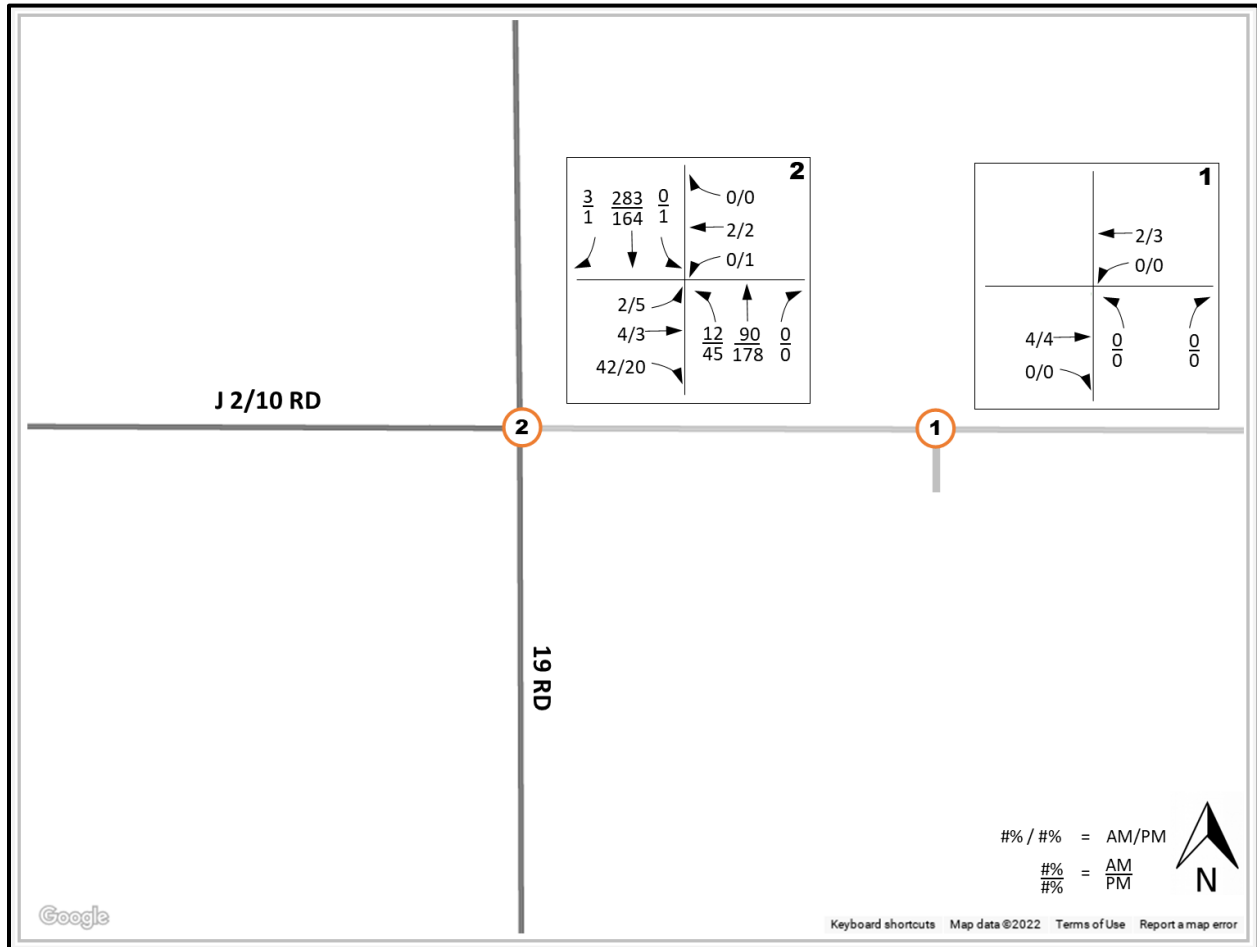


5. Existing & Future Traffic Volumes

Peak hour volumes were developed using counts conducted on December 7, 2022 at the study intersection. A peak seasonal adjustment is not used as the roadways do not provide direct access to seasonal activities.

The existing peak hour traffic is represented in Figure 5. Count summaries are included in Appendix B.

Figure 5 – Existing Peak Hour Traffic
 (From Counts on December 7, 2022)



6. Study Years Traffic Volumes

The Project would start construction in 2023 and is expected to be completed by 2025. The Assessment periods will be:

- Assessment Period 1 – 2025
- Assessment Period 2 - 2045

The Grand Valley Metropolitan Planning Organization (GVMPO) provided traffic volumes from the Regional Travel Demand Model (RTDM), base 2019 model + future 2045, and is the basis for the following road segment growth factors:

Table 2 – RTDM Road Segment Growth Factors

Road	Segment	ADT		Period Growth Factor	Avg. Annual Growth Rate	3 - year growth factor (2022-2025)	23 - year growth factor (2022-2045)
		2019	2045				
19 Rd	Both Sides	4,796	2,571	0.536	-2.37	0.931	0.576

These growth factors show a negative growth rate to 19 Road which accounts for the completion of the Fremont Street project. In order to provide a conservative estimate, an annual growth rate of 1.9% will be applied to 19 Road which was provided by Mesa County as the current growth without the completion of the Fremont Street project. The following table shows the growth rates used in the study as directed by Mesa County.

Table 3 – Mesa County Road Segment Growth Factors

Road	Segment	Avg. Annual Growth Rate	3 - year growth factor (2022-2025)	23 - year growth factor (2022-2045)
19 Rd	Through Volumes, Both Sides	1.90	1.058	1.542

