TRAFFIC AND SAFETY ANALYSIS OF MACLAY BRIDGE AND SOUTH AVENUE ALTERNATIVE

Prepared by
Nathan Huynh, Ph.D.
Associate Professor
Department of Civil & Environmental Engineering
University of South Carolina

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Executive Summary

This study examines the three assertions for the proposed South Avenue Bridge:

1. Provide the necessary capacity to meet current and future demands,
2. Address the traffic safety issue on Maclay Bridge, and
3. Provide better connectivity for neighborhood residents and regional users.

Regarding assertion 1, it is found that the current level of service in terms of delay (seconds per vehicle) at Maclay Bridge is "A" and is expected to remain at this level up to 2040. The projected 2040 AADT using linear regression is 2,550 vehicles per day which is well below the 5,650 vehicles per day projected by the TDM shown in the MBPS and HDR studies. The fact that Missoula County population grew at an average annual rate of 1.0% between 2010 and 2017 while the AADT on River Pines Road decreased at an average annual rate of 3.7% suggests that the projected AADT by the TDM may be a gross overestimate.

Regarding assertion 2, it is found that between 2013 and 2017, a span of 5 years, there were only 6 crashes within 500 feet of Maclay Bridge. Of the 6 crashes, only 2 resulted in injury and none was fatal. Most of the crashes can be attributed to driver error. Safety at Maclay Bridge can be further improved with a Road Safety Audit and use of warning signs, delineators, and/or pavement markings. A benefit of the Maclay Bridge is that it effectively serves as a traffic calming measure. As such, it provides the following safety and operational benefits when compared to the proposed South Avenue Bridge:

- Reducing number of vehicle travel lanes for pedestrians to cross
- Avoiding side-swipe crashes
- Decreasing crash severity when crashes do occur
- Improving speed limit compliance
- Reducing cut-through traffic

Regarding assertion 3, the proposed South Avenue Bridge will indeed provide better connectivity, but with unintended consequences. It will significantly increase traffic on South Avenue, Blue Mountain Road and Big Flat Road, and thereby, increase the number of crashes on these roads. Of particular concern is the amount of cut-through traffic induced by the proposed South Avenue Bridge; that is, traffic using the South Avenue Bridge to avoid congestion on Highway 93 will be passing through residential streets (e.g., South Avenue, Clements Road and Third Street). The significant increase in traffic on South Avenue will pose serious safety risks to school children due to the lack of sidewalks (west of Humble Road) and drivers due to the blind hill near Rafferty Lane. Due to the high driveway density on South Avenue, the number and severity of crashes can be expected to increase significantly with the projected traffic on South Avenue and higher design speed. Chief Chris Newman, the Fire Chief of Missoula Rural Fire District, indicated that there will be no appreciable differences in emergency response times with the proposed South Avenue Bridge; however, he expressed concerns about emergency response being hampered by the expected significant increase in traffic and the lack of a two-way left turn lane on South Avenue.

Compared to the proposed South Avenue Bridge, rehabilitating the Maclay Bridge yields a much lower cost alternative ($1.54M or $2.34M versus $12.8M). It should be noted that the South

Avenue Bridge cost estimate does not include the cost of providing a connection along South Avenue from the westernmost end of the existing shared-use path at Humble Road to the proposed project, cost of South Avenue pavement reconstruction and maintenance, and cost to upgrade Blue Mountain Road and Big Flat Road to minimize expected rise in crashes. To date, the Missoula County has not developed plans and cost estimates for extending the proposed 10-ft shared-use path along South Avenue to Humble Road and connecting it to the existing shared-use path. Such a plan could be hampered by right-of-way acquisition due to irrigation ditches, belonging to the Missoula Irrigation District, on both sides of South Avenue. In addition to lower cost, the Maclay Bridge rehabilitation alternative has no impact on floodplain, is consistent with the Target Range neighborhood plan, does not require condemnation of private property, minimizes cut-through traffic and minimizes the number and severity of crashes.

