



Riverfront Trails Residential Development Traffic Impact Study Update

Missoula, Montana

Prepared For:

**Woith Engineering, Inc.
3860 O'Leary Street, Suite A
Missoula, MT 59808**

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130 South Howie Street
Helena, Montana 59601
406-459-1443

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Riverfront Trails Residential Development Traffic Impact Study Update Missoula, Montana

A. EXECUTIVE SUMMARY

The Riverfront Trails development is a 92.43-acre residential and senior living facility proposed west of Lower Miller Creek Drive, along Old Bitterroot Road in Missoula, Montana. Upon anticipated completion by 2030, the development would include, 174 single-family residential units and 110 senior living units, and a 25,000 S.F. religious assembly site. The development would produce up to 2,209 new daily vehicle trips in this area. As proposed, the Riverfront Trails residential development will increase traffic volumes on the surrounding road network and roadway improvements may be warranted with this project and the current background traffic volume growth in this area. At this time, we recommend that the developers discuss the existing LOS issues with the City of Missoula to determine what mitigation measures can be implemented to improve traffic flow characteristics along the northern section of Miller Creek Road. This may include lane improvements at Brooks Street and the installation of a traffic signal or roundabout at Briggs Street. These improvements will be necessary regardless of the construction of the Riverfront Trails development to address existing LOS issues at these locations. Bicycle and pedestrian sidewalk improvements should also be implemented along Lower Miller Creek Road east of the project site to complete the nonmotorized connections to the northeast from the planned development site.

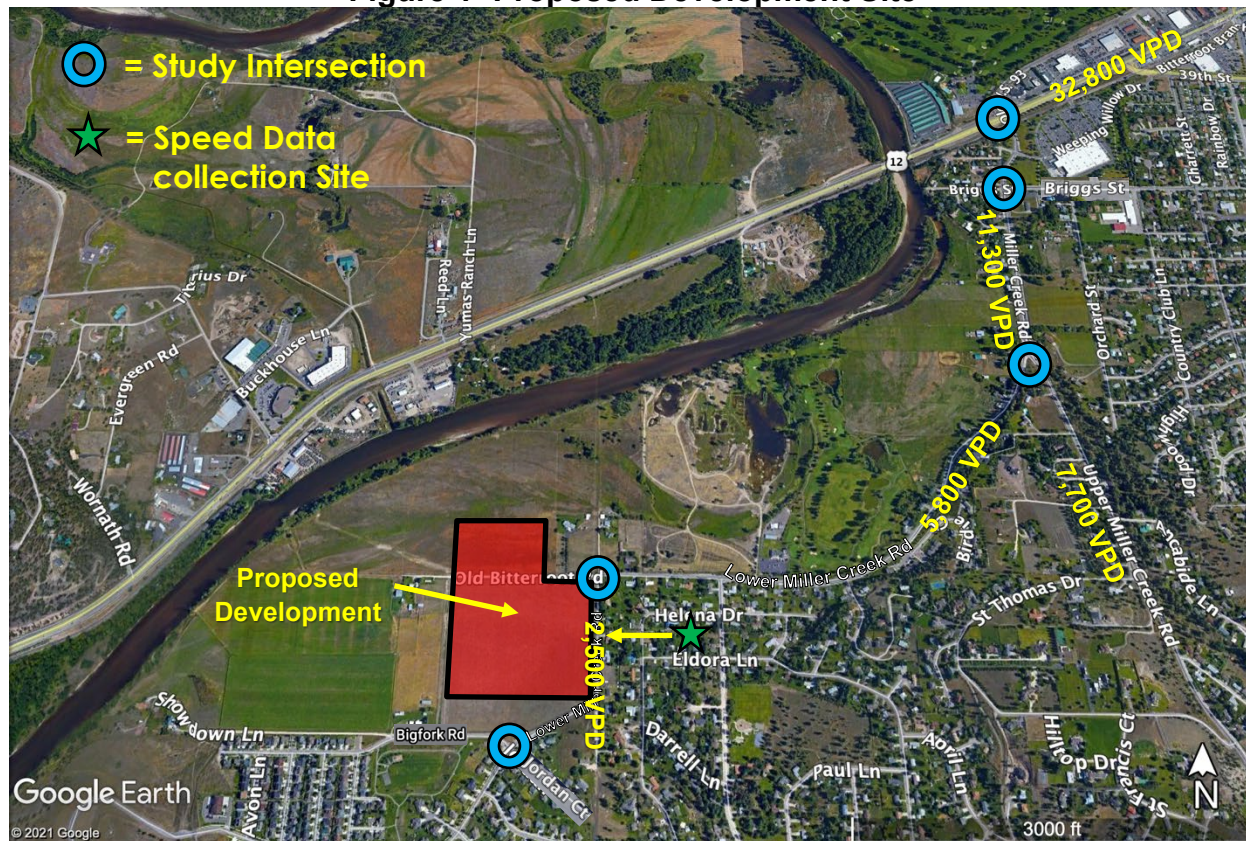
B. PROJECT DESCRIPTION

This document studies the possible effects on the surrounding road system from the proposed Riverfront Trails development located east of Lower Miller Creek Road, along Old Bitterroot Road in Missoula, MT. The document provides information regarding possible traffic impacts in the area and identifies mitigation efforts that the development may require. The project would include up to 174 single-family homes, 110 senior living units, and a religious assembly with a main building footprint estimated at 25,000 S.F.

C. EXISTING CONDITIONS

The Riverfront Trails residential development is proposed on a 92.43-acre parcel of vacant land located west of Lower Miller Creek Road, along Old Bitterroot Road. The site is located in a residential area south of the Brooks Street (Highway 93) and the Bitterroot River. The Linda Vista Public Golf Course is located east of the property and the Jeanette Rankin Elementary School is located south of the property. See **Figure 1** for a location map of the proposed development.

Figure 1- Proposed Development Site



Adjacent Roadways

Brooks Street (US Highway 93 South) is a north/south principle arterial route that extends through the western portion of Missoula and continues south toward Lolo. This section of highway has a four-lane cross-section with additional left-turn lanes at most intersections including that intersection with Miller Creek Road. At Miller Creek Road, Brooks Street has an urban cross-section with a paved width of 86 feet and is signal controlled at the intersection with Miller Creek Road. The speed limit along this section of Brooks Street is 45 MPH which increases to 60 MPH incrementally to the southwest and decreases to 35 MPH ¼ mile to the northeast. According to traffic counts conducted by MDT in 2021, the roadway currently carries 32,800 Vehicles per Day (VPD).

Miller Creek Road is a north/south major collector route that extends south from Brooks Street. Miller Creek Road provides access to the residential neighborhoods south of the Bitterroot River on the western edge of Missoula. The road has an urban three-lane cross-section (1 southbound, 2 Northbound) north of Lower Miller Creek Road with a paved width of 42 feet and has pedestrian walkways and bike lanes in both directions. Miller Creek Road

crosses BNSF railroad tracks 50 feet south of the intersection with Brooks Street. The crossing has drop-gates and flashing warning beacons. At the signalized intersection with Brooks Street, the southern leg of Miller Creek Road has a right-only and an all-movement lane. The northern leg (Old US 93) has three separate designated turn lanes. At the intersection with Briggs Street, Miller Creek Road has ample width for a southbound left-only lane. Although the street is not striped for this lane, field observations indicated that drivers are utilizing it as such. The posted speed limit on Miller Creek Road near Brooks Street is 25 MPH which increases to 35 MPH. Traffic data collected by MDT indicates that the road currently carries 11,300 Vehicles per Day (VPD).

Lower Miller Creek Road is a north/south major collector route that extends south from the roundabout intersection at Miller Creek. Lower Miller Creek Road provides access to residential neighborhoods southeast of the Bitterroot River on the western edge of Missoula. Near the proposed development Lower Miller Creek Road takes a 90-degree turn to head south and has a rural two-lane cross-section with a paved width of 22 feet. The posted speed limit on Lower Miller Creek Road is 30 MPH. Lower Miller Creek Road is controlled with a roundabout at the intersection with Miller Creek Road and Upper Miller Creek Road. Traffic data collected by MDT indicates that the road currently carries 2,500 Vehicles per Day (VPD) south of Old Bitterroot Road.

Upper Miller Creek Road is a north/south major collector route which extends south from the roundabout at Miller Creek, Upper Miller Creek Road, and Lower Miller Creek Road. Upper Miller Creek Road provides access to residential neighborhoods south of Miller Creek Road. Upper Miller Creek Road has an urban two-lane cross-section with a paved width of 32 feet and a posted speed limit of 35 MPH. Traffic data collected by MDT indicates that the road currently carries 7,700 VPD.

Briggs Street is a local east/west route that provides access to residential neighborhoods west of Miller Creek Road and south of Brooks Street. Briggs Street terminates at dead-ends 740 feet west of Miller Creek Road and ½ mile east of Miller Creek Road. Briggs Street has an urban two-lane cross-section with a paved width of 32 feet. The posted speed limit on Briggs Street is 25 MPH. Traffic data collected by MDT indicates that the road currently carries 3,100 VPD.

Bigfork Road is an east/west local road that extends west from the STOP controlled intersection with Lower Miller Creek Road providing access to Jeanette Rankin Elementary School and the residential area west of Miller Creek Road and south of the development site. Bigfork Road has an urban cross-section and with a paved width of 32 feet. The speed limit on Bigfork Road is 25 MPH.

Jordan Court is an east/west local cul-de-sac that extends east from the STOP intersection with Lower Miller Creek Road and Bigfork Road providing access to residences east of Lower Miller Creek Road. Jordan Court has an urban cross-section with a paved width of 32 feet and

no posted speed limit. Jordan Court terminates at a dead-end 600 feet east of Lower Miller Creek Road.

Old Bitterroot Road is an east/west local road that provides access to one existing residence and terminates ¼ mile west of Lower Miller Creek Road. Old Bitterroot Road has a rural unpaved cross-section and is STOP controlled at the intersection with Lower Miller Creek Road.

Traffic Counts

In April 2021, Abelin Traffic Services (ATS) collected traffic data at area intersections to evaluate current operational characteristics. These counts included peak-hour turning movement counts and 24-hour volume counts on Lower Miller Creek Road. The peak-hour turning movement counts were performed at the intersections of Brooks Street, Briggs Street Upper Miller Creek Road, and Bigfork Road/Jordan Court. Additional school release traffic data was collected at the Bigfork Road/Jordan Court intersection. Bicycle traffic was included in the total traffic count volumes and accounts for 1-2% of total intersection traffic volumes (5-10 bikes per hour). The raw traffic data is included in **Appendix A** of this report.

Generally, raw traffic data is adjusted for seasonal variation using automatic count site data. However, with the impact of the COVID-19 outbreak, traffic data must also be reviewed for pandemic related variation. ATS obtained traffic data from MDT's automatic continuous count site located along Beckwith Avenue in Missoula (Site #A-068). The continuous count data indicates the traffic counts collected on April 19th and April 20th are 124% of the 2021 AADT (Average Annual Daily Traffic) in this area and 100% of the historic AADT. For a conservative result no factorization applied was to the raw data for the analysis of this project.

Vehicle speed and volume data was also collected along Lower Miller Creek Road just north of the intersection with Bigfork Drive. The recorded ADT data for the study section was 2,349 VPD. This traffic survey suggested that the average vehicle speed on Lower Miller Creek Road was 33 MPH with an 85th percentile speed of 36 MPH for all recorded vehicles. In general, vehicle travel speeds on this section are higher than the posted 30 MPH speed limit. A maximum vehicle speeds of 48 MPH was recorded. These speeds should be taken into account when considering intersection and road designs through this section.

Historic Traffic Data

Abelin Traffic Services obtained historic traffic data for area roadways from the Montana DOT which is presented in **Table 1**. The traffic data from 2020 showed a significant decrease in traffic volumes in this area due to the Covid-19 pandemic. The traffic data history for 2012 to 2021 in this area indicates that traffic volumes in the area south of Brooks Street have increased at an average annual rate of 1.2% over this time period. This growth rate was used to factor

raw data to projected 2024 volumes for intersection analysis upon completion of the Riverfront Trails Residential Development.

Table 1 – Historic Average Daily Traffic

Location	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
US 93 NE of Miller Creek Rd #15-4A-045	33,830	33,820	32,880	34,230	26,150	32,781	30,914	30,759	28,052	32,840
US 93 at Bitterroot River Bridge #15-4A-046	26,670	25,530	26,580	27,454	26,707	26,960	26,825	22,887	24,464	27,704
Miller Ck Rd S of Brooks at RR Crossing #32-3A-072	12,740	10,310	11,450	9,863	9,726	12,429	10,796	13,270	11,095	11,323
Upper Miller Ck Rd 800 ft S of the Y #32-31-068	6,650	5,550	5,640	5,790	5,856	5,809	5,896	7,680	7,142	7,713
Lower Miller Ck Rd 100 ft SW of the Y #32-3A-069	5,440	5,560	5,660	5,810	5,214	5,172	5,250	5,809	5,402	5,834
Lower Miller Ck Rd S of 90 deg turn W of L.V. #32-3A-060	1,220	1,800	1,890	1,771	1,826	1,796	1,874	2,485	1,966	2,507
Lower Miller Ck Rd btwn Brusett & Jack Dr #32-3A-069	770	790	920	900	849	842	855	860	800	1,141
Briggs St 150 ft W of Gharrett Ave #32-3A-071	3,500	3,310	2,970	3,050	3,084	4,093	4,154	4,179	2,860	3,089

Missoula Connect Long Range Transportation Plan

The Missoula Connect Long Range Transportation Plan (LRTP) includes recommendations for improvements to the roadways and pedestrian facilities along the section of Lower Miller Creek Road adjacent to the proposed development. The recommended improvements include creating a complete street including bicycle, pedestrian, and streetscape improvements. The project would also include the development of a roundabout at the intersection of Miller Creek Road and Lower Miller Creek Road. This project is currently in the planning and design phase. The LRTP plan does not address existing congestion issues at the intersections of Brooks Street or Briggs Street with Miller Creek Road.

Jeanette Rankin Elementary School

The Jeanette Rankin Elementary School is located south of the proposed Riverfront Trails development site along Bigfork Road. The elementary school currently has 500 enrolled students in grades K-5. School is in session between 8:15 AM to 2:15 PM. Peak school traffic and peak commuter traffic does not generally occur at the same time. The data collected for this report clearly showed separate peak periods in the AM and PM traffic hours for commuter and school traffic. During the morning, the peak commuter period was 7:45-8:00 and the peak school period was 8:15-8:30. In the afternoon, the peak school period was 2:15-2:30 and the peak commuter period was 5:00-5:15. In order to accurately assess the traffic conditions for both commuter and school traffic ATS conducted traffic analysis for both time periods at the intersection of Lower Miller Creek Road with Bigfork Road. The Riverfront Development includes plans for pedestrian connections directly to the school from the internal network of the subdivision. Therefore, little to no traffic from the development will approach the school to the south on Lower Miller Creek Road. The traffic from the proposed residential homes in Riverfront Trails Subdivision will be commuter traffic which will occur during the standard morning and evening commuter peak traffic periods. Traffic generation from the development will be significantly less during the peak school traffic periods.

Although most pedestrian traffic will access the school from the north via internal connections, some pedestrian traffic will likely head west toward Lower Miller Creek to access the school bus line. Lower Miller Creek Road is not built-out to facilitate pedestrian traffic. It was noted in the field that some pedestrian traffic was walking on the street along Miller Creek Road. The build-out of Lower Miller Creek Road to include curb-and-gutter and pedestrian sidewalks was listed as a project in the Missoula Connect Long Range Transportation Plan and is currently in the design phase. Pedestrian safety along Lower Miller Creek Road would increase significantly with the completion of this project.

Level of Service

Using the data collected for this project, ATS conducted a Level of Service (LOS) analysis at area intersections. This evaluation was conducted in accordance with the procedures outlined in the Transportation Research Board's *Highway Capacity Manual (HCM) - Special Report 209* and the Highway Capacity Software (HCS) version 7.9. Intersections are graded from A to F representing the average delay that a vehicle entering an intersection can expect. Typically, a LOS of C or better is considered acceptable for peak-hour conditions.

Table 2 shows the existing LOS for the AM, and PM peak hours without the traffic from the proposed development. The LOS calculations are included in **Appendix C**. The table shows that the Miller Creek Road intersections with Brooks Street and Briggs Street are currently operating with significant delays in the AM and PM peak hours. The only way to correct the LOS issues at the intersection of Brooks Street would be to develop additional turning lanes to accommodate northbound turning traffic at the intersection (at a minimum, a separated

northbound left-turn lane). However, these lanes would need to be developed over the railroad crossing on this leg, which may be difficult to accomplish. The intersection with Briggs Street is near the limit of capacity for a STOP controlled intersection. This intersection will likely meet warrants for the installation of a traffic signal or roundabout. The intersections of Miller Creek Road and Bigfork Road with Lower Miller Creek Road are operating with acceptable LOS ratings. The roundabout at Miller Creek Drive and Lower Miller Creek Drive has reserve capacity to support growth well into the future.

The intersection of Lower Miller Creek Road and Bigfork Road near Jeanette Rankin Elementary School was also evaluated during the AM and PM peak school periods (8:15 AM & 2:15 PM). Currently, the intersection is functioning at an acceptable LOS during the school periods. **Table 3** shows the existing LOS for this intersection without traffic from the proposed development.