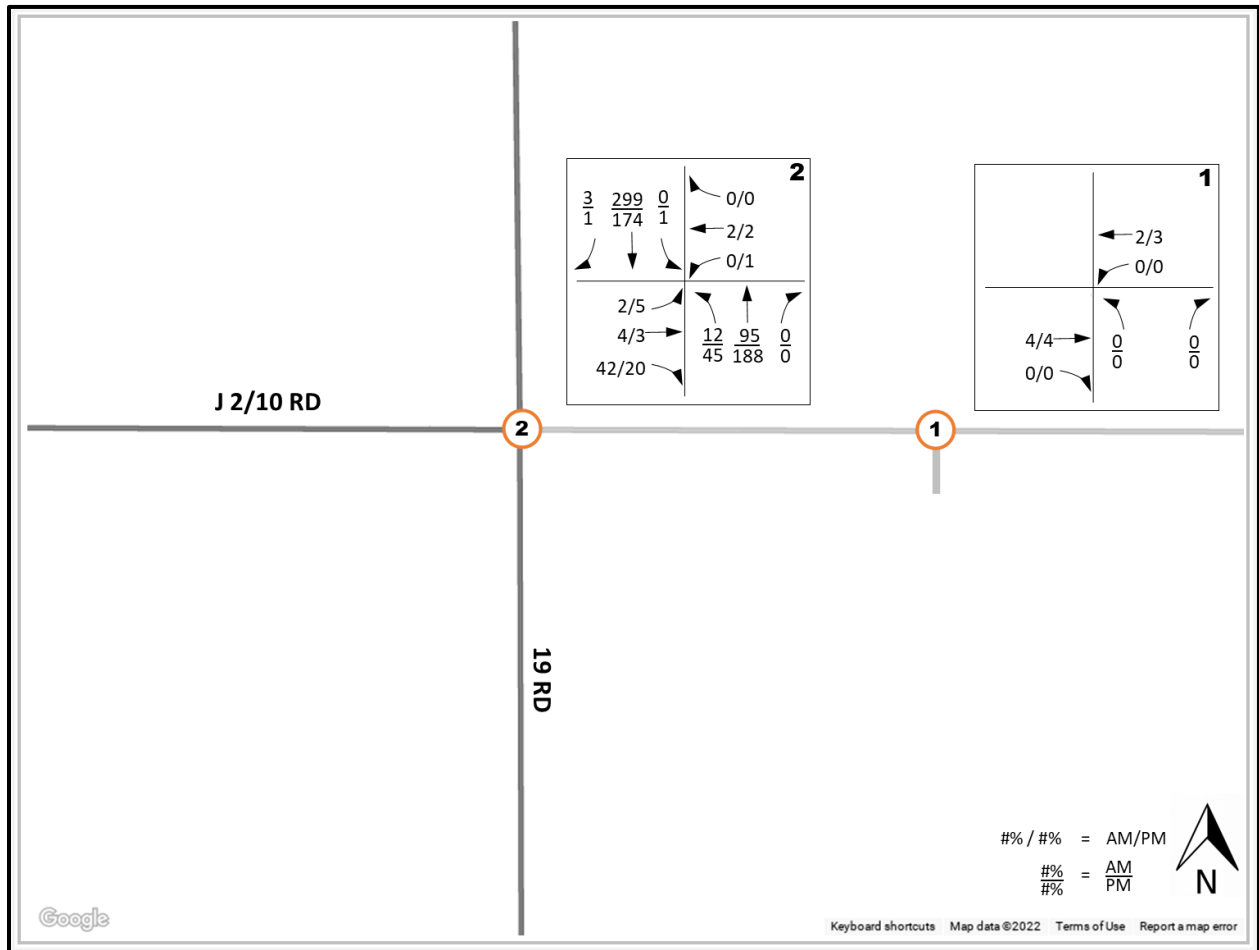
7. Study Period Volumes

Figures 6 and 8 demonstrate the future background traffic volumes by adjusting the traffic in Figure 5 with the growth factors from Table 2. Figures 7 and 9 show total peak hour traffic which consist of future background traffic with Project traffic.

Figure 6 and 8 show the predicted traffic volumes for year 2025.



Figure 6 – Background Peak Hour Future Traffic (Year 2025)



Total peak hour future traffic includes future background traffic plus traffic shown in Figure 4 – Project Peak Hour Trip Assignment (VPH).

Figure 7 –Total Peak Hour Future Traffic (Year 2025)

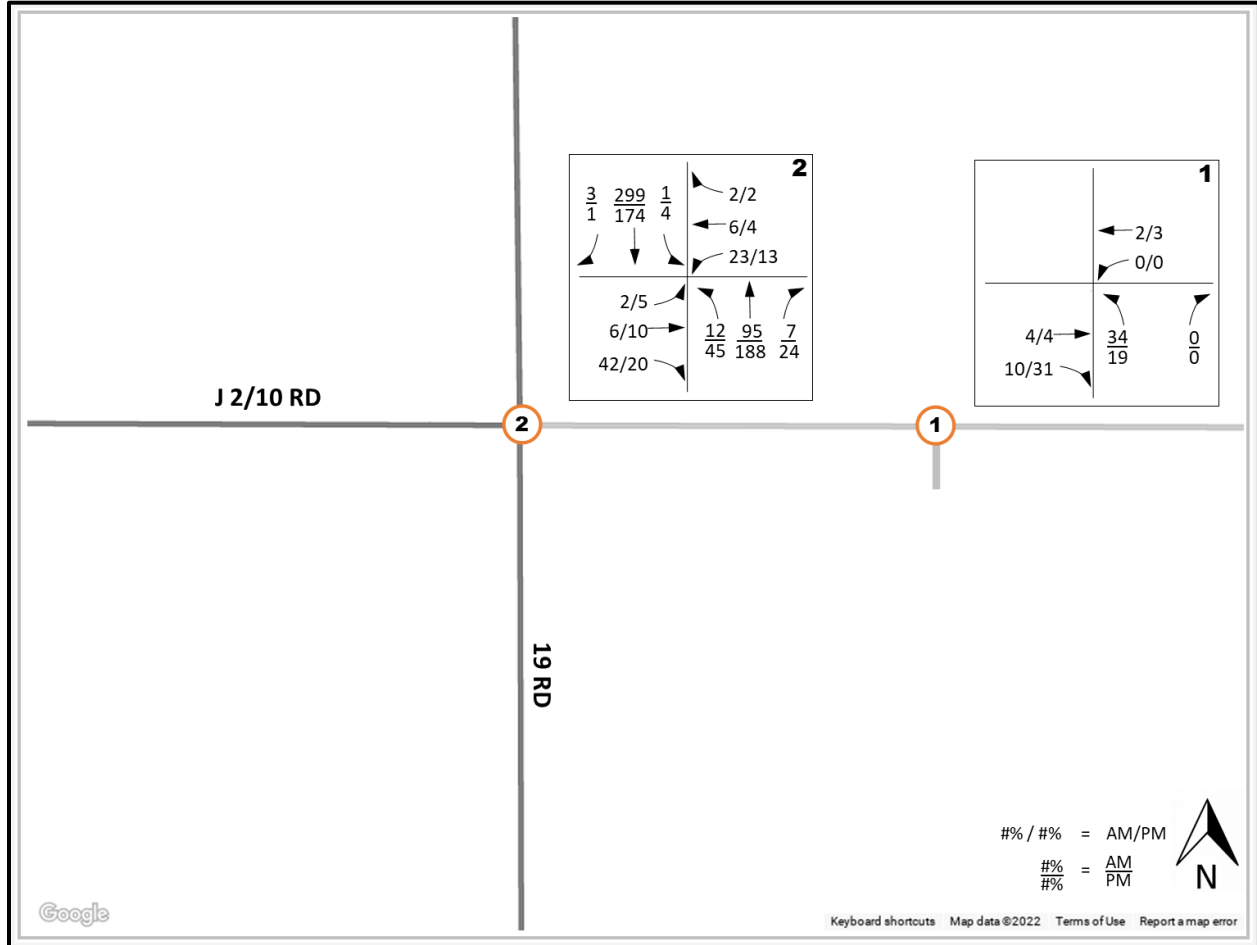


Figure 8 and 9 show the predicted traffic volumes for year 2045. Figure 8 includes the existing traffic with growth rates found in Table 2 applied similarly to the 2025 condition.

Figure 8 – Background Peak Hour Future Traffic (Year 2045)