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Abbreviations

AADT	Average Annual Daily Traffic
MBA	Maclay Bridge Alliance
MBPS	Maclay Bridge Planning Study
MDT	Montana Department of Transportation
TDM	Travel Demand Model
vpd	Vehicles Per Day

1 Introduction

The Maclay Bridge is a single-lane bridge that crosses the Bitterroot River, with River Pines Road located on its western end and North Avenue on its eastern end. It is located approximately 2.75 miles west of Reserve Street. The replacement of the Maclay Bridge was considered as far back as 1994 by the Missoula County Commissioners. However, the project did not get the necessary approval (i.e., A Finding of No Significant Impact on the 1994 Environmental Assessment) and funding from the Federal Highway Administration. In 2002, the project was once again considered when the County requested to use funds from the Montana Department of Transportation (MDT)'s Off-System Bridge Program. In 2010, MDT informed Missoula County that it could proceed with the project. Subsequently, Missoula County and MDT entered into an agreement to hire a consultant to perform a high-level planning study known as a pre-National Environmental Policy Act (NEPA)/Montana Environmental Policy Act (MEPA) analysis. The results of this study are documented in a report titled "Maclay Bridge Planning Study" (MBPS).

The findings from the MBPS identified option 3E.1 "Build Bridge on South Avenue" as the preferred alternative. The reasons are that it will provide the necessary capacity to meet current and future demands, address the traffic safety issue on Maclay Bridge and provide better connectivity for neighborhood residents and regional users. This study examines these three underpinning reasons in greater detail.

2 Historical Traffic Growth and Projected AADT

Table 1 below provides a summary of the historical Annual Average Daily Traffic (AADT), from 1992 to 2017, at MDT count station 32-3A-041 located on River Pines Road, about 300 feet west of Maclay Bridge (see Figure 1). The AADT data up to year 2011 were presented in Table 1, page 12 of the MBPS, and the remaining AADT data were obtained from the MDT traffic count website: https://goo.gl/3jj554.

Table 1 Historical AADT at count station 32-3A-041 (300 West of Maclay Bridge)

Year	AADT (vehicles per day)	Year-to-Year Change (%)
1992	1610	
1993	1580	-1.86%
1994	1840	16.46%
1995	2060	11.96%
1996	2190	6.31%
1997	2230	1.83%
1998	---	
1999	---	
2000	---	
2001	2230	
2002	2300	3.14%
2003	2060	-10.43%
2004	2300	11.65%
2005	2130	-7.39%
2006	2410	13.15%
2007	2460	2.07%
2008	---	
2009	2380	
2010	2610	9.66%
2011	2360	-9.58%

2012	2330	-1.27%
2013	2430	4.29%
2014	1890	-22.22%
2015	1940	2.65%
2016	1962	1.13%
2017	1946	-0.82%
Average Annual Growth Rate		**1.62%**