Table 2 – 2021 Level of Service Summary

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Brooks Street & Miller Creek Road	101	F	118	F
Briggs Street & Miller Creek Road*	15.8/92.1	C/F	32.6/138.1	D/F
Miller Creek Road & Lower Miller Creek Road	9.6	A	8.8	A
Lower Miller Creek Road & Bigfork Road*	10.6/9.2	B/A	10.3/8.6	B/A

*Eastbound/Westbound Side Street LOS and Delay

Table 3 – 2021 School Hour Level of Service Summary

Intersection	AM Peak Hour (8:15)		PM Peak Hour (2:15)	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lower Miller Creek Road & Bigfork Road*	23.2/9.2	C/A	11.7/11.0	B/B

*Eastbound/Westbound Side Street LOS and Delay

Area Crash Data

ATS collected crash data from MDT's public crash site to assess intersections for geometric and roadway characteristic deficiencies. The 5-year MDT data from 2016 to 2020 includes 65 crashes at Brooks Street and Miller Creek Road, six crashes at Miller Creek Road and Briggs Street, five Crashes at the roundabout at Miller Creek Road and Lower Miller Creek Road, and four Crashes at Lower Middle Creek Road and Old Bitterroot Road. Generally, crashes are expressed as a rate of crashes per million vehicles entering (MVE). All intersections analyzed

have crash rates between 0.16 and 1.0. The crash rates at these intersections are within typical ranges and do not suggest that road improvements are needed.

D. PROPOSED DEVELOPMENT

The Riverfront Trails development is currently proposed at the intersection of Old Bitterroot Road and Lower Miller Creek Road. The land to be developed is a 92.43-acre parcel of existing farmland. The development is planned to include two approaches onto Lower Miller Creek Road. The approach onto Old Bitterroot Road at Lower Middle Creek Road is currently planned as a roundabout based on the recommendations from the Miller Creek Road improvements project. The second approach onto Lower Middle Creek Road would be located 650 feet to the south and will include bulb-outs for improved pedestrian safety and traffic calming. Upon completion by 2025, the development would include 174 single-family residential units and 110 senior living units, and an 25,000 S.F. religious assembly. The development is to include internal roadways built to City of Missoula specifications for lane widths and an internal pedestrian connection to Jeanette Rankin Elementary School to the south. The Riverfront Trails site plan is shown in **Figure 2**.

E. TRIP GENERATION AND ASSIGNMENT

ATS performed a trip generation analysis to determine the anticipated future traffic volumes from the proposed development using the trip generation rates contained in *Trip Generation* (Institute of Transportation Engineers, Tenth Edition). These rates are the national standard and are based on the most current information available to planners. A vehicle “trip” is defined as any trip that either begins or ends at the development site. ATS determined that the critical traffic impacts on the intersections and roadways would occur during the weekday morning and evening peak hours. According to the ITE trip generation rates, at full build-out the Riverfront Trails development would produce 161 AM peak hour trips, 215 PM peak hour trips, and 2,209 daily trips. See **Table 4** for detailed trip generation information. Typically religious assemblies produce relatively little traffic during the peak weekday traffic period, but can produce significant amounts of traffic on holidays and Sunday mornings. The ITE manual predicts that the proposed religious assembly would be expected to produce up to 250 peak hour vehicle trips on Sunday mornings. While this is a significant amount of traffic, it is less than the current traffic volumes produced by Jeanette Rankin Elementary School and religious assembly traffic generally occurs when the background traffic volumes on adjacent streets are relatively low on Sunday mornings. Peak traffic generated by religious assemblies are not typically used for roadway design purposes.

Figure 2- Proposed Development

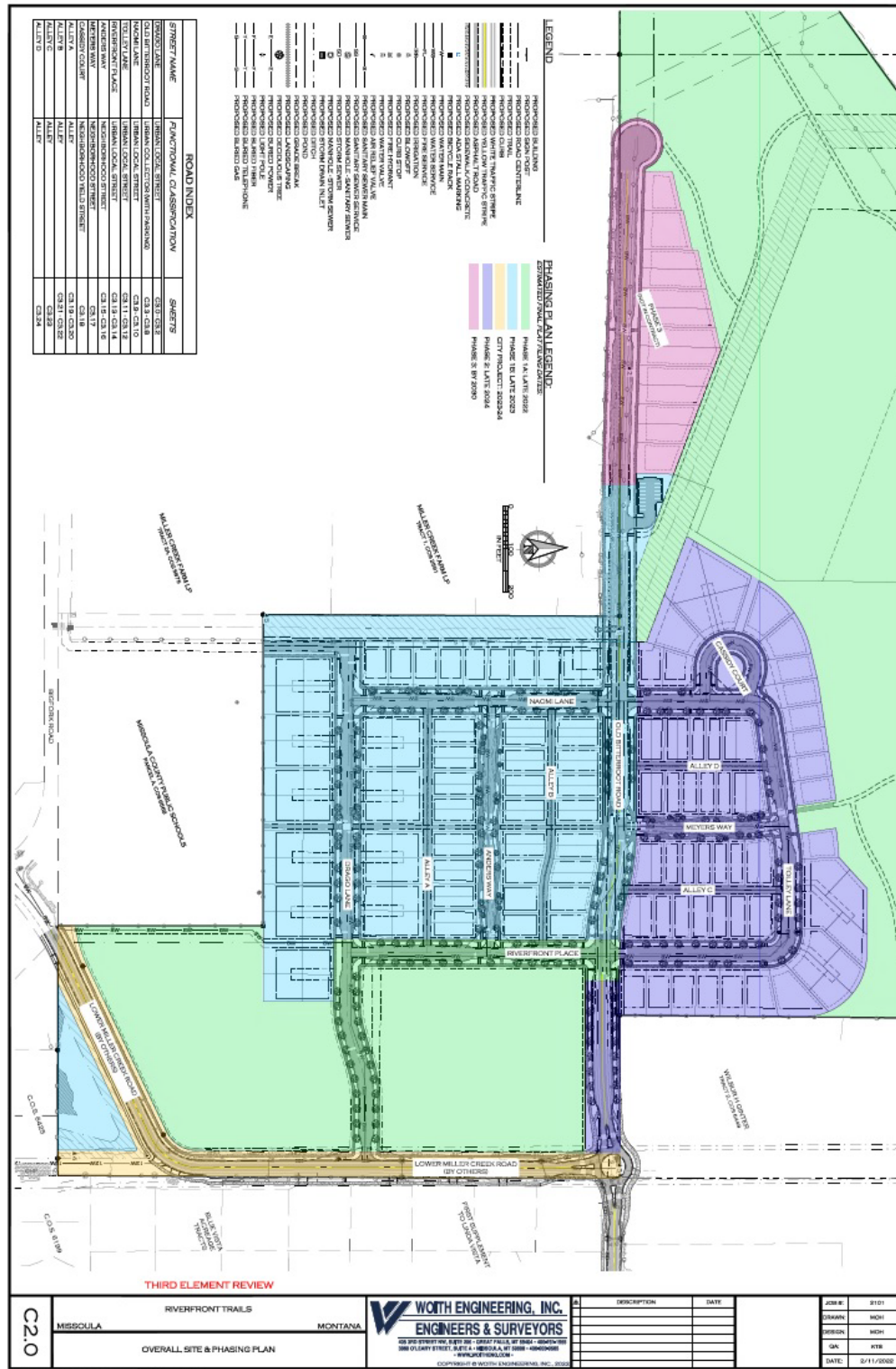


Table 4 - Trip Generation Rates

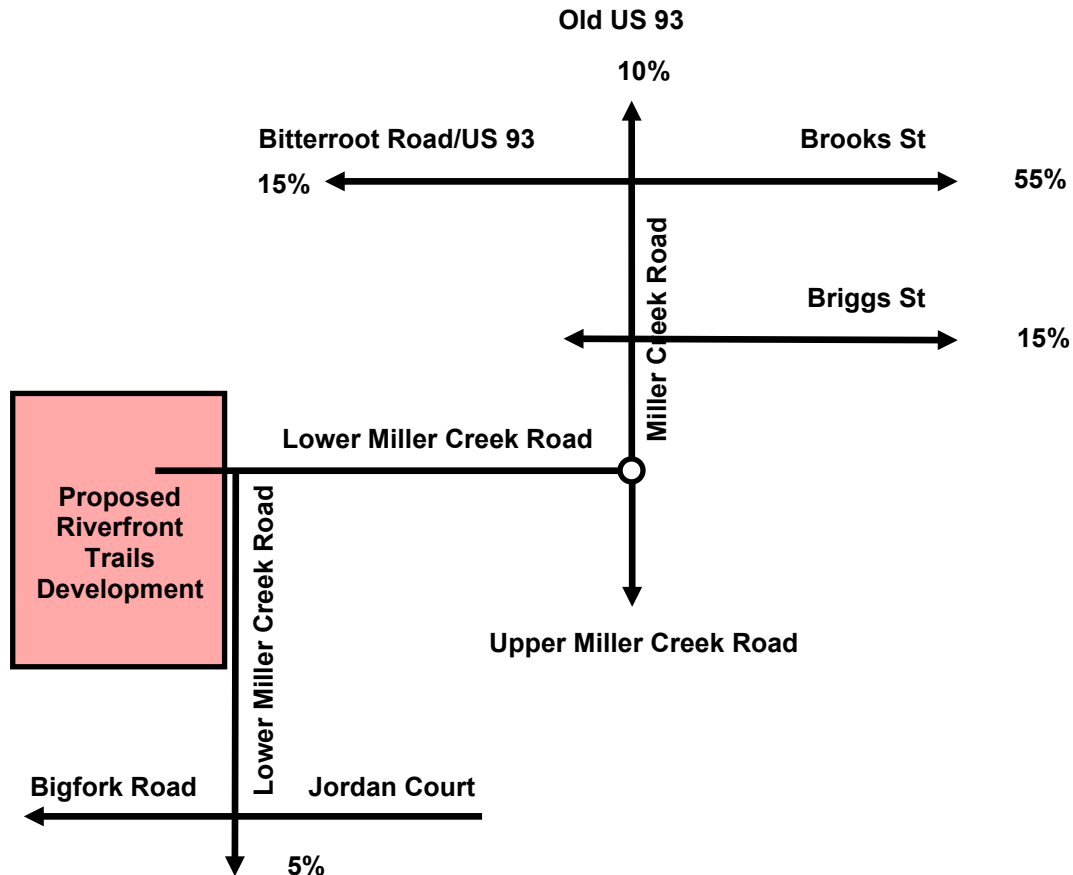
Land Use	Units	AM Peak Hour Trip Ends per Unit	Total AM Peak Hour Trip Ends	PM Peak Hour Trip Ends per Unit	Total PM Peak Hour Trip Ends	Weekday Trip Ends per Unit	Total Weekday Trip Ends
Single Family ITE #210	174	0.75	129	0.99	172	9.52	1,637
Senior Housing ITE #252	110	0.2	22	0.26	29	3.44	378
Church ITE #560	25 KSF	.33	8	.49	12	6.95	174
Total			161		215		2,209

F. TRIP DISTRIBUTION

The traffic distribution and assignment for the proposed development was based upon the existing ADT volumes along the adjacent roadways and the peak-hour turning volumes for the AM and PM Peak hours. Traffic is expected to distribute onto the surrounding road network in the AM and PM peak hours as shown on **Figures 3 & 4**. It is expected that the majority of traffic from the development will travel to and from the northeast on Lower Miller Creek Road to Briggs Street and Brooks Street. A small amount of traffic (~5%) will likely use Lower Miller Creek to the south to reach Jeanette Rankin Elementary School and other destinations in this area. See the model in **Appendix B** for detailed trip distribution information.

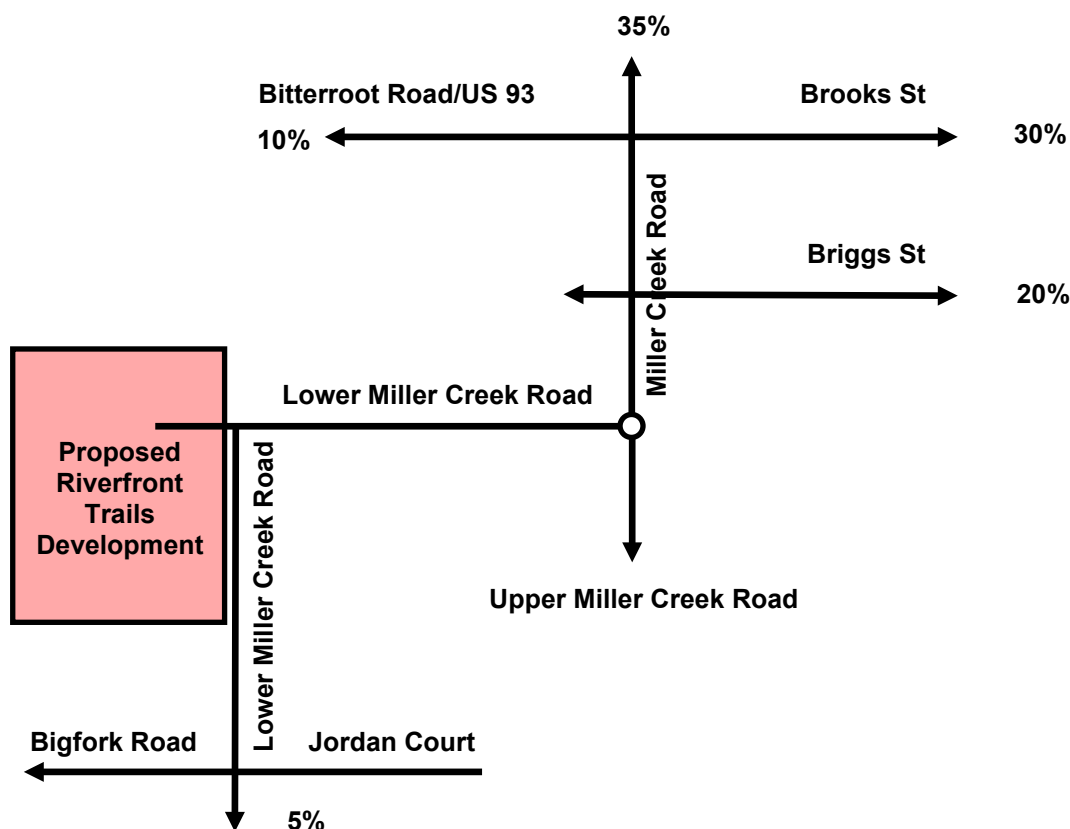
G. TRAFFIC IMPACTS OUTSIDE OF THE DEVELOPMENT

ATS analyzed the existing and projected traffic conditions within the study area to determine the anticipated future traffic conditions without the added traffic from the Riverfront Trails subdivision. The results of this traffic analysis are shown below in **Table 5** below. The 2025 'No Build' conditions in this area are similar to the existing conditions and indicate increased delay at the intersections along the northern end of Miller Creek Road at Brooks Street and Briggs Street. These intersections will require roadway improvements in the future regardless of any development of the Riverfront Trails project as described in **Section C**.

Figure 3 – Trip Distribution AM Peak Hour**Table 5 – Projected 2025 No Build Level of Service**

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Brooks Street & Miller Creek Road	117.2	F	132.1	F
Briggs Street & Miller Creek Road*	16.4/129	C/F	36.1/202	E/F
Miller Creek Road & Lower Miller Creek Road	10.6	B	9.4	A
Lower Miller Creek Road & Bigfork Road*	10.7/9.2	B/A	10.4/8.6	B/A

*Eastbound/Westbound Side Street LOS and Delay.

Figure 4 – Trip Distribution PM Peak Hour

The anticipated intersection LOS with the Riverfront Trails development is shown in **Tables 6 & 7**. The traffic volume calculations are included in **Appendix B** of this report. As the table shows, the development of the Riverfront Trails development and the anticipated background traffic volume growth in this area will create additional delay at the area intersections. As traffic volumes in this area increase, it may become necessary to make modifications at the intersections of Miller Creek Road with Briggs Street and Brooks Street. The existing LOS conditions at these intersections is poor (LOS F) and will require major improvements regardless of any development of the Riverfront Trails property. The direct traffic impact from the Riverfront Trails development at these intersections could be 16% and 6% respectively. The impact at the intersections of Lower Miller Creek Road with Miller Creek Road and Bigfork Road could be 16% and 8% respectively but the intersections will continue to operate at acceptable levels. The background traffic volume growth at the intersection of Lower Miller Creek Road and Bigfork Road may cause the intersection to fall to LOS D during the AM peak school periods by the year 2024 if the current growth trends in the area continue. This issue could be corrected by converting the intersection to a four-way STOP. However, the congestion issues at this location are extremely short in duration (15 minutes) and may not necessitate any traffic control improvements. Total traffic volumes

along Lower Miller Creek Road will increase to approximately 7,000 VPD and traffic volumes along Miller Creek Road north of the roundabout will increase to approximately 16,000 VPD. Typically, the road capacity for a two-lane roadway is 10,000 to 12,000 VPD and up to 18,000 for three lane roads.

Table 6 – Projected 2025 Level of Service with Development

Intersection	AM Peak Hour		PM Peak Hour	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Brooks Street & Miller Creek Road	143.3	F	223	F
Briggs Street & Miller Creek Road*	18.0/265	C/F	44.5/398	E/F
Miller Creek Road & Lower Miller Creek Road	13.3	B	11.6	B
Lower Miller Creek Road & Bigfork Road*	10.8/9.3	B/A	10.5/8.6	B/A

*Eastbound/Westbound Side Street LOS and Delay.

Table 7 – Projected School Hour Level of Service Summary

Intersection	AM Peak Hour (8:15)		PM Peak Hour (2:15)	
	Delay (Sec.)	LOS	Delay (Sec.)	LOS
Lower Miller Creek Road & Bigfork Road*	27.0/9.2	C/A	12.1/11.3	B/B

*Eastbound/Westbound Side Street LOS and Delay

The intersection of Miller Creek Road and Briggs Street will require a higher form of traffic control to function adequately with the existing and projected traffic along this section of road with or without the proposed Riverfront Trails development. If the intersection were improved with the installation of a traffic signal or roundabout the operations would be improved significantly to LOS A or B with little vehicle queueing at shown in **Table 8**. It is likely that a traffic signal at this location may function at with less delay and less queueing due to the predominant north/south traffic flow along Miller Creek Road. At this time, we recommend that the developers discuss the existing LOS issues with the City of Missoula and determine what mitigation would be most appropriate to improve the traffic flow characteristics along the northern section of Miller Creek Road. The planned roundabout at Lower Miller Creek Road and Old Bitterroot Road would function at LOS A once completed.