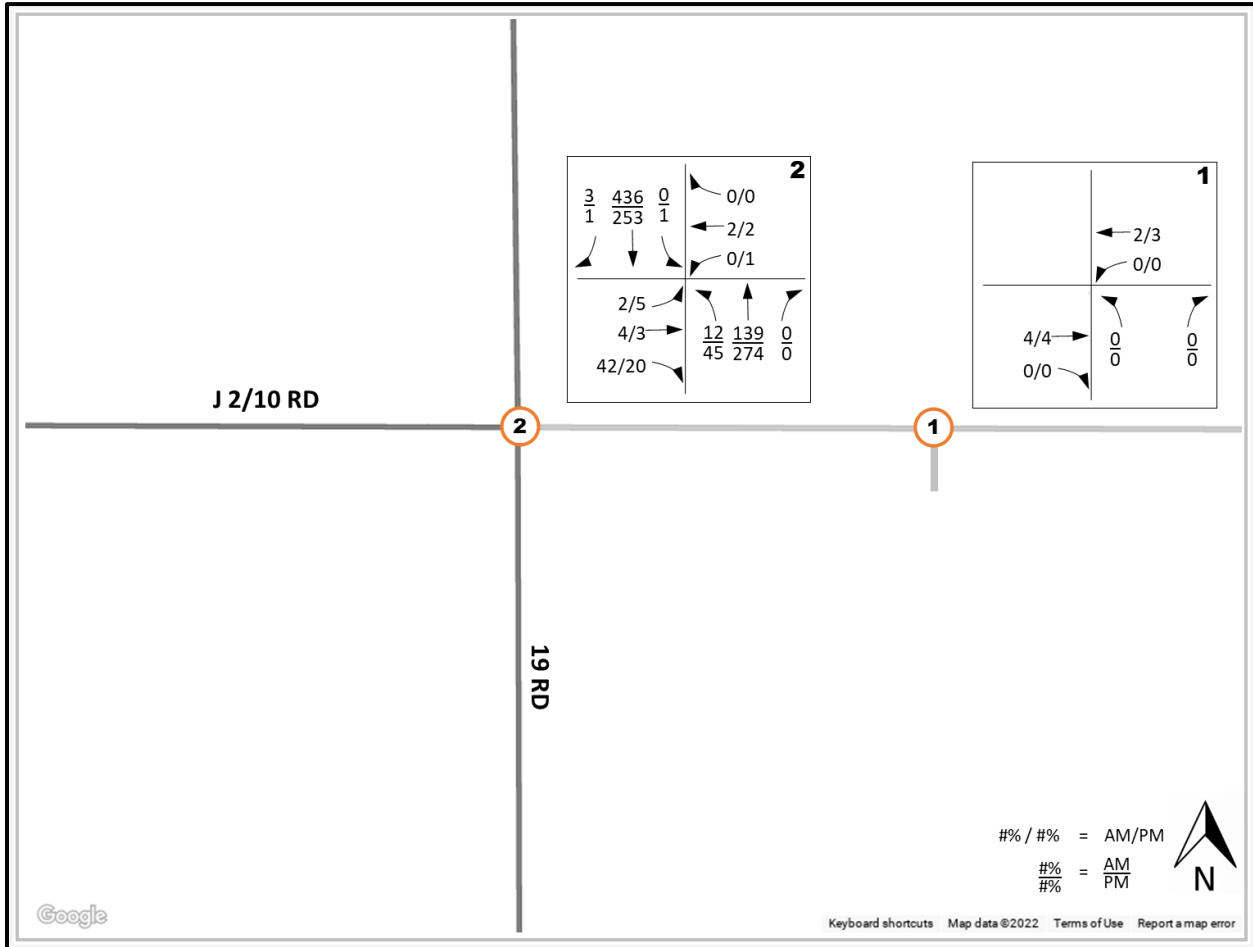
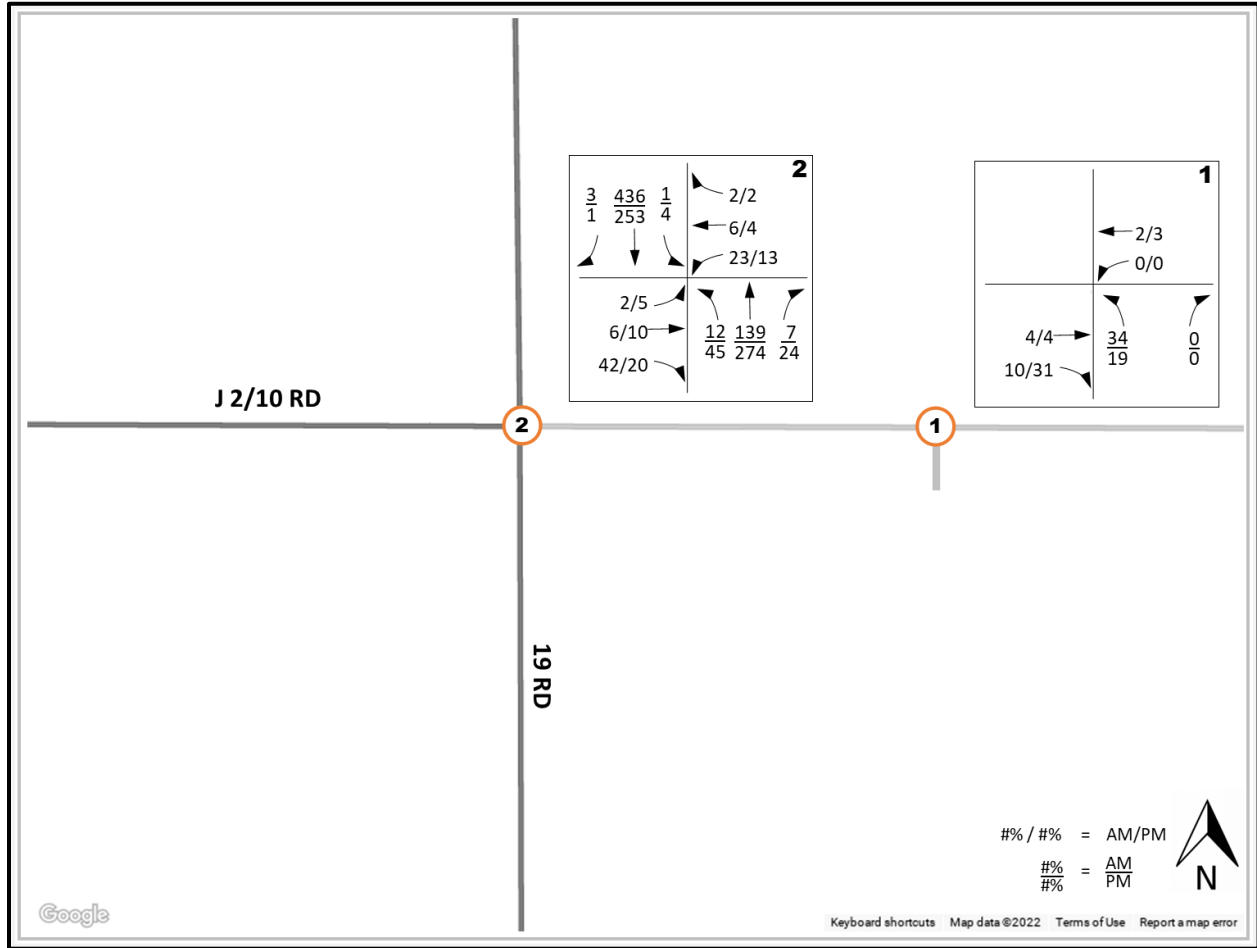


Figure 9 is calculated in a similar manner to Figure 7 –Total Peak Hour Future Traffic (Year 2025). The 2045 condition uses the 23 year growth rates to account for growth which is applied to the existing traffic counts. Figure 9 represents the adjusted traffic counts shown in Figure 8 with the addition of traffic shown in Figure 4 – Project Peak Hour Trip Assignment (VPH).

Figure 9 – Total Peak Hour Future Traffic (Year 2045)



8. Auxiliary Turn Lane Evaluation

The need for auxiliary lanes was evaluated based on the turn lane warrants listed in the 2020 Mesa County Design Standards and the Transportation Engineering Design Standards (TEDS).

8.1 Mesa County Design Standards (MCDS)

The following table shows the data and criteria necessary to identify the need for exclusive right-turn and left-turn deceleration lanes at the intersections in the Assessment area based on the MCDS.

Table 4 – Auxiliary Lane Requirements per MCDS

Intersection	Year	Deceleration Movement	Speed Limit	Highest Period	Turning (vph)	DHV of Roadway	Threshold Turning Volumes	Threshold DHV Volumes	Ingress ADT	Auxiliary Lane Req'd
2 J 2/10 Road & 19 Road	2025 Total	NB Right	45	PM	24	362	20	200	35	YES
		NB Left		PM	45	362	15	200	53	YES
		SB Right		AM	3	394	20 ¹	200 ¹	53	NO ¹
		SB Left		PM	4	362	15 ²	200 ²	35	NO ²
	2045 Total	NB Right	45	PM	24	527	20	200	35	YES
		NB Left		PM	45	527	15	200	53	YES
		SB Right		AM	3	575	20 ¹	200 ¹	53	NO ¹
		SB Left		PM	4	527	15 ²	200 ²	35	NO ²

Notes:

1. Right turn lanes generally not required with through volumes less than 200 vph and left turns less than 20 vph.
2. Left turn lanes generally not required with through volumes less than 200 vph and right turns less than 15 vph.