"---" indicates that data are not available

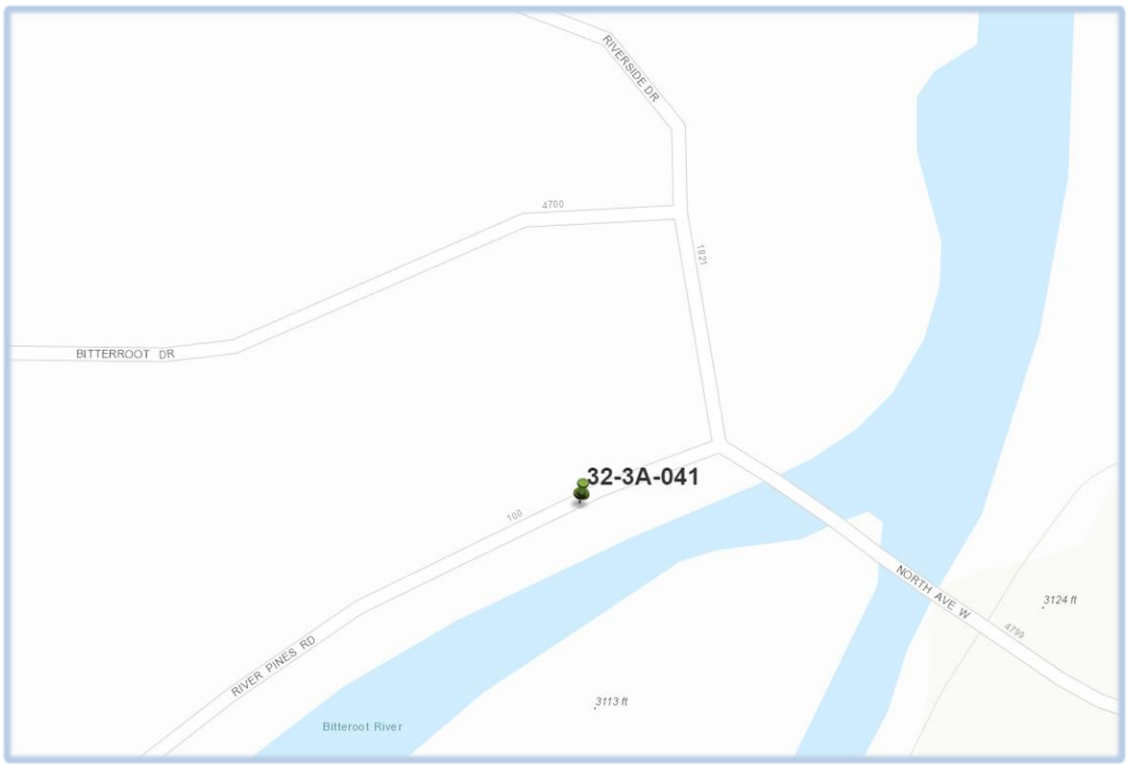

Figure 1 Location of traffic count station (Source: https://goo.gl/8GYFgz)

Figure 2 provides a visual trend of the AADT on River Pines Road dating back to 1992. Assuming a linear trend, the 2040 AADT can be determined using the linear regression method (Keith, 2015; Seber and Lee, 2012): 2,550 vehicles per day (rounded to the nearest 50). This estimate is under the peak AADT experienced in 2010 with 2,610 vehicles per day (vpd). Thus, with existing traffic volume and projected increase, if option 1 proposed by the Maclay Bridge Alliance is implemented (Kim and Kim, 2015), the rehabilitated Maclay Bridge would be able to support a traffic volume of 2,550 vpd in 2040 with adequate level of service. Currently, the average delay at Maclay Bridge is 6.28 seconds per vehicle which corresponds to a level of service "A" (Highway Capacity Manual, 6th edition). The delay of vehicles crossing Maclay Bridge was observed on Thursday, November 15, 2018 between 3:21 PM and 5:03 PM. During this time period, a total of 379 vehicles was observed. The observed delay was between 0 and 33 seconds per vehicle, and out of 379 vehicles, 209 (or 55%) experienced no delay. If the average delay increases at the same rate as the projected increase in AADT on River Pines Road, then the average delay for motorists crossing Maclay Bridge in 2040 will likely remain under 10 seconds per vehicle which correspond to a level of service "A."