Table 8 – Projected Level of Service with Roadway Improvements

Intersection	AM Peak Hour			PM Peak Hour		
	Delay (Sec.)	LOS	95% Veh Queue	Delay (Sec.)	LOS	95% Veh Queue
Briggs Street & Miller Creek Road Traffic Signal	4.2	A	39 ft.	5.6	A	41 ft.
Briggs Street & Miller Creek Road Roundabout	7.2	A	65 ft.	10.3	B	177 ft.
Lower Miller Creek Road & Old Bitterroot Road Roundabout	4.3	A	20 ft.	4.2	A	20 ft.

Current vehicle crash trends in this area are within normal operating limits and do not indicate any abnormal crash trends at the study intersections. Traffic from the proposed Riverfront Trails will likely increase the numbers of expected vehicle crashes in proportion with the anticipated increases in traffic loads on the local routes. This increase will be approximately 10% from current conditions, but the existing crash rates will not likely change. The roundabout planned for the intersection of Lower Miller Creek Road and Old Bitterroot Road will likely improve safety at this corner by slowing vehicles traveling through the roundabout.

Currently Miller Creek Road and Lower Miller Creek Road have continuous sidewalks on the south side of the road from Brooks Street to Linda Vista Boulevard, 1,000 feet east of the proposed development site. The route also has marked bike lanes from Briggs Street to Linda Vista Boulevard. The nearest transit stop to the development site is located within the Walmart Shopping Center at Weeping Willow Drive.

The Riverfront Trails development will include sidewalks along all streets and designated bike lanes along Old Bitterroot Road. The City of Missoula has plans to extend the sidewalks along the south side of the street and continue the bike lanes along Lower Miller Creek Road from the project site to Linda Vista Boulevard to complete the bike and pedestrian connections from this area into the greater Missoula area.

ATS also prepared estimates of the total traffic volumes which will likely exist on the road segments within the development at full build-out of the project. These estimates are based on the planned lot layout of the development and the likely travel paths residents will use. The estimated total ADT on the various road segments within the development are shown in **Table 9**.

H. IMPACT SUMMARY & RECOMMENDATIONS

As proposed, the Riverfront Trails residential development will increase traffic volumes on the surrounding road network and roadway improvements may be warranted with this project and the current background traffic volume growth in this area. At this time, we recommend that the developers discuss the existing LOS issues with the City of Missoula to determine what mitigation measures can be implemented to improve traffic flow characteristics along the northern section of Miller Creek Road. This may include lane improvements at Brooks Street and the installation of a traffic signal or roundabout at Briggs Street. These improvements will be necessary regardless of the construction of the Riverfront Trails development to address existing LOS issues at these locations. Bicycle and pedestrian sidewalk improvements should also be implemented along Lower Miller Creek Road east of the project site to complete the nonmotorized connections to the northeast from the planned development site.

Table 9 – Estimated Full-Built ADT Volumes

Road	Segment	ADT Volume
Old Bitterroot Road	West of Naomi Lane	150 VPD
Old Bitterroot Road	Naomi Lane to Riverfront Place	500 VPD
Old Bitterroot Road	West of Lower Miller Creek Rd	1,400 VPD
Naomi Lane	South of Old Bitterroot Road	150 VPD
Naomi Lane	North of Old Bitterroot Road	300 VPD
Riverfront Place	South of Old Bitterroot Road	400 VPD
Riverfront Place	North of Old Bitterroot Road	200 VPD
Drago Lane	Naomi Lane to Riverfront Place	200 VPD
Drago Lane	West of Lower Miller Creek Rd	800 VPD
Trolley Lane	Naomi Lane to Riverfront Place	100 VPD
Anders Way	Naomi Lane to Riverfront Place	200 VPD
Alley A	Naomi Lane to Riverfront Place	200 VPD
Alley B	Naomi Lane to Riverfront Place	200 VPD
Meyers Way	Old Bitterroot Road to Trolley Lane	100 VPD
Alley C	Old Bitterroot Road to Trolley Lane	100 VPD
Alley D	Old Bitterroot Road to Trolley Lane	100 VPD

APPENDIX A

Traffic Data

130 S. Howie Street
Helena, MT 59601

Page No : 1

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130 S. Howie Street
Helena, MT 59601

File Name : MillerBrooksTMC

Site Code : 00000000

Start Date : 4/21/2021

Page No : 1

Groups Printed- Unshifted - Bank 1 - Bank 2

[illegible]

130 S. Howie Street
Helena, MT 59601

File Name : Not Named 9

Site Code : 00000000

Start Date : 4/21/2021

Page No : 1

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[illegible]

Abelin Traffic Services

130 S. Howie Street
Helena, MT 59601
406-459-1443

File Name : BriggsMillerTMC

Site Code : 00000000

Start Date : 4/22/2021

Page No : 1

Groups Printed- Unshifted - Bank 1 - Bank 2

	MILLER Southbound					BRIGGS Westbound					MILLER Northbound					BRIGGS Eastbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
*** BREAK ***																					
07:30 AM	0	61	5	0	66	7	0	10	0	17	38	230	2	0	270	0	0	1	0	1	354
07:45 AM	0	80	10	0	90	9	0	18	2	29	35	222	2	0	259	0	1	0	0	1	379
Total	0	141	15	0	156	16	0	28	2	46	73	452	4	0	529	0	1	1	0	2	733
08:00 AM	0	82	9	0	91	12	1	20	0	33	24	177	1	0	202	1	1	0	0	2	328
08:15 AM	0	71	11	0	82	10	0	15	0	25	33	211	0	0	244	0	0	1	0	1	352
*** BREAK ***																					
Total	0	153	20	0	173	22	1	35	0	58	57	388	1	0	446	1	1	1	0	3	680
*** BREAK ***																					
04:30 PM	0	112	2	0	114	14	1	32	0	47	21	89	0	0	110	0	0	1	0	1	272
04:45 PM	0	140	5	0	145	17	2	33	0	52	26	106	1	0	133	0	1	0	0	1	331
Total	0	252	7	0	259	31	3	65	0	99	47	195	1	0	243	0	1	1	0	2	603
05:00 PM	1	162	10	0	173	10	1	36	1	48	19	113	0	0	132	0	0	0	0	0	353
05:15 PM	2	166	8	0	176	5	0	37	0	42	17	115	2	0	134	0	0	2	0	2	354
*** BREAK ***																					
Total	3	328	18	0	349	15	1	73	1	90	36	228	2	0	266	0	0	2	0	2	707
*** BREAK ***																					
Grand Total	3	874	60	0	937	84	5	201	3	293	213	1263	8	0	1484	1	3	5	0	9	2723
Apprch %	0.3	93.3	6.4	0		28.7	1.7	68.6	1		14.4	85.1	0.5	0		11.1	33.3	55.6	0		
Total %	0.1	32.1	2.2	0	34.4	3.1	0.2	7.4	0.1	10.8	7.8	46.4	0.3	0	54.5	0	0.1	0.2	0	0.3	
Unshifted	3	868	59	0	930	84	5	199	3	291	212	1256	8	0	1476	1	3	5	0	9	2706
% Unshifted	100	99.3	98.3	0	99.3	100	100	99	100	99.3	99.5	99.4	100	0	99.5	100	100	100	0	100	99.4
Bank 1	0	3	1	0	4	0	0	2	0	2	1	6	0	0	7	0	0	0	0	0	13
% Bank 1	0	0.3	1.7	0	0.4	0	0	1	0	0.7	0.5	0.5	0	0	0.5	0	0	0	0	0	0.5
Bank 2	0	3	0	0	3	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	4
% Bank 2	0	0.3	0	0	0.3	0	0	0	0	0	0	0.1	0	0	0.1	0	0	0	0	0	0.1

For Project:	LowerMillerCreek				
Project Notes:					
Location/Name:	Outgoing				
Report Generated:	4/22/2021	13:40			
Speed Intervals	1 MPH				
Time Intervals	Instant				
Traffic Report From	4/20/2021	18:00:00	through	4/21/2021	18:59:59
85th Percentile Speed	36 MPH				
85th Percentile Vehicles	1029				
Max Speed	48 MPH	on	4/21/2021	14:22:04	
Total Vehicles	1211				
AADT:	1162				

Volumes - weekly counts

Time	5 Day	7 Day
Average Daily	605	605
AM Peak	121	121
PM Peak	162	162

Speed

Speed Limit:	35
85th Percentile Speed:	36
Average Speed:	32.6

	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Count over limit	N/A	24	187	N/A	N/A	N/A	N/A
% over limit	N/A	23.5	16.9	N/A	N/A	N/A	N/A
Avg Speeder	N/A	38.0	37.9	N/A	N/A	N/A	N/A

Class Counts

	Number	%
VEH_SM	15	1.2
VEH_MED	1145	94.5
VEH_LG	51	4.2
[VEH_SM=motorcycle,	VEH_MED = sedan,	VEH_LG = truck]

Day/Time Ending	85th pctl (MPH)	85th pctl cnts	Total Cnts	Max Speed	Avg Speeder	% Speeders
4/20/2021 07:00:00 PM	36.0	79	93	44	37.9	17.2%
4/20/2021 08:00:00 PM	40.0	8	9	40	38.4	88.9%
4/20/2021 09:00:00 PM	**No Data**					
4/20/2021 10:00:00 PM	**No Data**					
.....						
4/21/2021 07:00:00 AM	30.0	1	1	30	0.0	0.0%
4/21/2021 08:00:00 AM	36.0	74	87	41	37.4	16.1%
4/21/2021 09:00:00 AM	35.0	103	121	40	37.3	13.2%
4/21/2021 10:00:00 AM	37.0	41	48	41	37.1	33.3%
4/21/2021 11:00:00 AM	35.0	64	75	43	39.4	10.7%
4/21/2021 12:00:00 PM	36.0	52	61	45	38.5	19.7%
4/21/2021 01:00:00 PM	36.0	60	70	43	38.1	17.1%
4/21/2021 02:00:00 PM	35.0	100	118	40	37.6	10.2%
4/21/2021 03:00:00 PM	36.0	98	115	48	38.5	16.5%
4/21/2021 04:00:00 PM	37.0	87	102	48	38.0	33.3%
4/21/2021 05:00:00 PM	35.0	100	118	42	38.0	12.7%
4/21/2021 06:00:00 PM	35.0	138	162	45	37.7	14.2%
4/21/2021 07:00:00 PM	36.0	26	31	42	38.0	19.4%

Day/Time Ending	85th pctl (MPH)	85th pctl cnts	Total Cnts	Max Speed	Avg Speeder	% Speeders
4/21/2021 12:00:00 AM	37.0	87	102	44	38.0	23.5%
4/21/2021 06:59:59 PM	36.0	943	1109	48	37.9	16.9%

For Project:	LowerMillerCreek				
Project Notes:					
Location/Name:	Incoming				
Report Generated:	4/22/2021	13:40			
Speed Intervals	1 MPH				
Time Intervals	Instant				
Traffic Report From	4/20/2021	18:00:00	through	4/21/2021	18:59:59
85th Percentile Speed	36 MPH				
85th Percentile Vehicles	1051				
Max Speed	48 MPH	on	4/21/2021	15:46:54	
Total Vehicles	1237				
AADT:	1187				

Volumes - weekly counts

Time	5 Day	7 Day
Average Daily	618	618
AM Peak	206	206
PM Peak	136	136

Speed

Speed Limit:	35						
85th Percentile Speed:	36						
Average Speed:	32.76						
	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Count over limit	N/A	18	253	N/A	N/A	N/A	N/A
% over limit	N/A	28.1	21.6	N/A	N/A	N/A	N/A
Avg Speeder	N/A	38.6	38.0	N/A	N/A	N/A	N/A

Class Counts

	Number	%
VEH_SM	4	0.3
VEH_MED	1195	96.6
VEH_LG	38	3.1
[VEH_SM=motorcycle,	VEH_MED = sedan,	VEH_LG = truck]

Day/Time Ending	85th pctl (MPH)	85th pctl cnts	Total Cnts	Max Speed	Avg Speeder	% Speeders
4/20/2021 07:00:00 PM	38.0	49	58	46	38.9	27.6%
4/20/2021 08:00:00 PM	36.0	5	6	36	36.0	33.3%
4/20/2021 09:00:00 PM	**No Data**					
4/20/2021 10:00:00 PM	**No Data**					
.....						
4/21/2021 07:00:00 AM	38.0	10	12	39	38.7	25.0%
4/21/2021 08:00:00 AM	36.0	103	121	41	37.4	19.8%
4/21/2021 09:00:00 AM	36.0	175	206	41	37.2	18.0%
4/21/2021 10:00:00 AM	38.0	85	100	46	38.2	37.0%
4/21/2021 11:00:00 AM	36.0	55	65	42	38.0	23.1%
4/21/2021 12:00:00 PM	36.0	50	59	45	37.9	25.4%
4/21/2021 01:00:00 PM	37.0	66	78	43	37.6	24.4%
4/21/2021 02:00:00 PM	38.0	54	63	42	37.9	27.0%
4/21/2021 03:00:00 PM	35.0	116	136	46	39.0	14.0%
4/21/2021 04:00:00 PM	37.0	90	106	48	39.2	19.8%
4/21/2021 05:00:00 PM	37.0	101	119	41	37.7	24.4%
4/21/2021 06:00:00 PM	35.0	71	84	43	37.5	15.5%
4/21/2021 07:00:00 PM	35.0	20	24	44	39.3	16.7%

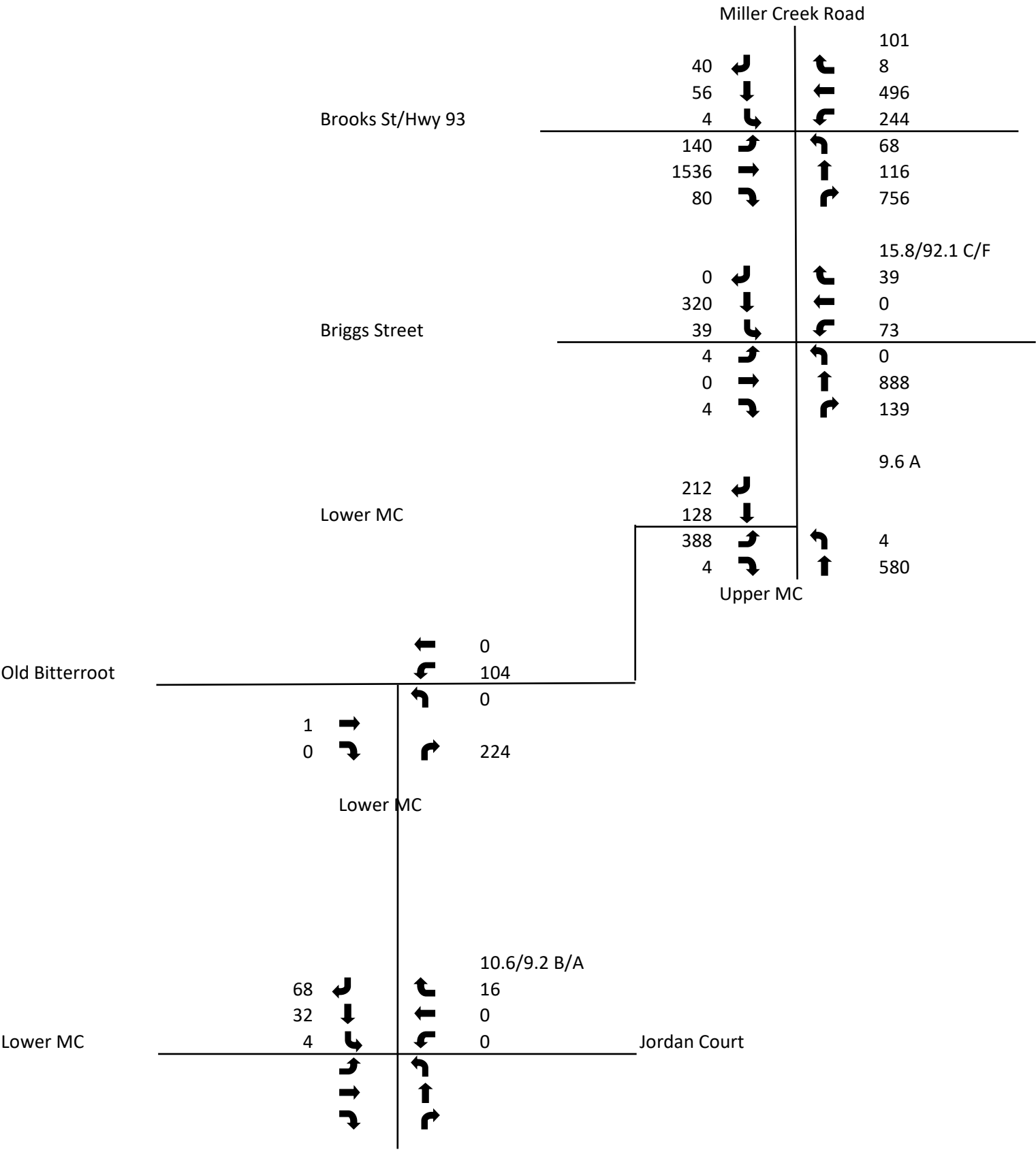
Day/Time Ending	85th pctl (MPH)	85th pctl cnts	Total Cnts	Max Speed	Avg Speeder	% Speeders
4/21/2021 12:00:00 AM	38.0	54	64	46	38.6	28.1%
4/21/2021 06:59:59 PM	36.0	997	1173	48	38.0	21.6%