Based on the MCDS, both the northbound right and left deceleration lanes are warranted. However, the northbound to westbound left turn lane is warranted regardless of the Project.

8.2 Transportation Engineering Design Standards (TEDS)

The following table shows the data and criteria necessary to identify the need for exclusive right-turn and left-turn deceleration lanes at the intersections in the Assessment area based on the TEDS manual.

Table 5 – Auxiliary Lane Requirements per TEDS

Intersection	Year	Deceleration Movement	Speed Limit	Highest Period	Turning (vph)	Directional DHV of Roadway	Threshold Turning Volumes	Threshold DHV Volumes	Auxiliary Lane Req'd
2 J 2/10 Road & 19 Road	2025 Total	NB Right	45	PM	24	188	120 ¹	300 ¹	NO ¹
		NB Left		PM	45	188	17	188	YES
		SB Right		AM	3	299	120 ¹	300 ¹	NO ¹
		SB Left		PM	4	174	19	174	NO
	2045 Total	NB Right	45	PM	24	274	120 ¹	200 ¹	NO ¹
		NB Left		PM	45	274	13	274	YES
		SB Right		AM	3	436	45	436	NO
		SB Left		PM	4	253	14	253	NO

Notes:

1. Right turn lanes generally not required with through volumes less than 300 vph and right turns less than 120 vph.

Based on the TEDS manual, only a northbound to westbound left turn deceleration lane is warranted. Note that this turn lane is warranted regardless of the Project and the Project does not add traffic to that movement.

9. Level of Service & Capacity

The Study includes level of service analysis to evaluate the quality of J 2/10 Road & 19 Road without the addition of auxiliary lanes. The traffic analysis was conducted using the methodologies outlined in the Transportation Research Board’s Highway Capacity Manual, 2020 Edition. Synchro® 10 Planning & Analysis Software was used to determine traffic operation.

The results of the intersection operational analysis were used to assess the LOS experienced by drivers as the duration of delay a driver experiences at a given intersection. LOS A represents the most desirable conditions with free-flow movement of traffic and minimal delay to motorists. LOS F generally indicates severely congested conditions with excessive delays to motorists. Intermediate grades of B, C, D, and E reflect incremental increases in congestion.

The duration of delay is measured differently for signalized intersections as compared to unsignalized intersections. The LOS delay range for an unsignalized intersection is typically shorter than at a signalized intersection primarily because at a stop sign, the traveling public has an expectation to experience less delay than at a signal. In addition, studies have shown that at unsignalized intersections drivers tend to become impatient with long delays and may use inadequate and unsafe gaps in the traffic stream to make left turns or enter the major street. The following table provides the delay thresholds for signalized and unsignalized intersections.

Table 6 – Intersection Delay & LOS Thresholds

Level of Service (LOS)	Signalized Intersections (seconds/vehicle)	Unsignalized Intersection (seconds/vehicle)
A	0.0 – 10.0	0.0 – 10.0
B	10.1 – 20.0	10.1 – 15.0
C	20.1 – 35.0	15.1 – 25.0
D	35.1 – 55.0	25.1 – 35.0
E	55.1 – 80.0	35.1 – 50.0
F	Greater than 80.0	Greater than 50.0

Source: Transportation Research Board, Highway Capacity Manual, 2020 Edition

Traffic Operations Analysis Results

Peak hour LOS was computed within the Study area using Synchro’s Highway Capacity Manual 2016 Methodology Module. Results are reported in Table 7 and calculations are included in Appendix C.

Table 7 – Intersection Operations Summary

Intersection E-W N-S		Period	Traffic Control	New Lane Geometry	2025		2045	
					Background	Total	Background	Total
2	J 2/10 Rd 19 Rd	AM	<u>Unsignalized</u>	Intersection LOS	A (1.4)	A (2.1)	A (1.1)	A (1.8)
	Eastbound		Stop	1 left-thru-right	B	B	B	B
	Westbound		Stop	1 left-thru-right	B	B	B	C
	Northbound		Free	1 left-thru-right	A	A	A	A
	Southbound		Free	1 left-thru-right	A	A	A	A
	Highest Control Delay LOS & Delay (sec/veh)					B (12.3)	B (13.2)	B (14.5)
2	J 2/10 Rd 19 Rd	PM	<u>Unsignalized</u>	Intersection LOS	A (1.6)	A (2.1)	A (1.2)	A (1.7)
	Eastbound		Stop	1 left-thru-right	B	B	B	B
	Westbound		Stop	1 left-thru-right	B	B	C	C
	Northbound		Free	1 left-thru-right	A	A	A	A
	Southbound		Free	1 left-thru-right	A	A	A	A
	Highest Control Delay LOS & Delay (sec/veh)					B (13.0)	B (13.3)	C (15.4)

Table 7 shows that the intersection will operate at acceptable conditions with the addition of Project traffic for the 2045 condition without any auxiliary lanes. The Project traffic does not significantly impact the LOS. A northbound to eastbound right turn deceleration lane is not recommended at this intersection.

The volumes of traffic at each intersection are well under the capacity at the 2045 condition. The results of the volume to capacity ratio can be found in Appendix C.

10. Intersection Sight Distance

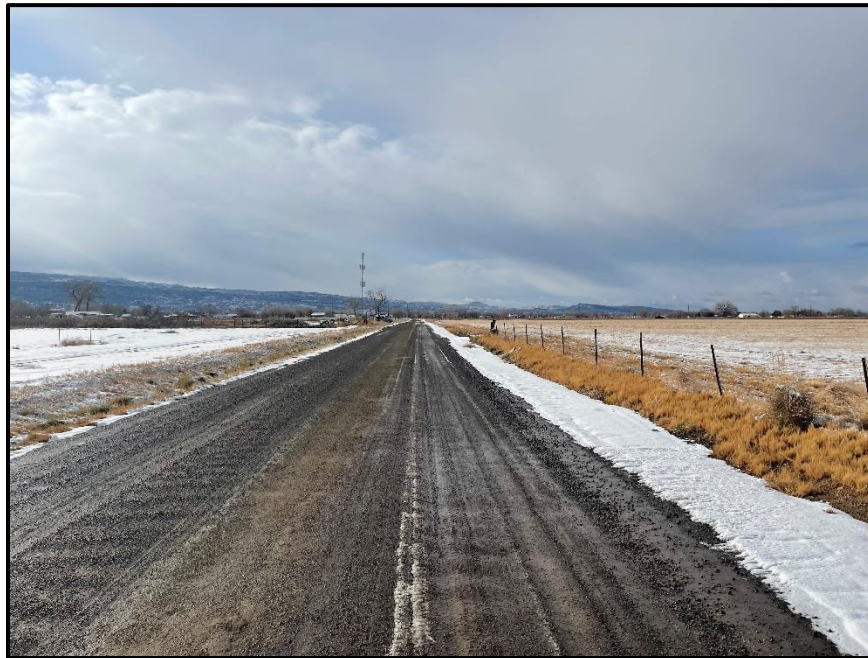
The Project access will be located on a proposed improvement of J 2/10 Road. Required stopping sight distance for vehicles along the roadway was obtained from Exhibit 6.1 in the Mesa County Design Standards. Stopping sight distance is based on design speed which is 10 mph greater than the posted speed limit. The posted speed limit is 35 mph.

J 2/10 Road has a grade of less than three percent to the east and west of the proposed Project access. The required stopping sight distance is 360 feet which is exceeded in both directions. Refer to Images 1 and 2.