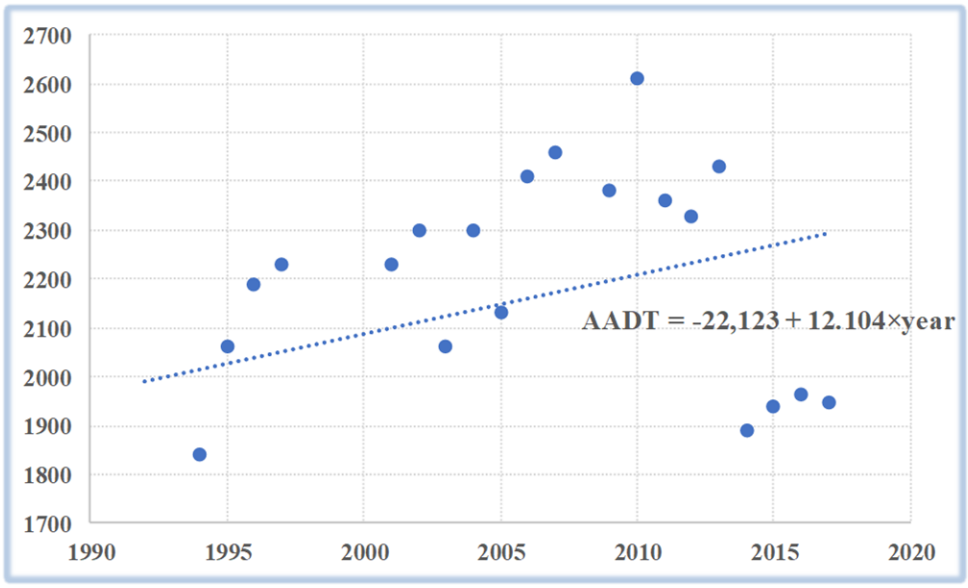

Figure 2 AADT on River Pines Road Since 1992

In the MBPS, the projected AADT using the Travel Demand Model (TDM) is 5,650 vpd (Table 2, page 13 of MBPS). The TDM projected AADT is more than twice the projected AADT using linear regression that relies on past AADT data and trend. The discrepancy is due to the use of two different methods. While the TDM is a more rigorous and accepted method among transportation agencies for planning purposes, it also requires a lot of input data and specialized expertise to apply the four-step model correctly (i.e., trip generation, trip distribution, mode choice and traffic assignment). For this reason, when it comes to estimating AADT, most State Departments of Transportation rely on short-term counts and the factor method or linear regression method according to a research study conducted for the South Carolina Department of Transportation (SCDOT, 2016). Another source of discrepancy is that the TDM used the 2010 data as its baseline conditions. As shown in Table 1, the AADT on River Pines Road peaked in 2010 and has declined since as shown in Figure 3. One of the possible reasons for this decline is due to the closing of the Smurfit-Stone Mill, or the Frenchtown Mill as known by locals, at the end of 2009 that resulted in a loss of 417 jobs (Cohen, 2009). Some of the Frenchtown Mill employees used the Maclay Bridge and Big Flat/Blue Mountain Road when commuting to and from work.

During the time period (2010 – 2017), the census data indicate that the population in Missoula County rose by an average of 1.0% annually (factfinder.com). The fact that Missoula County population grew at an average annual rate of 1.0% between 2010 and 2017 while the AADT on River Pines Road decreased at an average annual rate of 3.7% suggests that the projected AADT by the TDM may be a gross overestimate. Therefore, its input data and parameters within the four-step models should be reexamined. Specifically, the trip generation and trip distribution models need to consider the zoning ordinance in Big Flat that accommodates only limited additional residential and/or commercial development.

The fact that Missoula County population grew at an average annual rate of 1.0% between 2010 and 2017 while the AADT on River Pines Road decreased at an average annual rate of 3.7% suggests that the projected AADT by the TDM may be a gross overestimate.

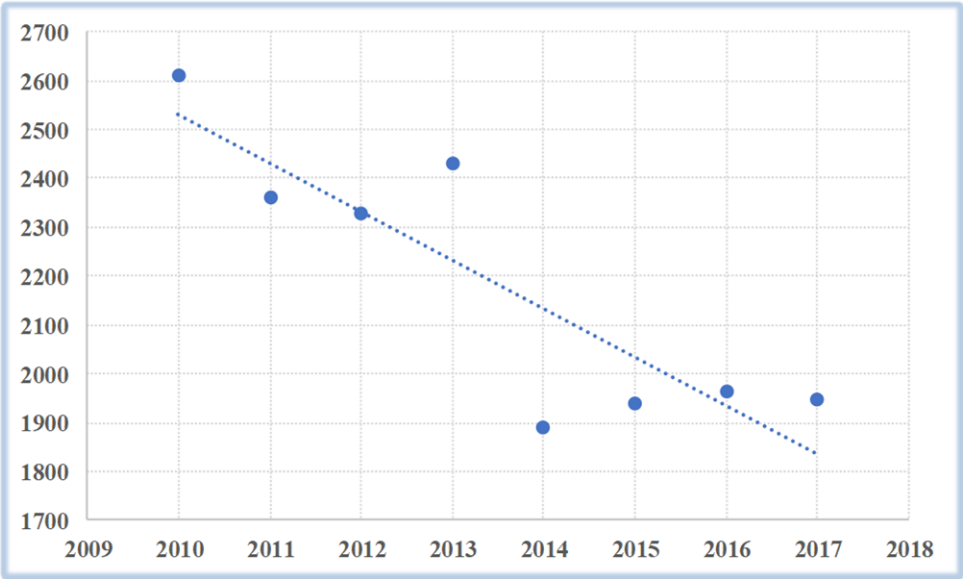

Figure 3 AADT on River Pines Road since 2010

3 Safety Analysis of Maclay Bridge

For the safety analysis of Maclay Bridge, the crash data were obtained from the MDT website: https://goo.gl/EiX3Dc. The crash data are only available from 2013 to 2017. Table 2 provides the number of crashes on River Pines Road, Riverside Drive, and North Avenue during this period.

Table 2 Number of crashes on River Pines Rd., Riverside Dr. and North Ave. between 2013 and 2017

River Pines Road	
Year	**Number of crashes**
2013	15
2014	24
2015	22
2016	32
2017	30
Riverside Drive	
Year	**Number of crashes**
2013	0
2014	0
2015	0
2016	0
2017	1
North Avenue	
Year	**Number of crashes**
2013	2
2014	1
2015	0
2016	2
2017	1

Figure 4 shows the locations of crashes within 500 feet of Maclay Bridge. During the 5-year period between 2013 and 2017, there was a total of 6 crashes, 4 on River Pines Road (indicated by the yellow pins), 1 on Riverside Drive (indicated by the blue pin) and 1 on North Avenue (indicated by the green pin).