APPENDIX B

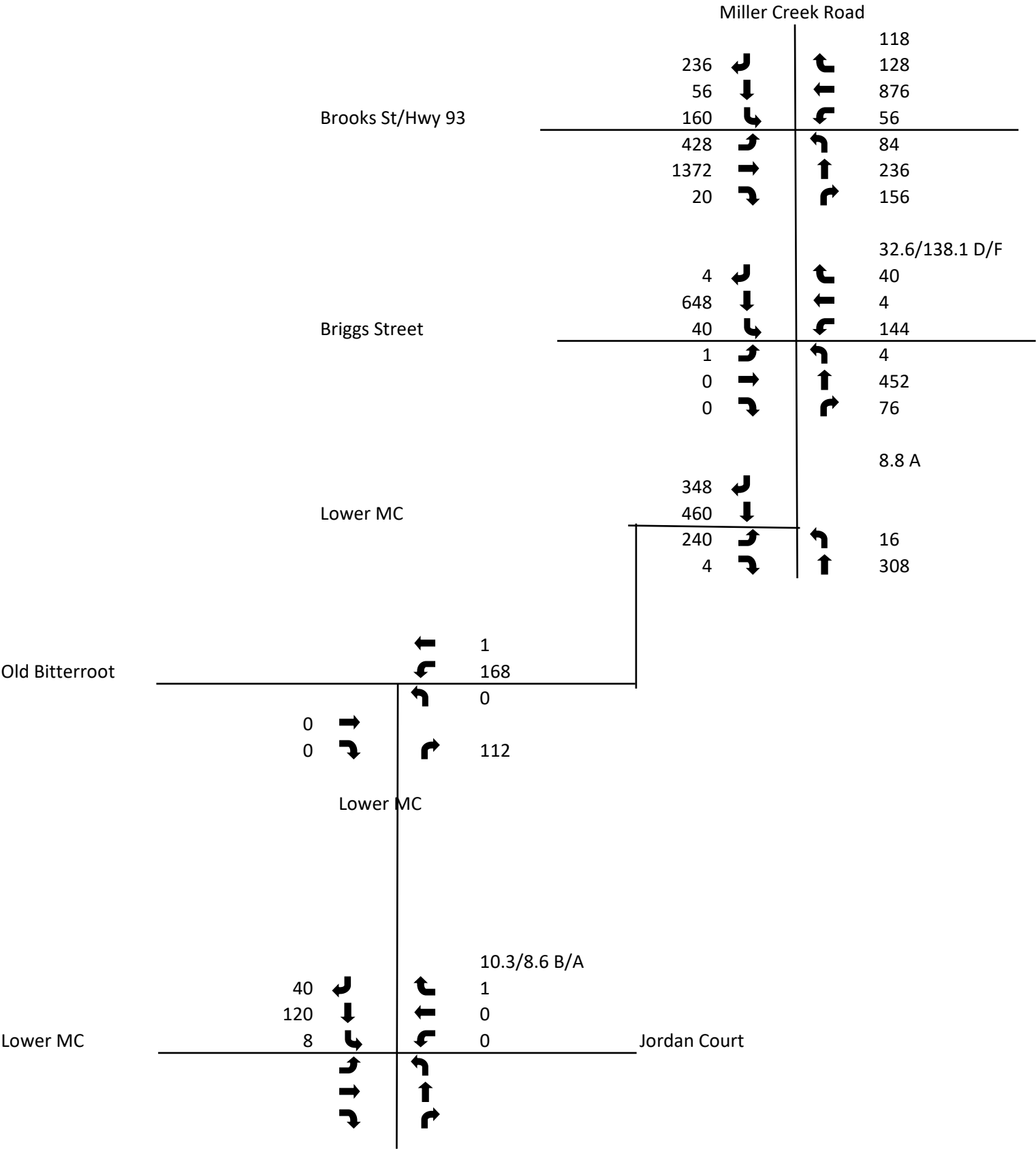
Traffic Model

River Front Trails
Traffic Model
AM Peak Hour (15 minx4)

Seasonal/Covid Factor 1

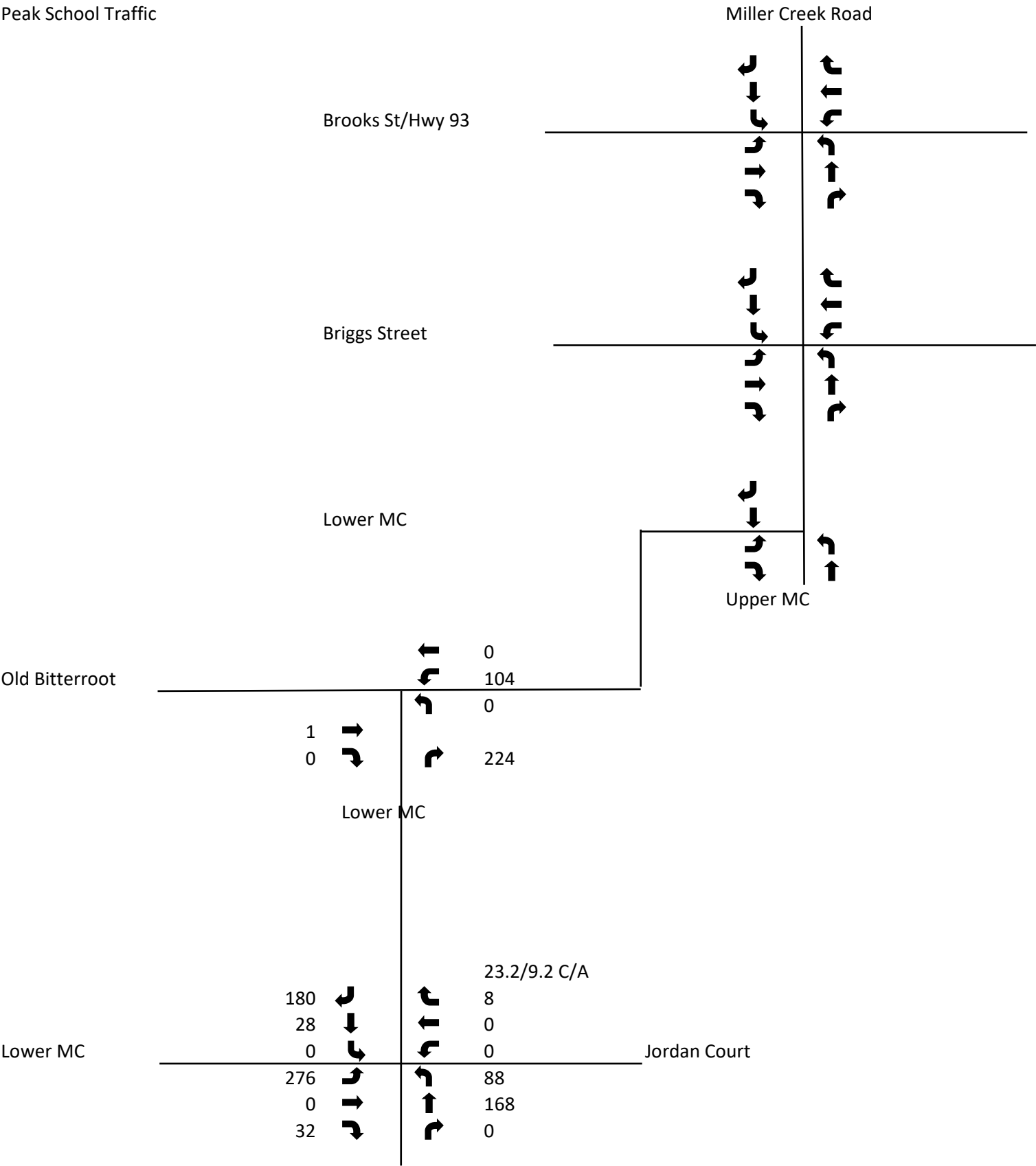


River Front Trails
Traffic Model
PM Peak Hour (15 minx4)

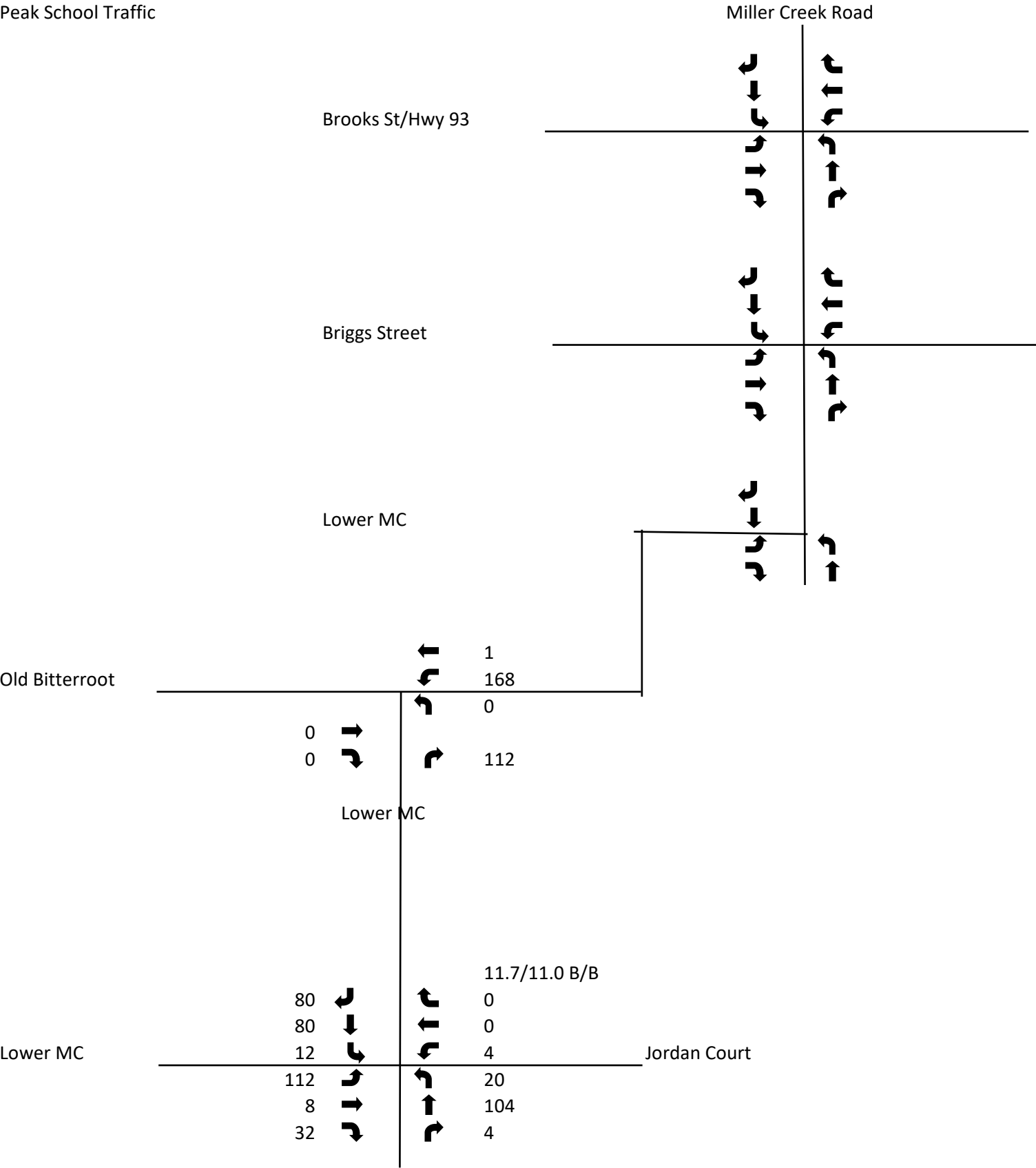


River Front Trails
Traffic Model
AM Peak Hour (15 minx4)
Peak School Traffic

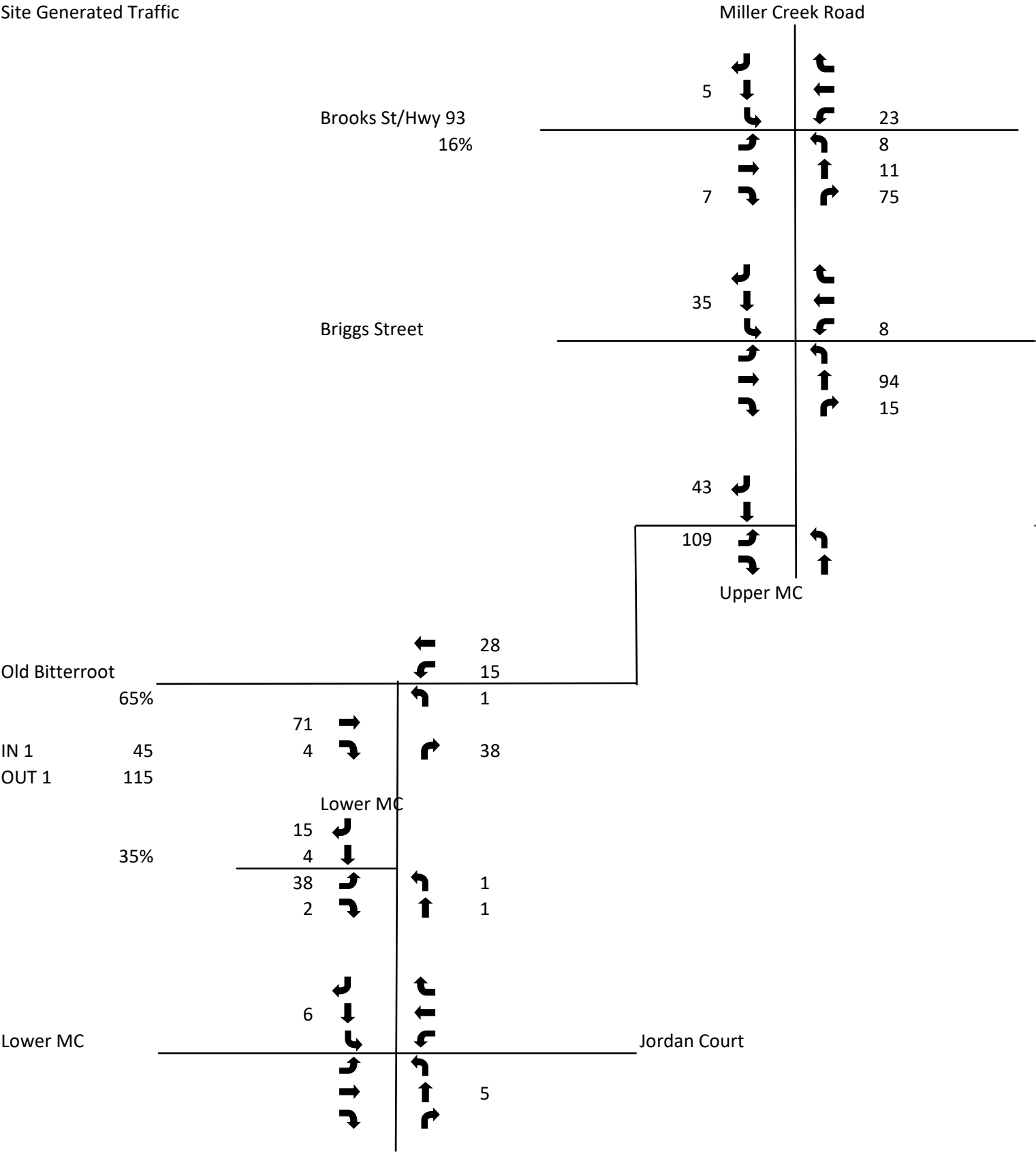
Seasonal/Covid Factor 1



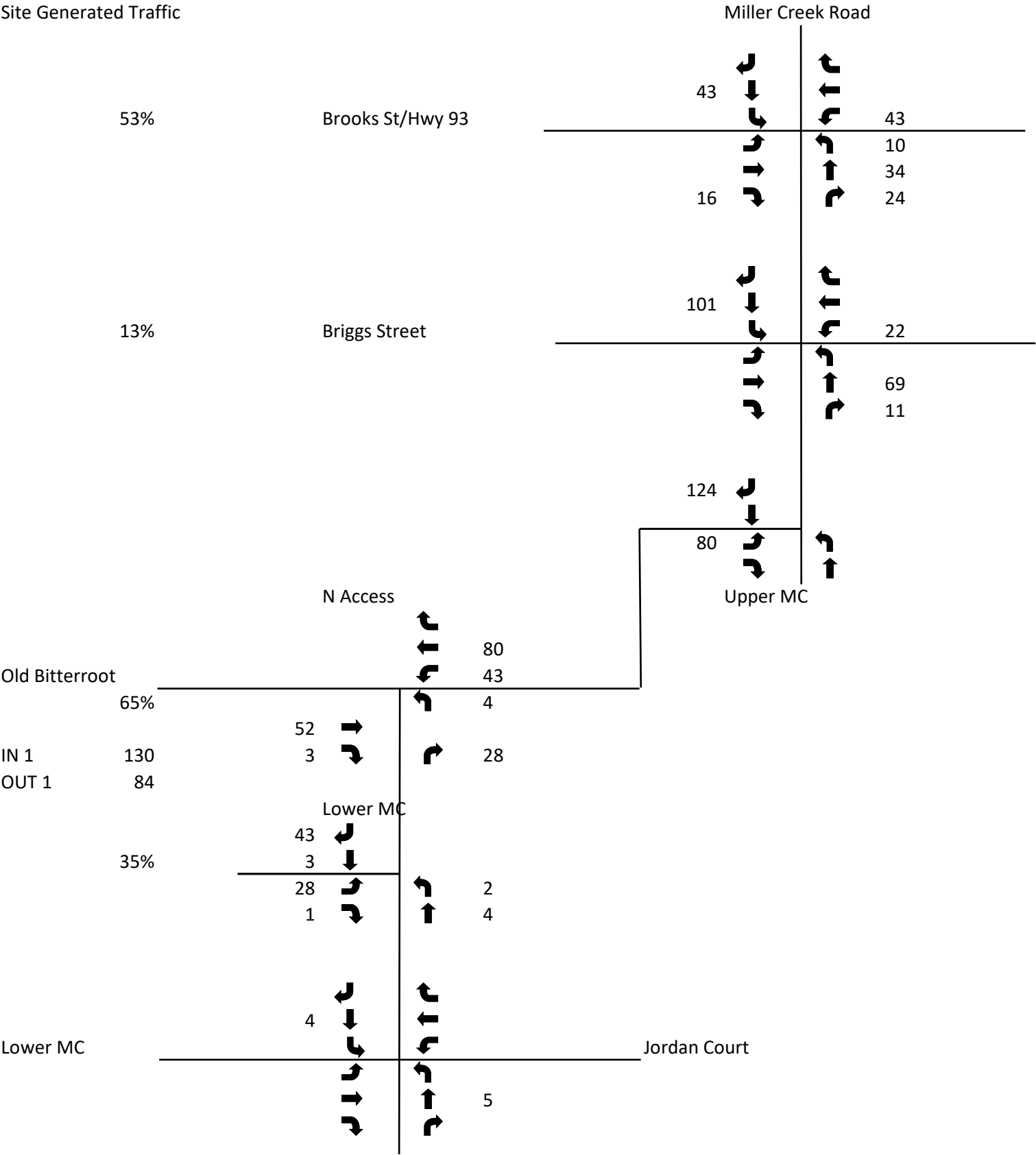
River Front Trails
Traffic Model
PM Peak Hour (15 minx4)
Peak School Traffic