Image 1 – Looking East from 360’ West of the Project Access



Image 2 – Looking West from 360’ East of the Project Access



Required intersection sight distance for left turns from a stop was obtained from Exhibit 6.12 in the Mesa County Design Standards. Intersection sight distance is also based on design speed which is 45 mph for this location. The required intersection sight distance is 500 feet which is exceeded in both directions. Refer to Images 3 and 4.

Image 3 – Looking East from the Project Access



Image 4 – Looking West from the Project Access

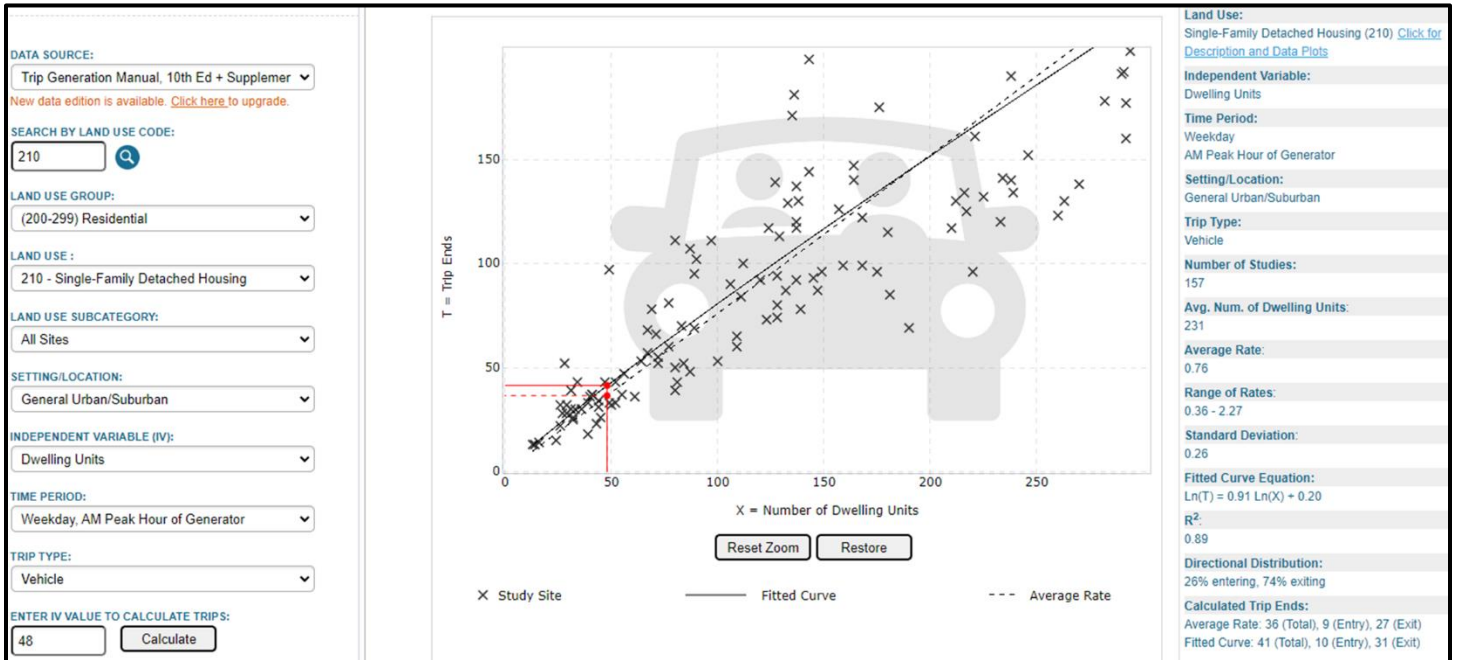


11. Summary and Recommendations

- The proposed Project will increase the traffic volumes of the roadway network by 41 AM trips, 53 PM trips, and 529 ADT.
- A northbound to westbound deceleration lane is warranted by both County and TEDS warrant thresholds however, the Project does not contribute any traffic to this movement.
- A northbound to eastbound deceleration lane is warranted per MCDS but not per TEDS. The LOS of the intersection is adequate, and APEX is not recommending construction of an auxiliary lane for this movement.
- All sight distance requirements are met.
- The Project will have minimal impact on the surrounding roadway network.
- The Project will improve J 2/10 Road east of 18 Road.