Figure 4 Location of crashes within 500 feet of Maclay Bridge between 2013 and 2017

Table 3 provides the injury severity and collision type of each crash shown in Figure 4. As shown in Table 3, among the 6 crashes, 4 resulted in property damage only and 2 resulted in injury (Crash numbers 2 and 3). Crash number 1 occurred at 3 AM on a Saturday, and it is likely due to driver error and/or poor lighting condition. Crash number 2 was likely due to ice/frost road condition as indicated in the crash record. Crash number 3 (right-angle crash) and crash number 4 (same direction sideswipe) suggest that one of the drivers failed to yield right of way. Crash number 5 occurred at 10:02 PM during rainy condition, so it was likely due to driver error and/or poor road condition. Crash number 6 (head-on collision) was likely due to the one-lane design of Maclay Bridge. It should be noted that none of the crashes was fatal. This can be attributed to the slow speed of vehicles crossing Maclay Bridge. Collectively, the crash data do not indicate that there is a traffic safety issue with the one-way design of Maclay Bridge.

Although only one head-on collision occurred over a span of five years, the consequence of such crashes can be severe, and thus, a proactive approach should be taken. One such proactive approach is known as Road Safety Audits (RSA), which is an integral element of the MDT Safety Plans and Programs (https://www.mdt.mt.gov/visionzero/plans/). Additionally, the guidance provided in Section 2C.21 of the Manual on Uniform Traffic Control Devices (MUTCD) should be implemented. Specifically, additional emphasis of the one-lane bridge should be provided by the use warning signs, delineators, and/or pavement markings.

Table 3 Injury severity and collision type of each crash shown in Figure 4

Crash # (as labeled in Figure 3)	Injury Severity	Collision Type
1	non-injury accident (property-damage-only accident)	fixed object
2	non-incapacitating evident injury accident	fixed object
3	non-incapacitating evident injury accident	right angle
4	non-injury accident (property-damage-only accident)	sideswipe, same direction
5	non-injury accident (property-damage-only accident)	fixed object
6	non-injury accident (property-damage-only accident)	head on

For comparison purposes, Figure 5 shows the crashes within 500 feet of Kona Bridge and Old Steel Bridge (in Kalispell, MT) between 2013 and 2017. Both of these bridges have two lanes (i.e., one lane in each direction). The Kona bridge shown in Figure 5a has straight approaches on both ends. The Old Steel Bridge shown in Figure 5b is more similar to Maclay Bridge in that its western end is connected to a horizontal curve but with a much larger radius. There were three crashes on or near Kona Bridge. The one that occurred on the western end of the bridge was a right-angle crash. There was only one crash within 500 feet of Old Steel Bridge between 2013 and 2017. This crash occurred on the eastern edge of the bridge, and it was also a right-angle crash. The right-angle crashes on these bridges indicate that crashes that are caused by driver error cannot be entirely eliminated by any particular highway and/or bridge design.

(a) (b)

Figure 5 Location of crashes within 500 feet of bridge between 2013 and 2017: (a) Kona Bridge and (b) Old Steel Bridge

The one-lane design of Maclay Bridge in effect serves as a traffic calming measure. Studies have shown that traffic calming improves safety without sacrificing operational level of service (USDOT, 2018). The safety and operational benefits of Maclay Bridge, once rehabilitated with a pedestrian and bicycle lane, include: 1) reducing number of vehicle travel lanes for pedestrians to cross, 2) avoiding side-swipe crashes, 3) decreasing crash severity when crashes do occur, 4) improving speed limit compliance, and 5) reducing cut-through traffic.

4 Analysis of Proposed South Avenue Bridge

Figure 6 shows the location of the proposed South Avenue Bridge within the Missoula metro area. With the intent to provide better connectivity for neighborhood residents and regional users, the proposed South Avenue Bridge will certainly attract a significant amount of traffic, and thereby, significantly increase traffic on South Avenue, Blue Mountain Road and Big Flat Road. In my opinion, there are significant traffic, design and safety implications as outlined below that must be investigated further before proceeding with the proposed project.