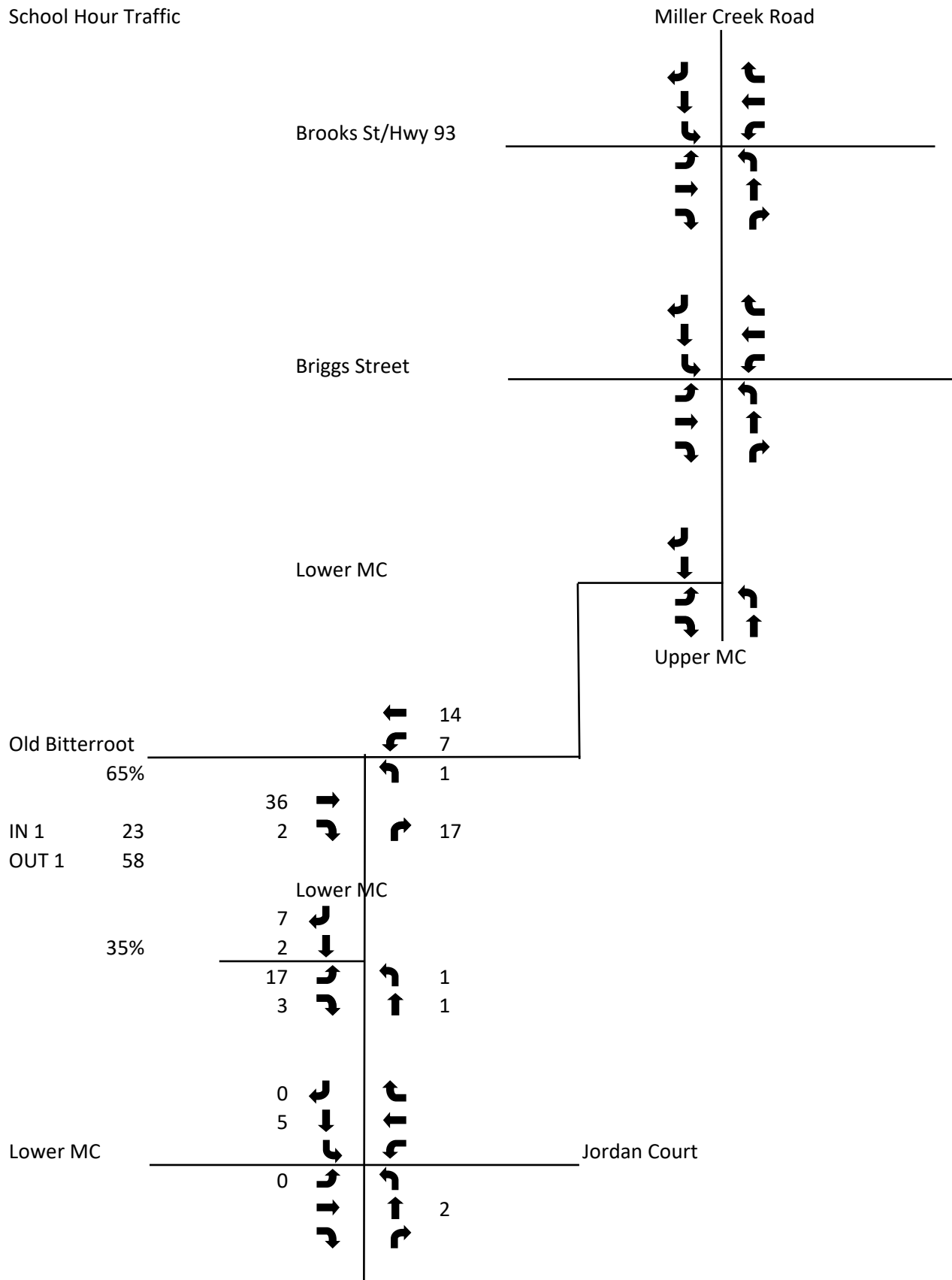
River Front Trails
Traffic Model
AM Modeled Traffic
Site Generated Traffic



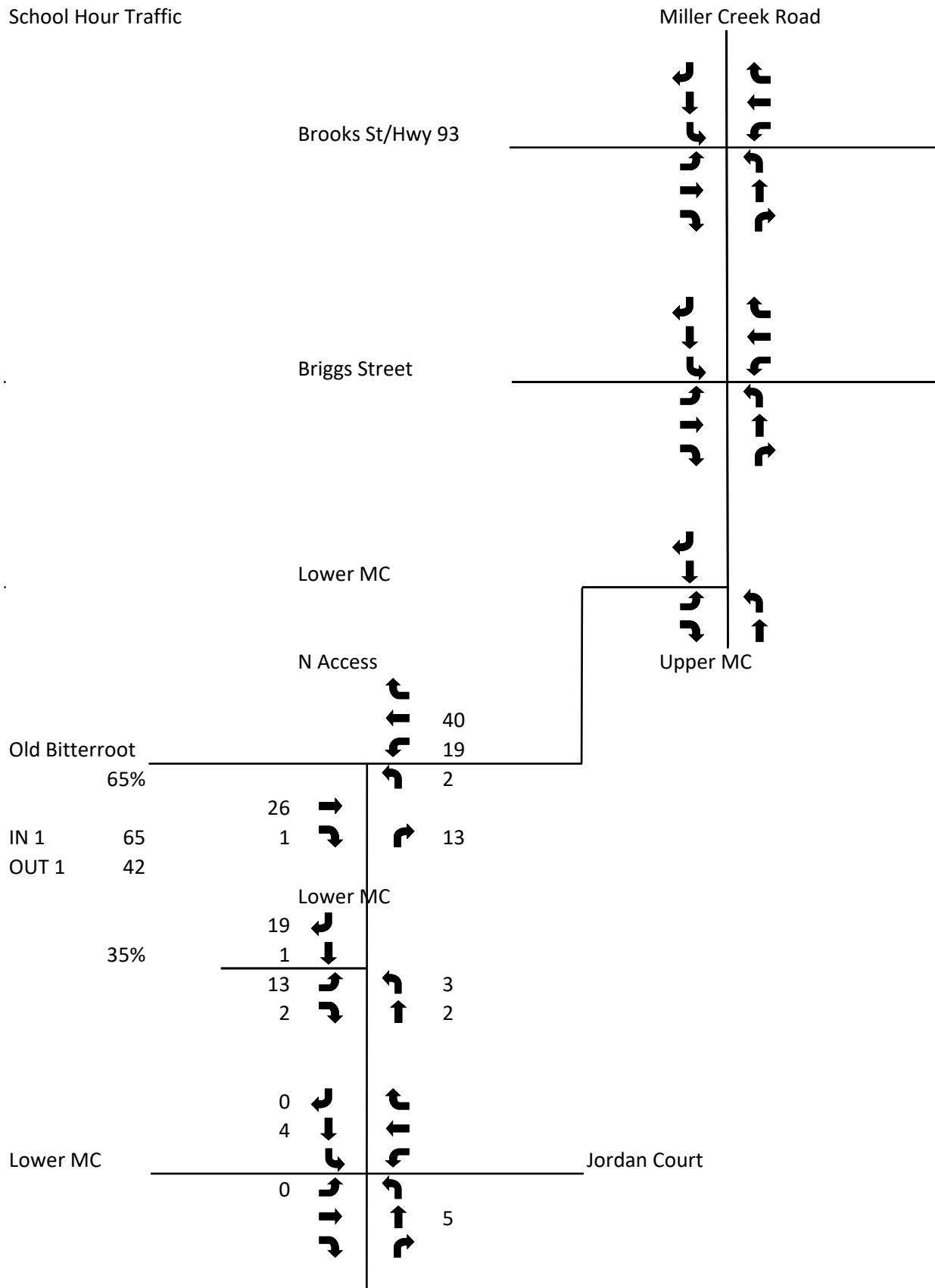
River Front Trails
Traffic Model
PM Modeled Traffic
Site Generated Traffic