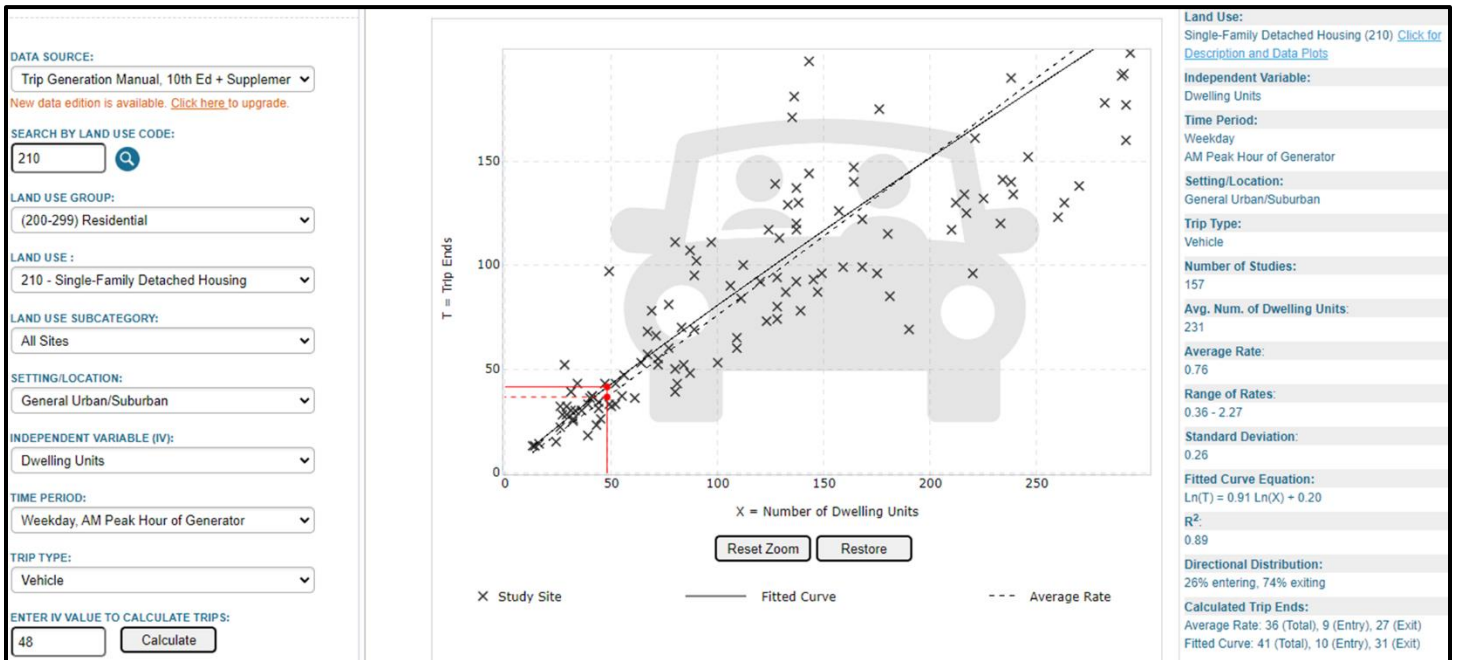


Appendix A – Trip Generation

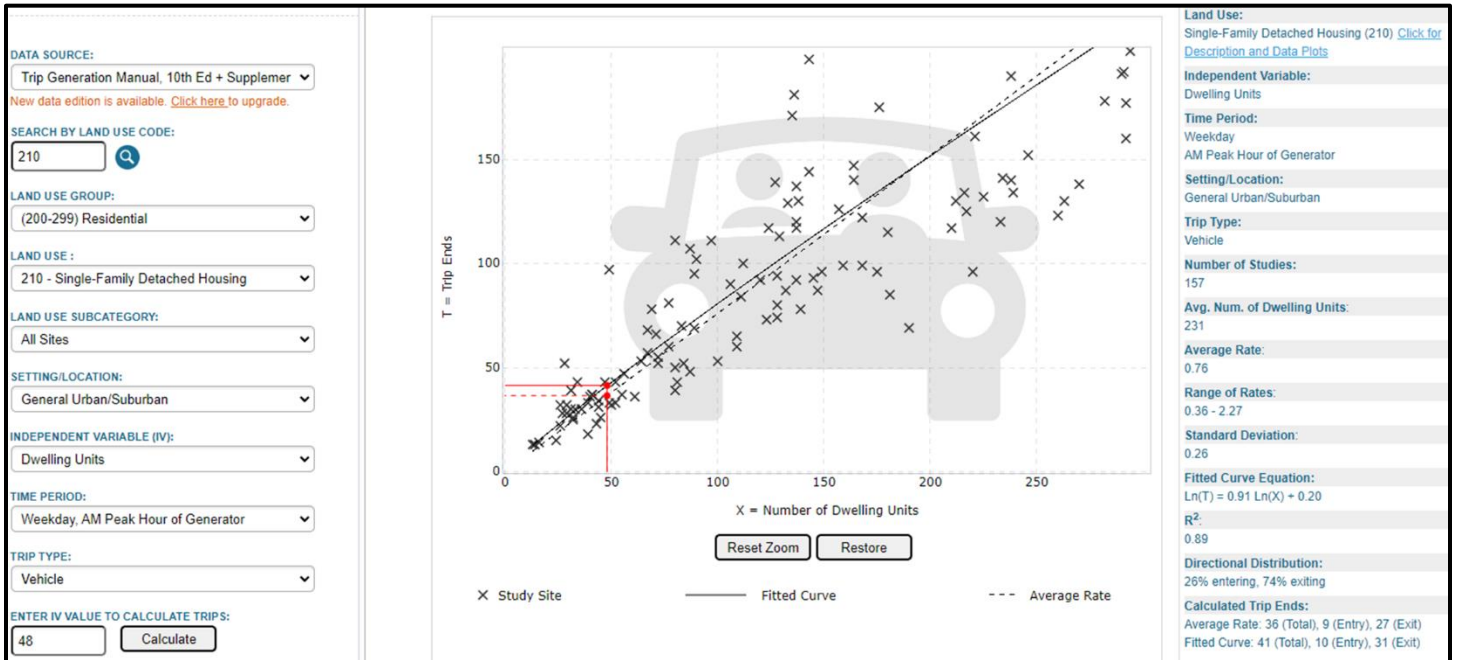


AM Peak Hour – LUC 210, 48 Dwelling Units

PM Peak Hour – LUC 210, 48 Dwelling Units



Appendix A – Trip Generation



ADT Weekday – LUC 210, 48 Dwelling Units



Appendix B – Count Summaries

Intersection Turning Movement Count Summary

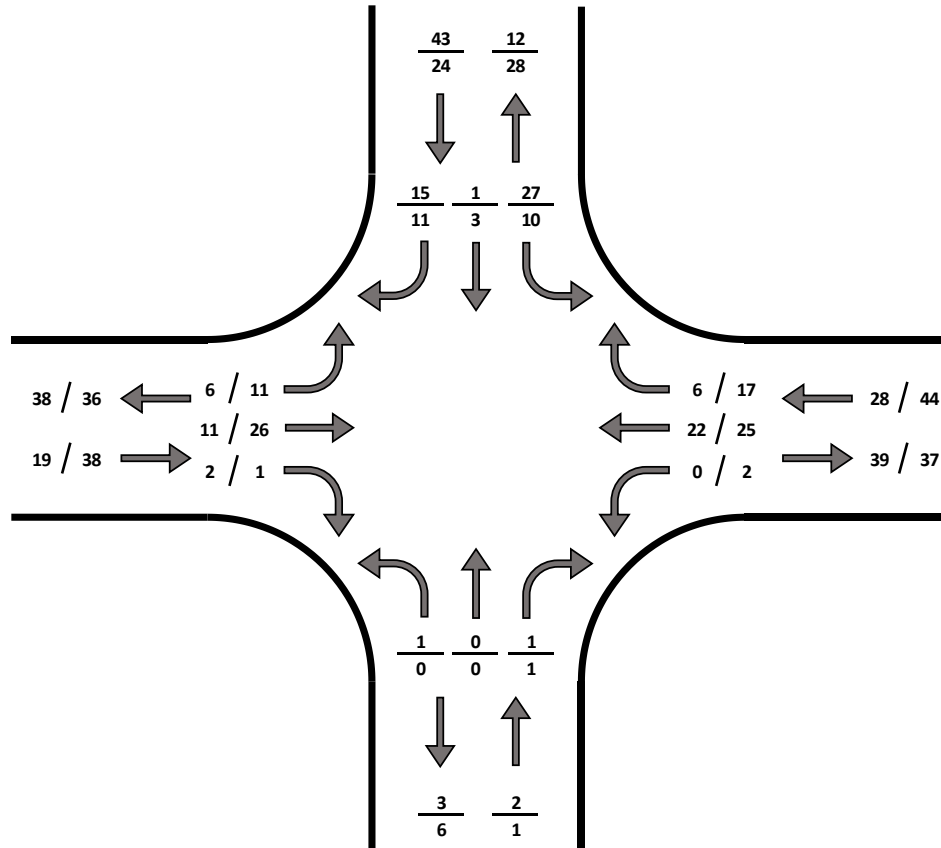
Project: Adele's Acres
 Location: Fruita, CO
 EB/WB Road: J 2/10 Rd.
 NB/SB Road: Park St.



Counted By: SW
 Count Date: 12/7/2022

Intersection 1 - J 2/10 Rd. & Park St.

		J 2/10 Rd. - (EB)			J 2/10 Rd. - (WB)			Park St. - (NB)			Park St. - (SB)			Sums
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM	7:00	0	0	0	0	4	0	0	0	0	6	0	1	11
	7:15	0	2	0	0	1	3	0	0	1	8	0	4	19
	7:30	3	4	0	0	13	0	0	0	0	8	0	8	36
	7:45	3	5	2	0	4	3	1	0	0	5	1	2	26
	8:00	1	1	0	1	1	1	0	0	0	4	0	2	11
	8:15	0	1	0	0	3	1	0	0	1	6	0	3	15
	8:30	2	4	0	0	3	2	0	2	0	5	0	2	20
	8:45	4	6	0	0	3	1	0	1	0	3	2	1	21
	Peak	6	11	2	0	22	6	1	0	1	27	1	15	92
Sums	19			28			2			43				
PM	16:00	5	5	0	0	7	3	0	0	0	6	3	2	31
	16:15	3	6	0	0	6	2	0	0	0	1	0	3	21
	16:30	2	8	1	0	7	7	0	0	1	1	0	2	29
	16:45	1	7	0	2	5	5	0	0	0	2	0	4	26
	17:00	2	5	0	1	1	4	1	0	1	5	0	2	22
	17:15	5	5	0	0	5	11	0	0	1	0	0	2	29
	17:30	3	2	0	1	5	6	0	0	0	3	0	0	20
	17:45	2	3	0	0	3	8	0	0	0	3	0	2	21
	Peak	11	26	1	2	25	17	0	0	1	10	3	11	107
	Sums	38			44			1			24			