River Front Trails
 Traffic Model
 AM Modeled Traffic
 School Hour Traffic

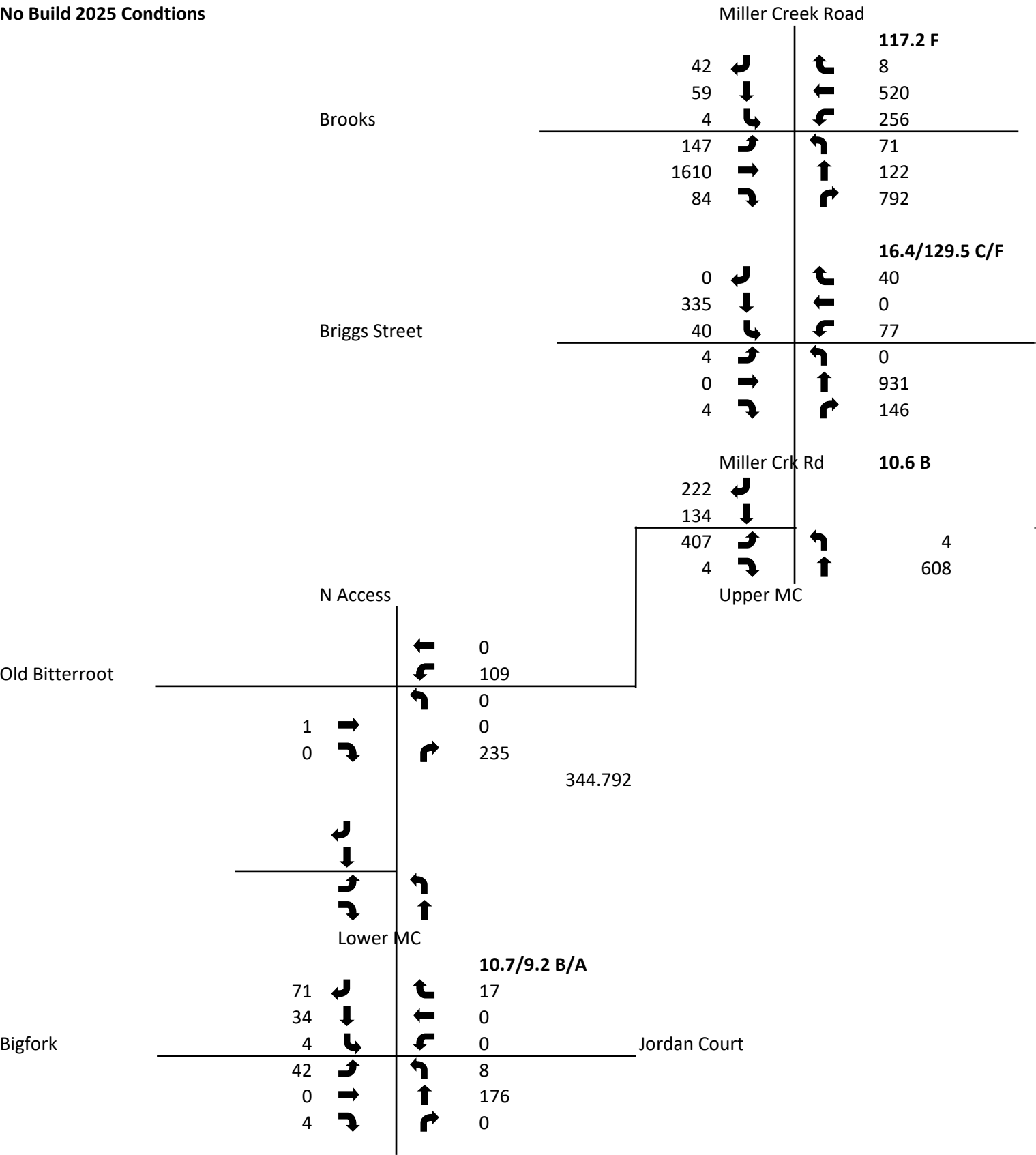


River Front Trails
 Traffic Model
 AM Modeled Traffic
 School Hour Traffic



River Front Trails
Traffic Model
AM Total Traffic
No Build 2025 Condtions

Growth Factor **1.048**

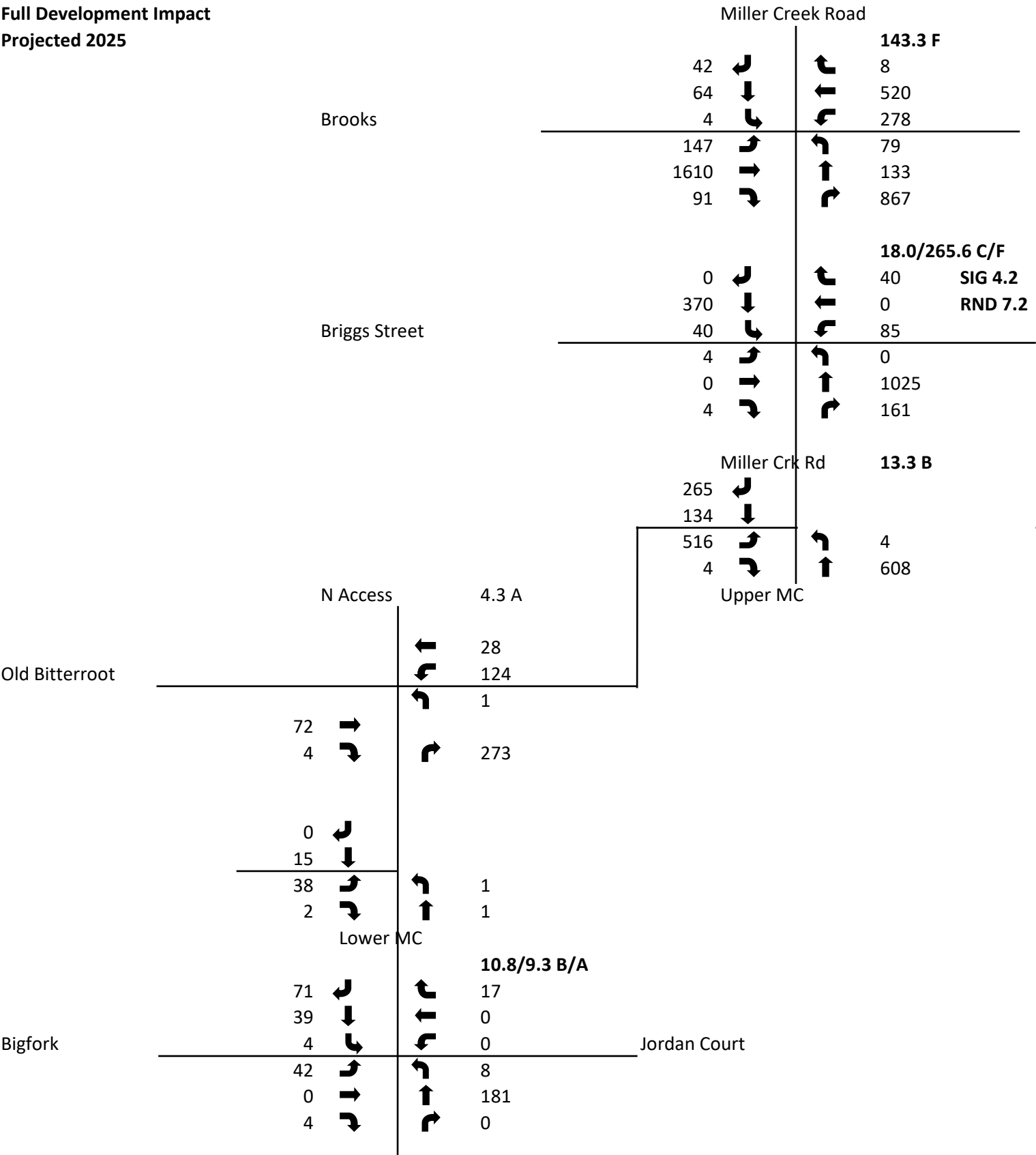


River Front Trails
Traffic Model
PM Total Traffic
No Build 2025 Condtions

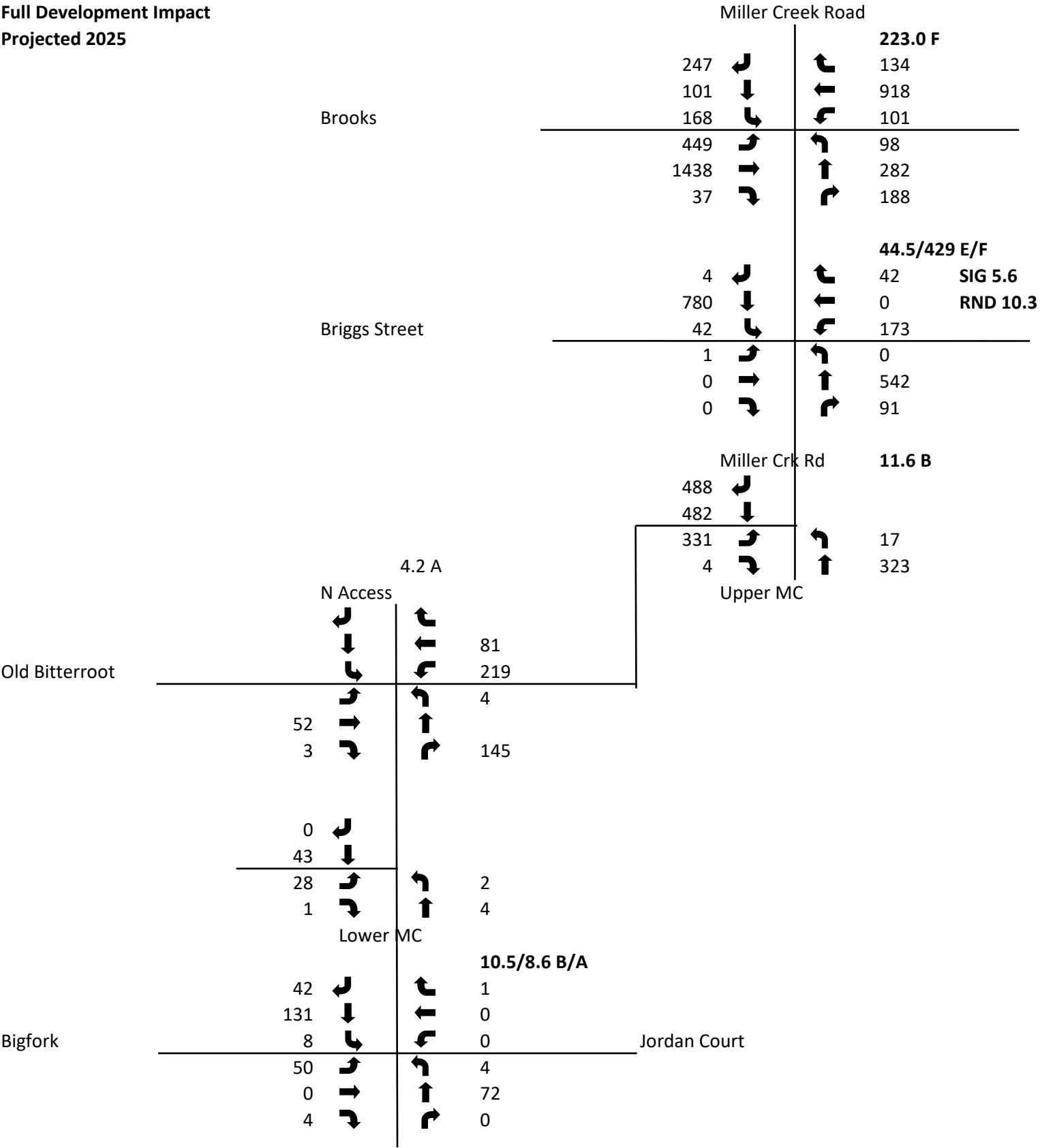
		Miller Creek Road			
				132.1 F	
Brooks	247	↶	↷	134	
	59	↓	↑	918	
	168	↷	↶	59	
	449	↷	↶	88	
	1438	→	↑	247	
	21	↷	↷	163	
				36.1/202.3 E/F	
Briggs Street	4	↶	↷	42	
	679	↓	↑	4	
	42	↷	↶	151	
	1	↷	↶	4	
	0	→	↑	474	
	0	↷	↷	91	
		Miller Crk Rd		9.4 A	
Old Bitterroot	365	↶			
	482	↓			
	252	↷	↶	17	
	4	↷	↑	323	
	Upper MC				
		N Access			
Old Bitterroot		↶	↷	1	
		↓	↑	176	
		↷	↶	0	
	0	→	↑	0	
	0	↷	↷	117	
				294.488	
Lower MC	0	↶			
	0	↓			
	0	↷	↶	0	
	0	↷	↑	0	
	Lower MC				
				10.4/8.6 B/A	
Lower MC	42	↶	↷	1	
	126	↓	↑	0	
	8	↷	↶	0	
	50	↷	↶	4	Jordan Court
	0	→	↑	67	
	4	↷	↷	0	

River Front Trails
Traffic Model
AM Total Traffic
Full Development Impact
Projected 2025

Growth Factor **1.048**

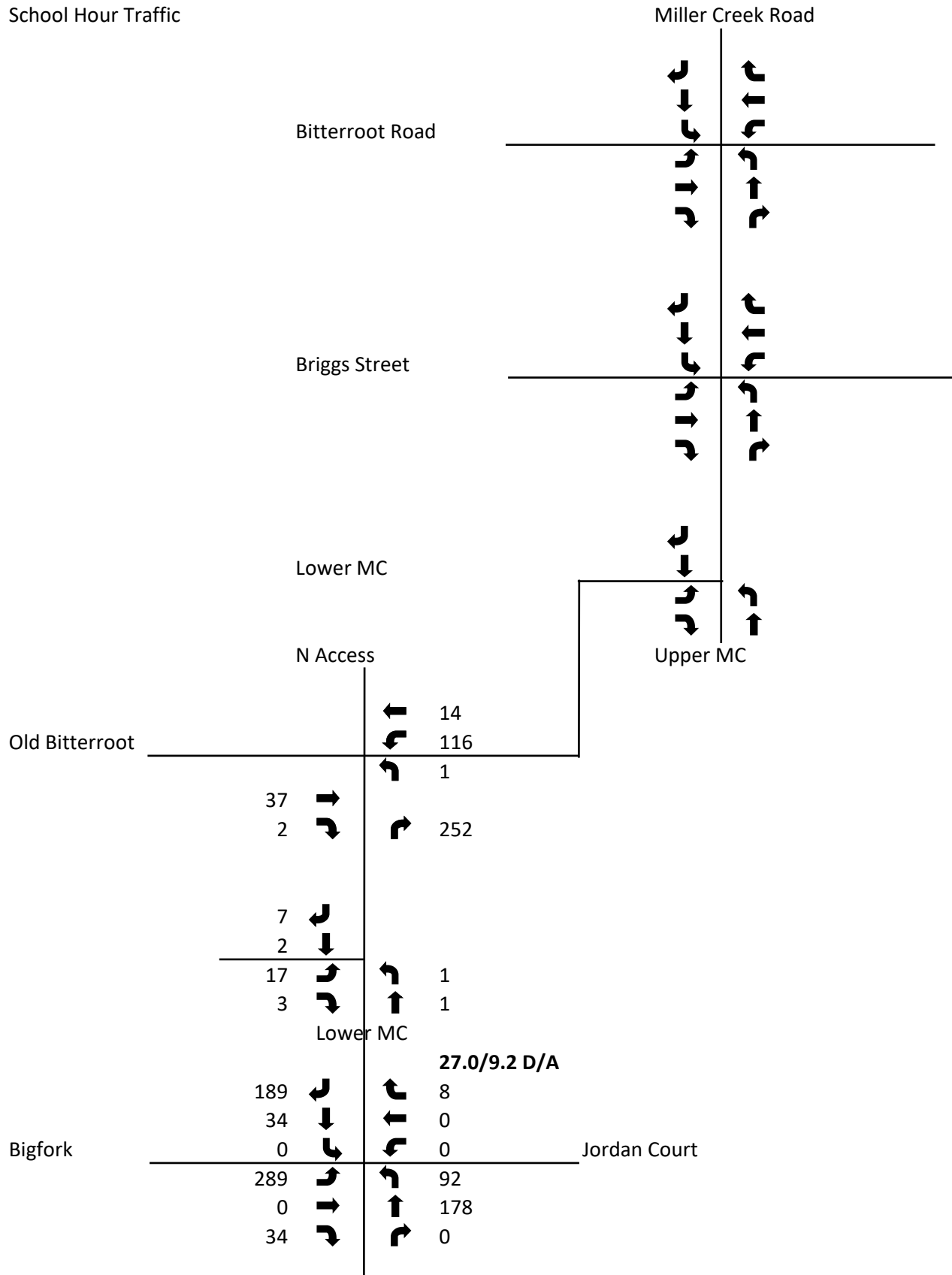


River Front Trails
Traffic Model
PM Total Traffic
Full Development Impact
Projected 2025

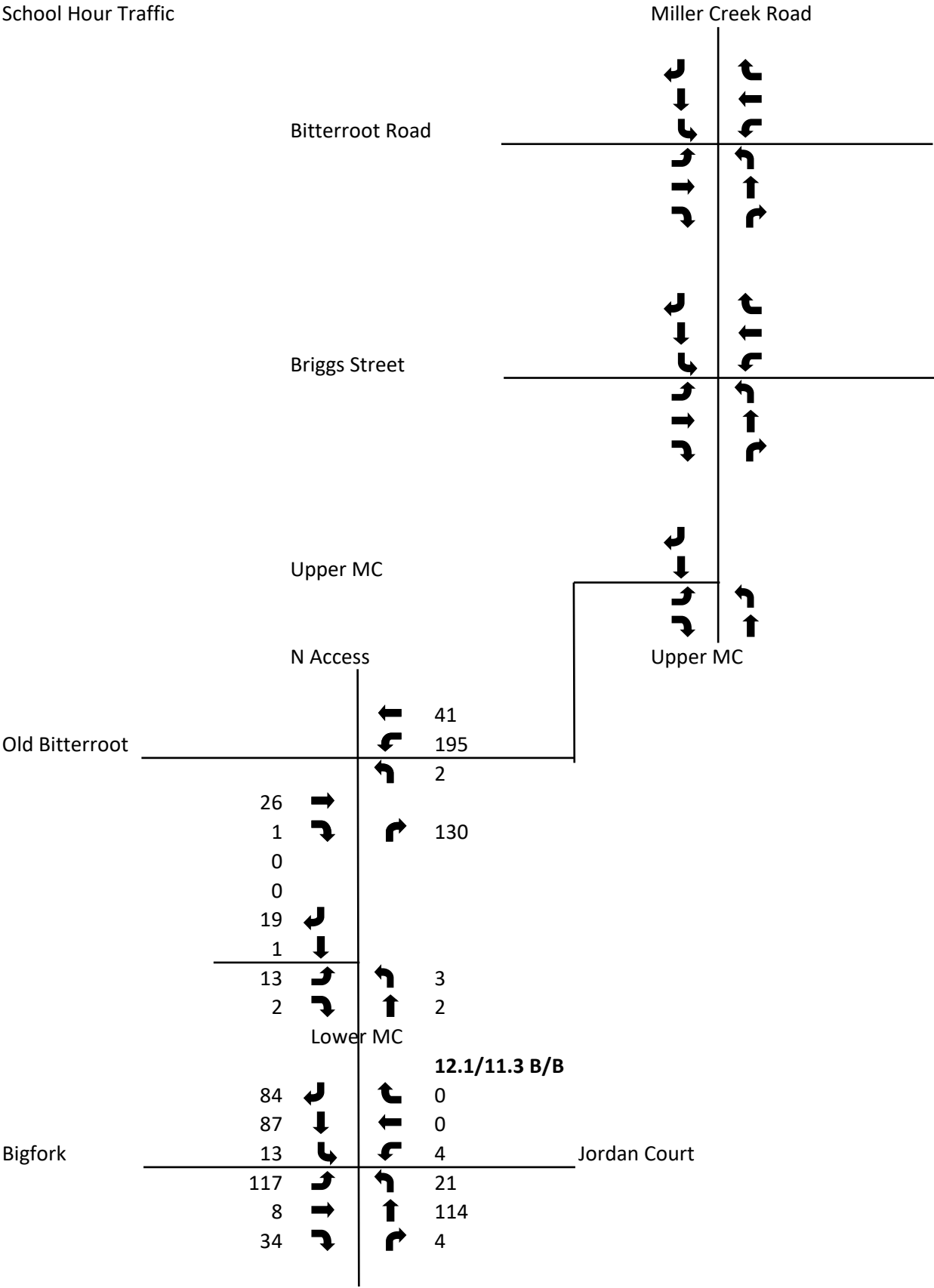


River Front Trails
 Traffic Model
 AM Total Traffic
 School Hour Traffic

Growth Factor **1.048**



River Front Trails
Traffic Model
PM Total Traffic
School Hour Traffic



APPENDIX C

LOS Calculations

HCS7 Two-Way Stop-Control Report

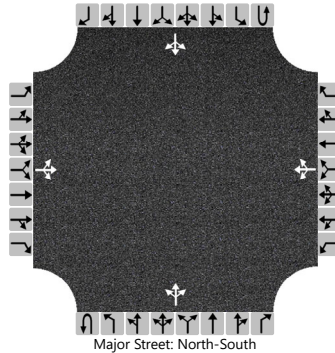
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2021
Time Analyzed	AM Peak Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Lower Miller & Bigfork
Jurisdiction	City of Missoula
East/West Street	Bigfork
North/South Street	Lower Miller Creek
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		40	0	4		0	0	16		8	168	0		4	32	68
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			44				16			8				4		
Capacity, c (veh/h)			688				874			1486				1404		
v/c Ratio			0.06				0.02			0.01				0.00		
95% Queue Length, Q ₉₅ (veh)			0.2				0.1			0.0				0.0		
Control Delay (s/veh)			10.6				9.2			7.4				7.6		
Level of Service (LOS)			B				A			A				A		
Approach Delay (s/veh)	10.6				9.2				0.4				0.3			
Approach LOS	B				A											

HCS7 Two-Way Stop-Control Report

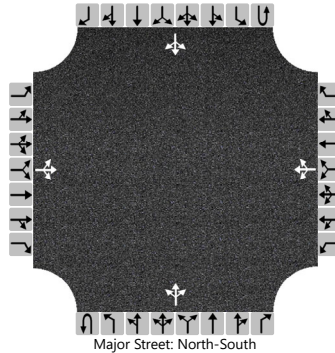
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2021
Time Analyzed	AM School Peak Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Lower Miller & Bigfork
Jurisdiction	City of Missoula
East/West Street	Bigfork
North/South Street	Lower Miller Creek
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		276	0	32		0	0	8		88	168	0		0	28	180
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			308				8			88				0		
Capacity, c (veh/h)			499				874			1357				1404		
v/c Ratio			0.62				0.01			0.06				0.00		
95% Queue Length, Q ₉₅ (veh)			4.1				0.0			0.2				0.0		
Control Delay (s/veh)			23.2				9.2			7.8				7.6		
Level of Service (LOS)			C				A			A				A		
Approach Delay (s/veh)	23.2				9.2				3.1				0.0			
Approach LOS	C				A											

HCS7 Two-Way Stop-Control Report

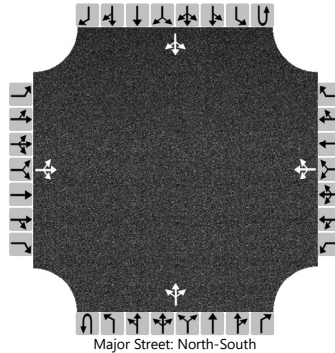
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2021
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Lower Miller & Bigfork
Jurisdiction	City of Missoula
East/West Street	Bigfork
North/South Street	Lower Miller Creek
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		48	0	4		0	0	1		4	64	0		8	120	40
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			52				1			4				8		
Capacity, c (veh/h)			731				998			1413				1532		
v/c Ratio			0.07				0.00			0.00				0.01		
95% Queue Length, Q ₉₅ (veh)			0.2				0.0			0.0				0.0		
Control Delay (s/veh)			10.3				8.6			7.6				7.4		
Level of Service (LOS)			B				A			A				A		
Approach Delay (s/veh)	10.3				8.6				0.5				0.4			
Approach LOS	B				A											

HCS7 Two-Way Stop-Control Report

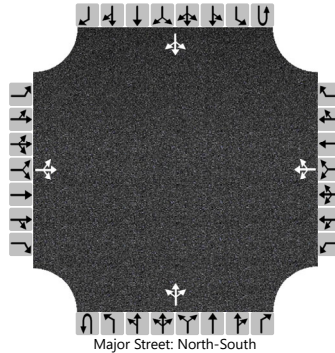
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2021
Time Analyzed	PM School Peak Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Lower Miller & Bigfork
Jurisdiction	City of Missoula
East/West Street	Bigfork
North/South Street	Lower Miller Creek
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		112	8	32		4	0	0		20	104	4		12	80	80
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

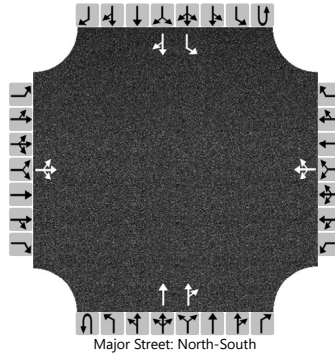
Flow Rate, v (veh/h)			152				4			20				12		
Capacity, c (veh/h)			689				601			1413				1476		
v/c Ratio			0.22				0.01			0.01				0.01		
95% Queue Length, Q ₉₅ (veh)			0.8				0.0			0.0				0.0		
Control Delay (s/veh)			11.7				11.0			7.6				7.5		
Level of Service (LOS)			B				B			A				A		
Approach Delay (s/veh)	11.7				11.0				1.3				0.6			
Approach LOS	B				B											

HCS7 Two-Way Stop-Control Report

General Information

Analyst	RLA	Intersection	Miller Creek Road & Brigg
Agency/Co.	ATS	Jurisdiction	City of Missoula
Date Performed	4/20/2021	East/West Street	Briggs Street
Analysis Year	2021	North/South Street	Miller Creek Road
Time Analyzed	AM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Riverfront Trails Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	2	0	0	1	1	0
Configuration			LTR				LTR				T	TR		L		TR
Volume (veh/h)		4	0	4		73	0	39			888	139	0	39	320	4
Percent Heavy Vehicles (%)		3	3	3		3	3	3					3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.2		7.5	6.5	6.9						4.1		
Critical Headway (sec)		7.56	6.56	6.26		7.56	6.56	6.96						4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3						2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33						2.23		

Delay, Queue Length, and Level of Service

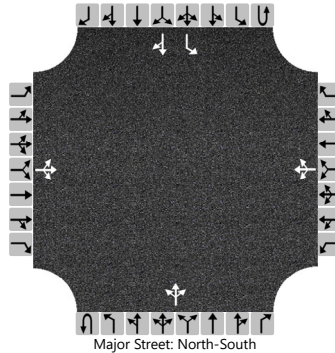
Flow Rate, v (veh/h)			8				112							39		
Capacity, c (veh/h)			342				140							666		
v/c Ratio			0.02				0.80							0.06		
95% Queue Length, Q ₉₅ (veh)			0.1				5.0							0.2		
Control Delay (s/veh)			15.8				92.1							10.7		
Level of Service (LOS)			C				F							B		
Approach Delay (s/veh)	15.8				92.1								1.2			
Approach LOS	C				F											

HCS7 Two-Way Stop-Control Report

General Information

Analyst	RLA	Intersection	Miller Creek Road & Brigg
Agency/Co.	ATS	Jurisdiction	City of Missoula
Date Performed	4/20/2021	East/West Street	Briggs Street
Analysis Year	2021	North/South Street	Miller Creek Road
Time Analyzed	PM Peak Hour	Peak Hour Factor	1.00
Intersection Orientation	North-South	Analysis Time Period (hrs)	0.25
Project Description	Riverfront Trails Residential Development		

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	1	1	0
Configuration			LTR				LTR				LTR			L		TR
Volume (veh/h)		1	0	0		144	4	40		4	452	76		40	648	4
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

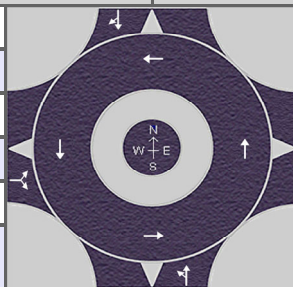
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			1				188			4				40		
Capacity, c (veh/h)			131				177			930				1034		
v/c Ratio			0.01				1.06			0.00				0.04		
95% Queue Length, Q ₉₅ (veh)			0.0				9.1			0.0				0.1		
Control Delay (s/veh)			32.6				138.1			8.9				8.6		
Level of Service (LOS)			D				F			A				A		
Approach Delay (s/veh)	32.6				138.1				0.1				0.5			
Approach LOS	D				F											

HCS7 Roundabouts Report

General Information

Analyst	RLA
Agency or Co.	ATS
Date Performed	4/20/2021
Analysis Year	2021
Time Analyzed	AM Peak Hour
Project Description	Riverfront trails



Site Information

Intersection	Miller & Lower Miller
E/W Street Name	Lower Miller Creek
N/S Street Name	Miller Creek
Analysis Time Period (hrs)	0.25
Peak Hour Factor	1.00
Jurisdiction	City of Missoula

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LR								LT				TR			
Volume (V), veh/h	0	388		4					0	4	580		0		128	212
Percent Heavy Vehicles, %	3	3		3					3	3	3		3		3	3
Flow Rate (V_{PCE}), pc/h	0	400		4					0	4	597		0		132	218
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763						4.9763			4.9763	
Follow-Up Headway (s)		2.6087						2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		404						601			350	
Entry Volume, veh/h		392						583			340	
Circulating Flow (v_c), pc/h	132			1001			400			4		
Exiting Flow (v_{ex}), pc/h	0			222			997			136		
Capacity (C_{PCE}), pc/h		1206						918			1374	
Capacity (c), veh/h		1171						891			1334	
v/c Ratio (x)		0.33						0.65			0.25	

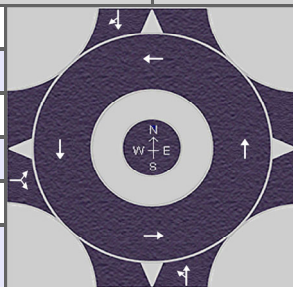
Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		6.3						14.6			4.9	
Lane LOS		A						B			A	
95% Queue, veh		1.5						5.0			1.0	
Approach Delay, s/veh	6.3						14.6			4.9		
Approach LOS	A						B			A		
Intersection Delay, s/veh LOS	9.6						A					

HCS7 Roundabouts Report

General Information

Analyst	RLA
Agency or Co.	ATS
Date Performed	4/20/2021
Analysis Year	2021
Time Analyzed	PM Peak Hour
Project Description	Riverfront trails



Site Information

Intersection	Miller & Lower Miller
E/W Street Name	Lower Miller Creek
N/S Street Name	Miller Creek
Analysis Time Period (hrs)	0.25
Peak Hour Factor	1.00
Jurisdiction	City of Missoula

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LR								LT				TR			
Volume (V), veh/h	0	240		4					0	16	308		0		460	348
Percent Heavy Vehicles, %	3	3		3					3	3	3		3		3	3
Flow Rate (V_{PCE}), pc/h	0	247		4					0	16	317		0		474	358
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763						4.9763			4.9763	
Follow-Up Headway (s)		2.6087						2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		251						333			832	
Entry Volume, veh/h		244						323			808	
Circulating Flow (v_c), pc/h	474			580			247			16		
Exiting Flow (v_{ex}), pc/h	0			374			564			478		
Capacity (C_{PCE}), pc/h		851						1073			1358	
Capacity (c), veh/h		826						1041			1318	
v/c Ratio (x)		0.29						0.31			0.61	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.6						6.6			10.0	
Lane LOS		A						A			B	
95% Queue, veh		1.2						1.3			4.4	
Approach Delay, s/veh	7.6						6.6			10.0		
Approach LOS	A						A			B		
Intersection Delay, s/veh LOS	8.8						A					

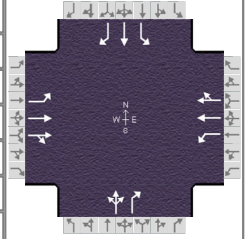
HCS7 Signalized Intersection Results Summary

General Information

Agency	ATS		
Analyst	RLA	Analysis Date	Apr 20, 2021
Jurisdiction		Time Period	AM Peak Hour
Urban Street	Brooks	Analysis Year	2021
Intersection	Brooks & Miller Creek	File Name	BrooksAM.xus
Project Description	Riverfront Trails		

Intersection Information

Duration, h	0.250
Area Type	Other
PHF	1.00
Analysis Period	1> 7:00



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	140	1536	80	244	496	8	68	116	756	4	56	40

Signal Information

Cycle, s	140.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	6.0	3.0	64.0	0.9	50.1	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	0.0	4.0	4.0	4.0	0.0		
				Red	0.0	0.0	0.0	0.0	0.0	0.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	0.0	13.0	1.1	3.0
Phase Duration, s	10.0	68.0	13.0	71.0	0.0	54.1	4.9	59.0
Change Period, ($Y+R_c$), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway (MAH), s	3.3	0.0	3.0	0.0	0.0	3.4	3.0	3.4
Queue Clearance Time (g_s), s	7.9		11.0			52.1	2.2	4.6
Green Extension Time (g_e), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
Phase Call Probability	1.00		1.00			1.00	0.14	1.00
Max Out Probability	1.00		1.00			1.00	0.00	0.00

Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	140	812	804	244	253	251		184	756	4	56	40
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1900	1867	1810	1900	1889		133	1610	1810	1900	1610
Queue Service Time (g_s), s	5.9	56.8	57.5	9.0	11.2	11.2		6.0	50.1	0.2	2.6	2.0
Cycle Queue Clearance Time (g_c), s	5.9	56.8	57.5	9.0	11.2	11.2		50.1	50.1	0.2	2.6	2.0
Green Ratio (g/C)	0.50	0.46	0.46	0.53	0.48	0.48		0.36	0.42	0.38	0.39	0.44
Capacity (c), veh/h	478	868	853	183	909	904		83	681	63	746	702
Volume-to-Capacity Ratio (X)	0.293	0.935	0.943	1.336	0.278	0.278		2.221	1.111	0.064	0.075	0.057
Back of Queue (Q), ft/ln (50 th percentile)	63.9	765.6	768.7	392.1	126.7	126.2		411.1	909.2	2.1	29	18.9
Back of Queue (Q), veh/ln (50 th percentile)	2.6	30.6	30.7	15.7	5.1	5.0		16.4	36.4	0.1	1.2	0.8
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	19.4	36.1	36.3	39.8	22.0	22.0		42.2	40.4	36.8	26.6	22.8
Incremental Delay (d_2), s/veh	0.1	18.4	19.7	183.5	0.8	0.8		586.3	69.1	0.2	0.0	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	19.5	54.5	56.0	223.3	22.7	22.7		628.5	109.5	37.0	26.6	22.9
Level of Service (LOS)	B	D	E	F	C	C		F	F	D	C	C
Approach Delay, s/veh / LOS	52.4		D	88.2		F	211.1		F	25.5		C
Intersection Delay, s/veh / LOS	101.3						F					

Multimodal Results

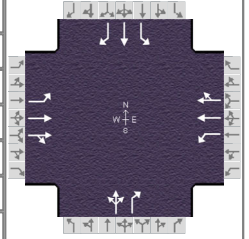
	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.92		B	2.11		B	2.29		B	2.29		B
Bicycle LOS Score / LOS	1.94		B	1.10		A	2.04		B	0.65		A

HCS7 Signalized Intersection Results Summary

General Information

Agency	ATS		
Analyst	RLA	Analysis Date	Apr 20, 2021
Jurisdiction		Time Period	PM Peak Hour
Urban Street	Brooks	Analysis Year	2021
Intersection	Brooks & Miller Creek	File Name	BrooksPM.xus
Project Description	Riverfront Trails		

Intersection Information



Demand Information

	EB			WB			NB			SB		
Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h	428	1372	20	56	876	128	84	236	156	160	56	236

Signal Information

Cycle, s	140.0	Reference Phase	2									
Offset, s	0	Reference Point	End									
Uncoordinated	No	Simult. Gap E/W	On	Green	5.4	15.6	41.8	7.0	50.2	0.0		
Force Mode	Fixed	Simult. Gap N/S	On	Yellow	4.0	4.0	4.0	4.0	4.0	0.0		
				Red	0.0	0.0	0.0	0.0	0.0	0.0		

Timer Results

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Assigned Phase	5	2	1	6	3	8	7	4
Case Number	1.1	4.0	1.1	4.0	0.0	13.0	1.1	3.0
Phase Duration, s	29.1	65.4	9.4	45.8	0.0	54.2	11.0	65.2
Change Period, ($Y+R_c$), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Max Allow Headway (MAH), s	3.3	0.0	3.0	0.0	0.0	3.3	3.0	3.3
Queue Clearance Time (g_s), s	24.2		4.9			50.4	9.0	11.6
Green Extension Time (g_e), s	0.9	0.0	0.1	0.0	0.0	1.6	0.0	1.6
Phase Call Probability	1.00		0.89			1.00	1.00	1.00
Max Out Probability	0.00		0.00			0.00	1.00	0.00

Movement Group Results

Approach Movement	L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement	5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h	428	697	695	56	514	490		320	156	160	56	236
Adjusted Saturation Flow Rate (s), veh/h/ln	1810	1900	1890	1810	1900	1815		225	1610	1810	1900	1610
Queue Service Time (g_s), s	22.2	44.6	44.7	2.9	35.7	35.7		6.0	9.2	7.0	2.4	9.6
Cycle Queue Clearance Time (g_c), s	22.2	44.6	44.7	2.9	35.7	35.7		48.4	9.2	7.0	2.4	9.6
Green Ratio (g/C)	0.51	0.44	0.44	0.35	0.30	0.30		0.36	0.40	0.41	0.44	0.62
Capacity (c), veh/h	456	857	852	174	592	566		110	620	322	805	970
Volume-to-Capacity Ratio (X)	0.939	0.814	0.815	0.321	0.867	0.867		2.907	0.252	0.496	0.070	0.243
Back of Queue (Q), ft/ln (50 th percentile)	326.4	564.6	562.7	31.7	472.5	454.1		723.9	92.1	86	27.2	82.5
Back of Queue (Q), veh/ln (50 th percentile)	13.1	22.6	22.5	1.3	18.9	18.2		29.0	3.7	3.4	1.1	3.3
Queue Storage Ratio (RQ) (50 th percentile)	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh	29.5	33.3	33.4	33.1	45.4	45.4		38.3	29.3	32.7	23.9	13.0
Incremental Delay (d_2), s/veh	27.1	8.4	8.4	0.4	15.7	16.3		861.6	0.1	0.4	0.0	0.0
Initial Queue Delay (d_3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh	56.5	41.7	41.8	33.5	61.2	61.8		899.9	29.4	33.1	23.9	13.0
Level of Service (LOS)	E	D	D	C	E	E		F	C	C	C	B
Approach Delay, s/veh / LOS	45.2	D		60.0		E	614.6	F		21.5		C
Intersection Delay, s/veh / LOS	117.7						F					

Multimodal Results

	EB			WB			NB			SB		
Pedestrian LOS Score / LOS	1.92	B		2.13	B		2.29	B		2.28	B	
Bicycle LOS Score / LOS	1.99	B		1.36	A		1.27	A		1.23	A	

HCS7 Two-Way Stop-Control Report

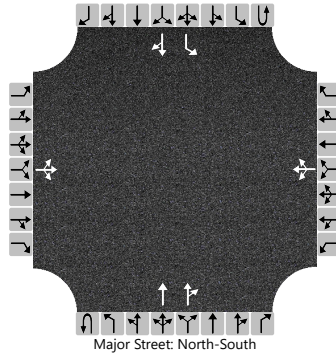
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2025
Time Analyzed	AM Projected Peak Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Miller Creek Road & Brigg
Jurisdiction	City of Missoula
East/West Street	Briggs Street
North/South Street	Miller Creek Road
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	2	0	0	1	1	0
Configuration			LTR				LTR				T	TR		L		TR
Volume (veh/h)		4	0	4		85	0	40			1025	161	0	40	370	0
Percent Heavy Vehicles (%)		3	3	3		3	3	3					3	3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.5	6.5	6.2		7.5	6.5	6.9						4.1		
Critical Headway (sec)		7.56	6.56	6.26		7.56	6.56	6.96						4.16		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3						2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33						2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			8				125								40	
Capacity, c (veh/h)			284				97								579	
v/c Ratio			0.03				1.28								0.07	
95% Queue Length, Q ₉₅ (veh)			0.1				8.8								0.2	
Control Delay (s/veh)			18.0				265.6								11.7	
Level of Service (LOS)			C				F								B	
Approach Delay (s/veh)	18.0				265.6								1.1			
Approach LOS	C				F											

HCS7 Two-Way Stop-Control Report

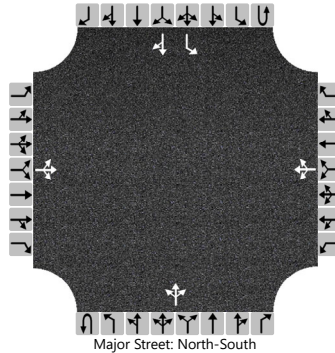
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2025
Time Analyzed	PM Projected Peak Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Miller Creek Road & Brigg
Jurisdiction	City of Missoula
East/West Street	Briggs Street
North/South Street	Miller Creek Road
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	1	1	0
Configuration			LTR				LTR				LTR			L		TR
Volume (veh/h)		1	0	0		173	0	42		0	542	91		42	780	4
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

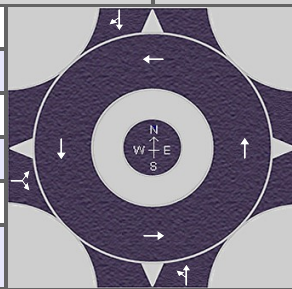
Flow Rate, v (veh/h)			1			215				0				42		
Capacity, c (veh/h)			92			123				830				945		
v/c Ratio			0.01			1.75				0.00				0.04		
95% Queue Length, Q ₉₅ (veh)			0.0			16.4				0.0				0.1		
Control Delay (s/veh)			44.5			428.8				9.3				9.0		
Level of Service (LOS)			E			F				A				A		
Approach Delay (s/veh)	44.5				428.8				0.0				0.5			
Approach LOS	E				F											

HCS7 Roundabouts Report

General Information

Analyst	RLA
Agency or Co.	ATS
Date Performed	4/20/2021
Analysis Year	2025
Time Analyzed	AM Projected Peak Hour
Project Description	Riverfront trails

Site Information



Intersection	Miller & Lower Millier
E/W Street Name	Lower Miller Creek
N/S Street Name	Miller Creek
Analysis Time Period (hrs)	0.25
Peak Hour Factor	1.00
Jurisdiction	City of Missoula

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LR								LT				TR			
Volume (V), veh/h	0	516		4					0	4	608		0		134	265
Percent Heavy Vehicles, %	3	3		3					3	3	3		3		3	3
Flow Rate (V_{PCE}), pc/h	0	531		4					0	4	626		0		138	273
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763						4.9763			4.9763	
Follow-Up Headway (s)		2.6087						2.6087			2.6087	

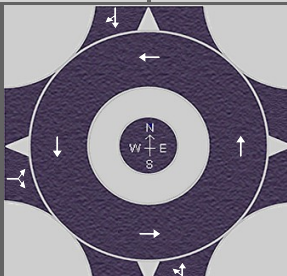
Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		535						630			411	
Entry Volume, veh/h		519						612			399	
Circulating Flow (v_c), pc/h	138			1161			531			4		
Exiting Flow (v_{ex}), pc/h	0			277			1157			142		
Capacity (C_{PCE}), pc/h		1199						803			1374	
Capacity (c), veh/h		1164						780			1334	
v/c Ratio (x)		0.45						0.78			0.30	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		7.8						23.2			5.3	
Lane LOS		A						C			A	
95% Queue, veh		2.3						7.9			1.3	
Approach Delay, s/veh	7.8						23.2			5.3		
Approach LOS	A						C			A		
Intersection Delay, s/veh LOS	13.3						B					