Appendix B – Count Summaries

Intersection Turning Movement Count Summary

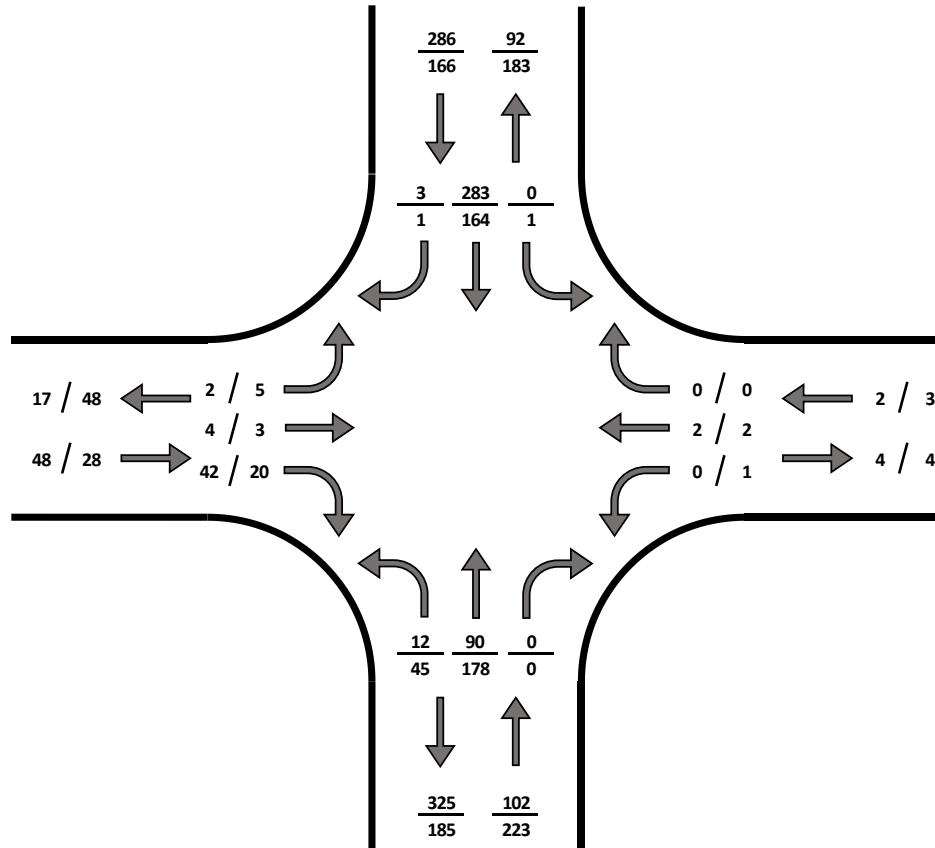
Project: Adele's Acres
 Location: Fruita, CO
 EB/WB Road: J 2/10 Rd.
 NB/SB Road: 19 Rd.



Counted By: SW
 Count Date: 12/7/2022

Intersection 2 - J 2/10 Rd. & 19 Rd.

		J 2/10 Rd. - (EB)			J 2/10 Rd. - (WB)			19 Rd. - (NB)			19 Rd. - (SB)			Sums
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	
AM	7:00	0	0	10	0	1	0	3	8	0	0	41	0	63
	7:15	0	0	11	0	0	0	4	20	0	0	68	0	103
	7:30	0	3	15	0	0	0	4	23	0	0	119	2	166
	7:45	2	1	6	0	1	0	1	39	0	0	55	1	106
	8:00	0	0	5	0	0	0	2	12	0	0	41	0	60
	8:15	1	0	12	0	1	0	2	20	0	1	34	0	71
	8:30	2	1	11	0	0	1	2	25	0	0	57	1	100
	8:45	0	1	9	0	0	0	2	18	0	2	59	0	91
	Peak	2	4	42	0	2	0	12	90	0	0	283	3	438
	Sums	48			2			102			286			
PM	16:00	2	1	5	0	2	0	8	36	0	1	52	0	107
	16:15	2	0	6	0	0	0	15	40	0	0	48	1	112
	16:30	1	1	3	0	0	0	10	54	0	0	34	0	103
	16:45	0	1	6	1	0	0	12	48	0	0	30	0	98
	17:00	1	0	9	0	0	0	9	43	0	0	23	2	87
	17:15	0	0	3	0	0	0	13	59	0	0	30	0	105
	17:30	3	0	8	0	1	1	11	66	0	0	23	1	114
	17:45	0	0	4	0	1	0	12	37	0	0	27	0	81
	Peak	5	3	20	1	2	0	45	178	0	1	164	1	420
	Sums	28			3			223			166			



Appendix C - LOS Calculations

2: 19 Rd & J 2/10 Rd
 HCM 6th TWSC

Year 2025 Background Condition
 Timing Plan: AM Peak

Intersection												
Int Delay, s/veh	1.4											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	4	42	0	2	0	12	95	0	0	299	3
Future Vol, veh/h	2	4	42	0	2	0	12	95	0	0	299	3
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	4	46	0	2	0	13	103	0	0	325	3

Major/Minor	Minor2	Minor1		Major1		Major2						
Conflicting Flow All	457	456	327	481	457	103	328	0	0	103	0	0
Stage 1	327	327	-	129	129	-	-	-	-	-	-	-
Stage 2	130	129	-	352	328	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	514	501	714	495	500	952	1232	-	-	1489	-	-
Stage 1	686	648	-	875	789	-	-	-	-	-	-	-
Stage 2	874	789	-	665	647	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	508	495	714	456	495	952	1232	-	-	1489	-	-
Mov Cap-2 Maneuver	508	495	-	456	495	-	-	-	-	-	-	-
Stage 1	678	648	-	865	780	-	-	-	-	-	-	-
Stage 2	862	780	-	618	647	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.8	12.3	0.9	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1232	-	-	678	495	1489	-	-
HCM Lane V/C Ratio	0.011	-	-	0.077	0.004	-	-	-
HCM Control Delay (s)	8	0	-	10.8	12.3	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0	0	-	-

Appendix C - LOS Calculations

2: 19 Rd & J 2/10 Rd
 HCM 6th TWSC

Year 2025 Background Condition
 Timing Plan: PM Peak

Intersection

Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	3	20	1	2	0	45	188	0	1	174	1
Future Vol, veh/h	5	3	20	1	2	0	45	188	0	1	174	1
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	3	22	1	2	0	49	204	0	1	189	1

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	495	494	190	506	494	204	190	0	0	204	0	0
Stage 1	192	192	-	302	302	-	-	-	-	-	-	-
Stage 2	303	302	-	204	192	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	485	476	852	477	476	837	1384	-	-	1368	-	-
Stage 1	810	742	-	707	664	-	-	-	-	-	-	-
Stage 2	706	664	-	798	742	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	468	456	852	448	456	837	1384	-	-	1368	-	-
Mov Cap-2 Maneuver	468	456	-	448	456	-	-	-	-	-	-	-
Stage 1	778	741	-	679	637	-	-	-	-	-	-	-
Stage 2	675	637	-	773	741	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.5	13	1.5	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1384	-	-	687	453	1368	-	-
HCM Lane V/C Ratio	0.035	-	-	0.044	0.007	0.001	-	-
HCM Control Delay (s)	7.7	0	-	10.5	13	7.6	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	0	0	-	-

Appendix C - LOS Calculations

2: 19 Rd & J 2/10 Rd
 HCM 6th TWSC

Year 2045 Total Condition
 Timing Plan: AM Peak

Intersection

Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	6	42	23	6	2	12	95	7	1	299	3
Future Vol, veh/h	2	6	42	23	6	2	12	95	7	1	299	3
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	7	46	25	7	2	13	103	8	1	325	3