HCS7 Roundabouts Report

General Information			Site Information		
Analyst	RLA		Intersection	Miller & Lower Millier	
Agency or Co.	ATS		E/W Street Name	Lower Miller Creek	
Date Performed	4/20/2021		N/S Street Name	Miller Creek	
Analysis Year	2025		Analysis Time Period (hrs)	0.25	
Time Analyzed	PM Projected Peak Hour		Peak Hour Factor	1.00	
Project Description	Riverfront trails		Jurisdiction	City of Missoula	

Volume Adjustments and Site Characteristics

Approach	EB				WB				NB				SB			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Number of Lanes (N)	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0
Lane Assignment	LR								LT				TR			
Volume (V), veh/h	0	331		4					0	17	323		0		482	488
Percent Heavy Vehicles, %	3	3		3					3	3	3		3		3	3
Flow Rate (V_{PCE}), pc/h	0	341		4					0	18	333		0		496	503
Right-Turn Bypass	None				None				None				None			
Conflicting Lanes	1								1				1			
Pedestrians Crossing, p/h	0								0				0			

Critical and Follow-Up Headway Adjustment

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Critical Headway (s)		4.9763						4.9763			4.9763	
Follow-Up Headway (s)		2.6087						2.6087			2.6087	

Flow Computations, Capacity and v/c Ratios

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Entry Flow (v_e), pc/h		345						351			999	
Entry Volume, veh/h		335						341			970	
Circulating Flow (v_c), pc/h	496			692			341			18		
Exiting Flow (v_{ex}), pc/h	0			521			674			500		
Capacity (C_{PCE}), pc/h		832						975			1355	
Capacity (c), veh/h		808						946			1315	
v/c Ratio (x)		0.41						0.36			0.74	

Delay and Level of Service

Approach	EB			WB			NB			SB		
Lane	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass	Left	Right	Bypass
Lane Control Delay (d), s/veh		9.6						7.7			13.7	
Lane LOS		A						A			B	
95% Queue, veh		2.1						1.7			7.2	
Approach Delay, s/veh	9.6						7.7			13.7		
Approach LOS	A						A			B		
Intersection Delay, s/veh LOS	11.6						B					

HCS7 Two-Way Stop-Control Report

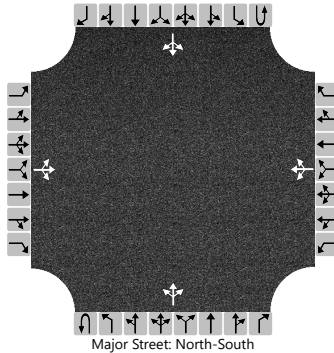
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2025
Time Analyzed	AM Projected Peak Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Lower Miller & Bigfork
Jurisdiction	City of Missoula
East/West Street	Bigfork
North/South Street	Lower Miller Creek
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		42	0	4		0	0	17		8	181	0		4	39	71
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			46				17			8				4		
Capacity, c (veh/h)			665				859			1474				1388		
v/c Ratio			0.07				0.02			0.01				0.00		
95% Queue Length, Q ₉₅ (veh)			0.2				0.1			0.0				0.0		
Control Delay (s/veh)			10.8				9.3			7.5				7.6		
Level of Service (LOS)			B				A			A				A		
Approach Delay (s/veh)	10.8				9.3				0.4				0.3			
Approach LOS	B				A											

HCS7 Two-Way Stop-Control Report

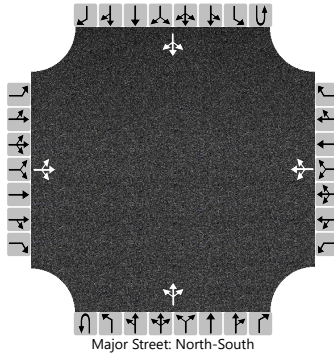
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2025
Time Analyzed	PM Projected Peak Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Lower Miller & Bigfork
Jurisdiction	City of Missoula
East/West Street	Bigfork
North/South Street	Lower Miller Creek
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		50	0	4		0	0	1		4	72	0		8	131	42
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			54				1				4				8	
Capacity, c (veh/h)			709				987				1398				1522	
v/c Ratio			0.08				0.00				0.00				0.01	
95% Queue Length, Q ₉₅ (veh)			0.2				0.0				0.0				0.0	
Control Delay (s/veh)			10.5				8.6				7.6				7.4	
Level of Service (LOS)			B				A				A				A	
Approach Delay (s/veh)	10.5				8.6				0.4				0.4			
Approach LOS	B				A											

HCS7 Two-Way Stop-Control Report

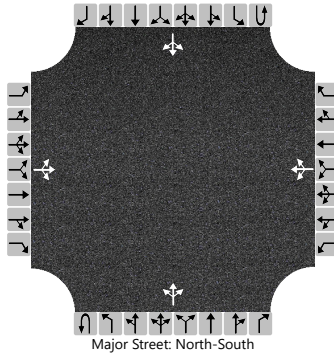
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2025
Time Analyzed	AM Projected School Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Lower Miller & Bigfork
Jurisdiction	City of Missoula
East/West Street	Bigfork
North/South Street	Lower Miller Creek
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		289	0	34		0	0	8		92	178	0		0	34	189
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			323				8			92				0		
Capacity, c (veh/h)			477				862			1340				1392		
v/c Ratio			0.68				0.01			0.07				0.00		
95% Queue Length, Q ₉₅ (veh)			5.0				0.0			0.2				0.0		
Control Delay (s/veh)			27.0				9.2			7.9				7.6		
Level of Service (LOS)			D				A			A				A		
Approach Delay (s/veh)	27.0				9.2				3.1				0.0			
Approach LOS	D				A											

HCS7 Two-Way Stop-Control Report

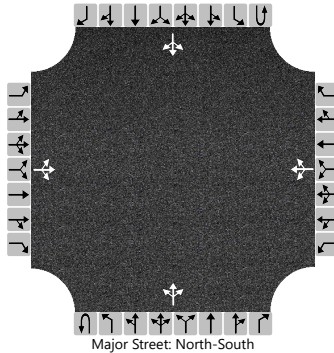
General Information

Analyst	RLA
Agency/Co.	ATS
Date Performed	4/20/2021
Analysis Year	2025
Time Analyzed	Project PM School Hour
Intersection Orientation	North-South
Project Description	Riverfront Trails Residential Development

Site Information

Intersection	Lower Miller & Bigfork
Jurisdiction	City of Missoula
East/West Street	Bigfork
North/South Street	Lower Miller Creek
Peak Hour Factor	1.00
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume (veh/h)		117	8	34		4	0	0		21	114	4		13	87	84
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized																
Median Type Storage	Undivided															

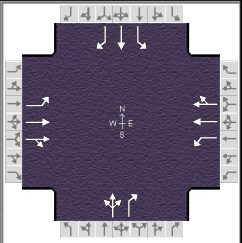
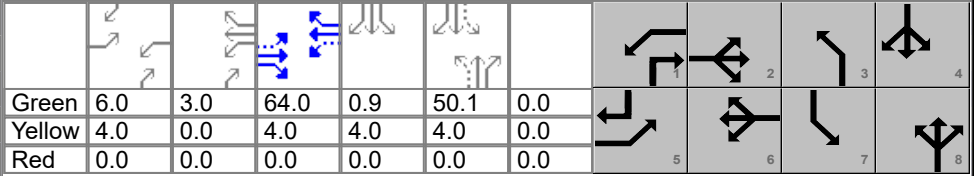
Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

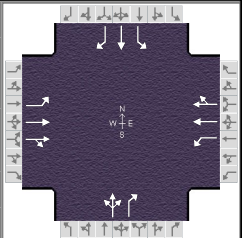
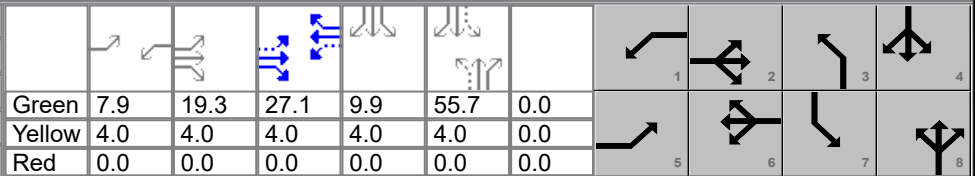
Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			159				4				21				13	
Capacity, c (veh/h)			668				577				1400				1464	
v/c Ratio			0.24				0.01				0.01				0.01	
95% Queue Length, Q ₉₅ (veh)			0.9				0.0				0.0				0.0	
Control Delay (s/veh)			12.1				11.3				7.6				7.5	
Level of Service (LOS)			B				B				A				A	
Approach Delay (s/veh)	12.1				11.3				1.3				0.6			
Approach LOS	B				B											

HCS7 Signalized Intersection Results Summary

General Information						Intersection Information															
Agency		ATS				Duration, h		0.250													
Analyst		RLA		Analysis Date		Apr 20, 2021		Area Type		Other											
Jurisdiction				Time Period		AM Peak Hour		PHF		1.00											
Urban Street		Brooks		Analysis Year		2025		Analysis Period		1> 7:00											
Intersection		Brooks & Miller Creek		File Name		BrooksAMupdate.xus															
Project Description		Riverfront Trails																			
Demand Information						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Demand (v), veh/h						147	1610	91	278	520	8	79	133	867	4	64	42				
Signal Information																					
Cycle, s		140.0	Reference Phase		2																
Offset, s		0	Reference Point		End																
Uncoordinated		No	Simult. Gap E/W		On		Green	6.0	3.0	64.0	0.9	50.1	0.0								
Force Mode		Fixed	Simult. Gap N/S		On		Yellow	4.0	0.0	4.0	4.0	4.0	0.0								
						Red	0.0	0.0	0.0	0.0	0.0	0.0									
Timer Results						EBL		EBT		WBL		WBT		NBL		NBT		SBL		SBT	
Assigned Phase						5		2		1		6		3		8		7		4	
Case Number						1.1		4.0		1.1		4.0		0.0		13.0		1.1		3.0	
Phase Duration, s						10.0		68.0		13.0		71.0		0.0		54.1		4.9		59.0	
Change Period, (Y+R c), s						4.0		4.0		4.0		4.0		4.0		4.0		4.0		4.0	
Max Allow Headway (MAH), s						3.3		0.0		3.0		0.0		0.0		3.4		3.0		3.4	
Queue Clearance Time (g s), s						8.0				11.0						52.1		2.2		5.0	
Green Extension Time (g e), s						0.0		0.0		0.0		0.0		0.0		0.0		0.0		3.7	
Phase Call Probability						1.00				1.00						1.00		0.14		1.00	
Max Out Probability						1.00				1.00						1.00		0.00		0.00	
Movement Group Results						EB			WB			NB			SB						
Approach Movement						L	T	R	L	T	R	L	T	R	L	T	R				
Assigned Movement						5	2	12	1	6	16	3	8	18	7	4	14				
Adjusted Flow Rate (v), veh/h						147	854	847	278	265	263		212	867	4	64	42				
Adjusted Saturation Flow Rate (s), veh/h/ln						1810	1900	1864	1810	1900	1890		128	1610	1810	1900	1610				
Queue Service Time (g s), s						6.0	62.1	63.3	9.0	11.8	11.8		6.0	50.1	0.2	3.0	2.1				
Cycle Queue Clearance Time (g c), s						6.0	62.1	63.3	9.0	11.8	11.8		50.1	50.1	0.2	3.0	2.1				
Green Ratio (g/C)						0.50	0.46	0.46	0.53	0.48	0.48		0.36	0.42	0.38	0.39	0.44				
Capacity (c), veh/h						467	868	852	169	909	904		81	681	63	746	702				
Volume-to-Capacity Ratio (X)						0.315	0.984	0.994	1.641	0.291	0.291		2.609	1.274	0.064	0.086	0.060				
Back of Queue (Q), ft/ln (50 th percentile)						67.4	878.6	890.9	516.8	133.5	133.2		500.3	1218.9	2.1	33.3	19.8				
Back of Queue (Q), veh/ln (50 th percentile)						2.7	35.1	35.6	20.7	5.3	5.3		20.0	48.8	0.1	1.3	0.8				
Queue Storage Ratio (RQ) (50 th percentile)						0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00				
Uniform Delay (d 1), s/veh						19.7	37.5	37.8	43.6	22.1	22.1		42.6	40.4	36.8	26.7	22.9				
Incremental Delay (d 2), s/veh						0.1	26.9	29.5	313.4	0.8	0.8		758.4	134.6	0.2	0.0	0.0				
Initial Queue Delay (d 3), s/veh						0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0				
Control Delay (d), s/veh						19.9	64.4	67.4	357.0	22.9	23.0		801.0	175.0	37.0	26.7	22.9				
Level of Service (LOS)						B	E	E	F	C	C		F	F	D	C	C				
Approach Delay, s/veh / LOS						62.2		E		138.2		F		298.0		F		25.6		C	
Intersection Delay, s/veh / LOS						143.3						F									
Multimodal Results						EB			WB			NB			SB						
Pedestrian LOS Score / LOS						1.92		B		2.11		B		2.29		B		2.29		B	
Bicycle LOS Score / LOS						2.01		B		1.15		A		2.27		B		0.67		A	

HCS7 Signalized Intersection Results Summary

General Information						Intersection Information									
Agency	ATS					Duration, h		0.250							
Analyst	RLA		Analysis Date	Apr 20, 2021		Area Type		Other							
Jurisdiction			Time Period	Projected PM Peak Hour		PHF		1.00							
Urban Street	Brooks		Analysis Year	2025		Analysis Period		1> 7:00							
Intersection	Brooks & Miller Creek		File Name	BrooksPMupdate.xus											
Project Description	Riverfront Trails														
Demand Information				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Demand (v), veh/h				449	1438	37	101	918	134	98	282	188	168	101	247
Signal Information															
Cycle, s	140.0	Reference Phase	2												
Offset, s	0	Reference Point	End												
Uncoordinated	No	Simult. Gap E/W	On												
Force Mode	Fixed	Simult. Gap N/S	On												
Green	7.9	19.3	27.1	9.9	55.7	0.0									
Yellow	4.0	4.0	4.0	4.0	4.0	0.0									
Red	0.0	0.0	0.0	0.0	0.0	0.0									
Timer Results				EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT				
Assigned Phase				5	2	1	6	3	8	7	4				
Case Number				1.1	4.0	1.1	4.0	0.0	13.0	1.1	3.0				
Phase Duration, s				35.3	54.4	11.9	31.1	0.0	59.7	13.9	73.6				
Change Period, ($Y+R_c$), s				4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Allow Headway (MAH), s				3.3	0.0	3.0	0.0	0.0	3.3	3.0	3.3				
Queue Clearance Time (g_s), s				31.8		8.0			55.7	9.6	15.1				
Green Extension Time (g_e), s				1.0	0.0	0.2	0.0	0.0	2.0	0.2	2.0				
Phase Call Probability				1.00		0.98			1.00	1.00	1.00				
Max Out Probability				0.00		0.00			0.00	0.00	0.00				
Movement Group Results				EB			WB			NB			SB		
Approach Movement				L	T	R	L	T	R	L	T	R	L	T	R
Assigned Movement				5	2	12	1	6	16	3	8	18	7	4	14
Adjusted Flow Rate (v), veh/h				449	740	735	101	566	486		380	188	168	101	247
Adjusted Saturation Flow Rate (s), veh/h/ln				1810	1900	1883	1810	1900	1629		177	1610	1810	1900	1610
Queue Service Time (g_s), s				29.8	52.3	52.3	6.0	30.4	30.4		6.0	11.4	7.6	4.1	13.1
Cycle Queue Clearance Time (g_c), s				29.8	52.3	52.3	6.0	30.4	30.4		53.7	11.4	7.6	4.1	13.1
Green Ratio (g/C)				0.45	0.36	0.36	0.27	0.19	0.19		0.40	0.40	0.47	0.50	0.50
Capacity (c), veh/h				446	710	704	159	413	354		100	618	217	920	780
Volume-to-Capacity Ratio (X)				1.008	1.042	1.044	0.635	1.372	1.372		3.789	0.304	0.773	0.110	0.317
Back of Queue (Q), ft/ln (50 th percentile)				460.3	837.8	834.7	67.7	876.3	757.3		941	113.8	82.1	44.2	120.7
Back of Queue (Q), veh/ln (50 th percentile)				18.4	33.5	33.4	2.7	35.1	30.3		37.6	4.6	3.3	1.8	4.8
Queue Storage Ratio (RQ) (50 th percentile)				0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00
Uniform Delay (d_1), s/veh				42.5	43.8	43.8	42.4	54.8	54.8		36.5	30.1	32.3	19.7	22.0
Incremental Delay (d_2), s/veh				21.4	45.2	46.1	1.6	182.1	184.5		1267.0	0.1	2.2	0.0	0.1
Initial Queue Delay (d_3), s/veh				0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0
Control Delay (d), s/veh				63.9	89.0	89.9	43.9	236.9	239.3		1303.5	30.2	34.5	19.7	22.1
Level of Service (LOS)				F	F	F	D	F	F		F	C	C	B	C
Approach Delay, s/veh / LOS				83.5		F	221.0		F	882.1		F	25.7		C
Intersection Delay, s/veh / LOS				223.4						F					
Multimodal Results				EB			WB			NB			SB		
Pedestrian LOS Score / LOS				1.93		B	2.14		B	2.29		B	2.27		B
Bicycle LOS Score / LOS				2.07		B	1.44		A	1.42		A	1.34		A