Major/Minor	Minor2	Minor1		Major1		Major2						
Conflicting Flow All	467	466	327	488	463	107	328	0	0	111	0	0
Stage 1	329	329	-	133	133	-	-	-	-	-	-	-
Stage 2	138	137	-	355	330	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	506	494	714	490	496	947	1232	-	-	1479	-	-
Stage 1	684	646	-	870	786	-	-	-	-	-	-	-
Stage 2	865	783	-	662	646	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	495	488	714	450	490	947	1232	-	-	1479	-	-
Mov Cap-2 Maneuver	495	488	-	450	490	-	-	-	-	-	-	-
Stage 1	676	645	-	860	777	-	-	-	-	-	-	-
Stage 2	846	774	-	613	645	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	10.9	13.2	0.8	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1232	-	-	665	474	1479	-	-
HCM Lane V/C Ratio	0.011	-	-	0.082	0.071	0.001	-	-
HCM Control Delay (s)	8	0	-	10.9	13.2	7.4	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.2	0	-	-

Appendix C - LOS Calculations

2: 19 Rd & J 2/10 Rd
 HCM 6th TWSC

Year 2025 Total Condition
 Timing Plan: PM Peak

Intersection

Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	10	20	13	4	2	45	188	24	4	174	1
Future Vol, veh/h	5	10	20	13	4	2	45	188	24	4	174	1
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	22	14	4	2	49	204	26	4	189	1

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	516	526	190	529	513	217	190	0	0	230	0	0
Stage 1	198	198	-	315	315	-	-	-	-	-	-	-
Stage 2	318	328	-	214	198	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	470	457	852	460	465	823	1384	-	-	1338	-	-
Stage 1	804	737	-	696	656	-	-	-	-	-	-	-
Stage 2	693	647	-	788	737	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	450	437	852	425	445	823	1384	-	-	1338	-	-
Mov Cap-2 Maneuver	450	437	-	425	445	-	-	-	-	-	-	-
Stage 1	771	735	-	667	629	-	-	-	-	-	-	-
Stage 2	658	620	-	754	735	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	11.3		13.3		1.3		0.2	
HCM LOS	B		B					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1384	-	-	609	452	1338	-	-
HCM Lane V/C Ratio	0.035	-	-	0.062	0.046	0.003	-	-
HCM Control Delay (s)	7.7	0	-	11.3	13.3	7.7	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.1	0	-	-

Appendix C - LOS Calculations

2: 19 Rd & J 2/10 Rd
 HCM 6th TWSC

Year 2045 Background Condition
 Timing Plan: AM Peak

Intersection

Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	4	42	0	2	0	12	139	0	0	436	3
Future Vol, veh/h	2	4	42	0	2	0	12	139	0	0	436	3
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	4	46	0	2	0	13	151	0	0	474	3

Major/Minor	Minor2	Minor1		Major1		Major2						
Conflicting Flow All	654	653	476	678	654	151	477	0	0	151	0	0
Stage 1	476	476	-	177	177	-	-	-	-	-	-	-
Stage 2	178	177	-	501	477	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	380	387	589	366	386	895	1085	-	-	1430	-	-
Stage 1	570	557	-	825	753	-	-	-	-	-	-	-
Stage 2	824	753	-	552	556	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	375	382	589	331	381	895	1085	-	-	1430	-	-
Mov Cap-2 Maneuver	375	382	-	331	381	-	-	-	-	-	-	-
Stage 1	563	557	-	814	743	-	-	-	-	-	-	-
Stage 2	811	743	-	505	556	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.2	14.5	0.7	0
HCM LOS	B	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1085	-	-	551	381	1430	-	-
HCM Lane V/C Ratio	0.012	-	-	0.095	0.006	-	-	-
HCM Control Delay (s)	8.4	0	-	12.2	14.5	0	-	-
HCM Lane LOS	A	A	-	B	B	A	-	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0	0	-	-

Appendix C - LOS Calculations

2: 19 Rd & J 2/10 Rd
 HCM 6th TWSC

Year 2045 Background Condition
 Timing Plan: PM Peak

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	3	20	1	2	0	45	274	0	1	253	1
Future Vol, veh/h	5	3	20	1	2	0	45	274	0	1	253	1
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	3	22	1	2	0	49	298	0	1	275	1

Major/Minor	Minor2	Minor1		Major1		Major2						
Conflicting Flow All	675	674	276	686	674	298	276	0	0	298	0	0
Stage 1	278	278	-	396	396	-	-	-	-	-	-	-
Stage 2	397	396	-	290	278	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	368	376	763	362	376	741	1287	-	-	1263	-	-
Stage 1	728	680	-	629	604	-	-	-	-	-	-	-
Stage 2	629	604	-	718	680	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	353	358	763	337	358	741	1287	-	-	1263	-	-
Mov Cap-2 Maneuver	353	358	-	337	358	-	-	-	-	-	-	-
Stage 1	695	679	-	600	576	-	-	-	-	-	-	-
Stage 2	598	576	-	693	679	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	11.6	15.4	1.1	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1287	-	-	574	351	1263	-	-
HCM Lane V/C Ratio	0.038	-	-	0.053	0.009	0.001	-	-
HCM Control Delay (s)	7.9	0	-	11.6	15.4	7.9	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0	0	-	-

Appendix C - LOS Calculations

2: 19 Rd & J 2/10 Rd
 HCM 6th TWSC

Year 2045 Total Condition
 Timing Plan: AM Peak

Intersection												
Int Delay, s/veh	1.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	2	6	42	23	6	2	12	139	7	1	436	3
Future Vol, veh/h	2	6	42	23	6	2	12	139	7	1	436	3
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	2	7	46	25	7	2	13	151	8	1	474	3

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	664	663	476	685	660	155	477	0	0	159	0	0
Stage 1	478	478	-	181	181	-	-	-	-	-	-	-
Stage 2	186	185	-	504	479	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	374	382	589	362	383	891	1085	-	-	1420	-	-
Stage 1	568	556	-	821	750	-	-	-	-	-	-	-
Stage 2	816	747	-	550	555	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	364	377	589	326	378	891	1085	-	-	1420	-	-
Mov Cap-2 Maneuver	364	377	-	326	378	-	-	-	-	-	-	-
Stage 1	561	555	-	810	740	-	-	-	-	-	-	-
Stage 2	796	737	-	501	554	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.4	16.4	0.6	0
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1085	-	-	539	350	1420	-	-
HCM Lane V/C Ratio	0.012	-	-	0.101	0.096	0.001	-	-
HCM Control Delay (s)	8.4	0	-	12.4	16.4	7.5	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.3	0.3	0	-	-

Appendix C - LOS Calculations

2: 19 Rd & J 2/10 Rd
 HCM 6th TWSC

Year 2045 Total Condition
 Timing Plan: PM Peak

Intersection

Int Delay, s/veh	1.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	10	20	13	4	2	45	274	24	4	253	1
Future Vol, veh/h	5	10	20	13	4	2	45	274	24	4	253	1
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, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	11	22	14	4	2	49	298	26	4	275	1

Major/Minor	Minor2	Minor1		Major1		Major2						
Conflicting Flow All	696	706	276	709	693	311	276	0	0	324	0	0
Stage 1	284	284	-	409	409	-	-	-	-	-	-	-
Stage 2	412	422	-	300	284	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.12	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.218	-	-
Pot Cap-1 Maneuver	356	361	763	349	367	729	1287	-	-	1236	-	-
Stage 1	723	676	-	619	596	-	-	-	-	-	-	-
Stage 2	617	588	-	709	676	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	338	343	763	318	348	729	1287	-	-	1236	-	-
Mov Cap-2 Maneuver	338	343	-	318	348	-	-	-	-	-	-	-
Stage 1	689	673	-	590	568	-	-	-	-	-	-	-
Stage 2	582	560	-	675	673	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	12.8	16.1	1	0.1
HCM LOS	B	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1287	-	-	499	345	1236	-	-
HCM Lane V/C Ratio	0.038	-	-	0.076	0.06	0.004	-	-
HCM Control Delay (s)	7.9	0	-	12.8	16.1	7.9	0	-
HCM Lane LOS	A	A	-	B	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.2	0.2	0	-	-