Figure 6 Proposed South Avenue Bridge (adapted from HDR 2018)

4.1 Induced Traffic Concerns

The TDM projected that the South Avenue Bridge will attract 7,200 vpd by 2040 (Table 14, page 61 of MBPS). In 2017, the AADT on South Avenue, west of Humble Road is only 290 vpd (Table 4-1, Page 9, HDR 2018a). Thus, the 2040 projected AADT indicates a 25-fold increase in traffic volume. With 7,200 vpd crossing the proposed South Avenue Bridge in 2040, traffic flow and traffic safety along South Avenue, Clements Road and Third Street will be negatively affected, as well as Blue Mountain Road and Big Flat Road. Of particular concern is the amount of cut-through traffic induced by the South Avenue Bridge; that is, traffic using the South Avenue Bridge to avoid congestion on Highway 93 will be passing through residential streets (e.g., South Avenue, Clements Road and Third Street). Therefore, the scope of the project needs to consider the operational and safety impact of the proposed bridge on the aforementioned roadways, not just within the project

limit as shown in Figure 6.

> Of particular concern is the amount of cut-through traffic induced by the South Avenue Bridge; that is, traffic using the South Avenue Bridge to avoid congestion on Highway 93 will be passing through residential streets (e.g., South Avenue, Clements Road and Third Street).

In 2017, the AADT at count station 32-3A-019 (Buckhouse Bridge on Highway 93) is 26,707 vpd. When traffic is backed up on Highway 93 (Brooks St. and Reserve St.), it has been observed that some drivers avoid congestion by using Blue Mountain Road and Maclay Bridge to go to the City of Missoula. On Friday, September 16, 2018, between 7:51 AM and 8: 15 AM, it was observed that 7.14% of vehicles going east on Highway 93 turned left onto Blue Mountain Road. It is surmised that a percentage of these vehicles opted to take the back road to avoid stop-and-go traffic on Reserve Street. The percentage of commuters using such an alternate route is relatively small due to the increase in distance, and as discussed above, the Maclay Bridge serving as a traffic calming measure deters cut-through traffic. This is not the case with the proposed South Avenue Bridge, and hence, it will attract a greater amount of cut-through traffic. Given that the projected traffic on Highway 93 at Buckhouse Bridge will increase by about 73% in 2040 (Table 2 of MBPS) and that there is no plan to address congestion on Reserve Street (Activate Missoula 2045) which will see traffic increase between 29% and 39% by 2040 (Table 2 of MBPS), there is a very high likelihood that even more traffic than projected will use Blue Mountain Road, South Avenue Bridge and other residential streets to avoid traffic congestion on Highway 93.

Big Flat Road is increasingly being used as an alternate route by local residents to avoid congestion on Reserve Street. Gravel trucks and semi-trailer trucks routinely use this route even though Reserve Street provides a more direct path to their destinations in south Missoula or Lolo. These trucks currently do not cross Maclay Bridge due to weight restrictions. However, if the South Avenue Bridge is constructed, then these trucks would use the new bridge and South Avenue if their destinations are in south Missoula. The attraction of more gravel and semi-trailer trucks will exacerbate safety issues on Big Flat Road and very likely contribute to new safety issues on South Avenue as discussed below.

4.2 Roadway Design Concerns

The MDT Road Design Manual requires provision of adequate sight distances for vehicles traveling through sag and crest vertical curves at the designated design speed (Section 2.8.1.2 of MDT Road Design Manual). There is a crest vertical curve on South Avenue near Rafferty Lane that has a steep upgrade (approximately 5.7%) over a short distance which creates a "blind hill." This blind hill poses a safety hazard for residents turning onto South Avenue because their view of oncoming traffic is restricted as shown in Figure 7. Moreover, vehicles that cross the proposed South Avenue Bridge would not be able to stop in time to avoid collision with a deer, pedestrian, bicyclist or vehicle on top of the hill if they travel at a speed greater than 35 mi/hr and/or drivers have a reaction time greater than 2.5 seconds. The lack of sight distance is even more problematic in the spring (March and April) and in the fall (September and October) when the sun rises directly east and sets directly west; thus, during sunrise and sunset drivers could be temporarily blinded by the sun.

Figure 7 View of oncoming traffic (heading east on South Avenue) is restricted

The width of pavement on the western end of South Avenue is only 21.31 feet wide (average of four measurements taken on South Avenue within the project limit); this segment was designed to be a local road and currently has no yellow centerline pavement marking. The MBPS and HDR study did not indicate how the proposed bridge with two 12-ft travel lanes, 4-ft shoulders and a 10-ft shared-use path will be connected to the existing roadway. A 10-foot travel lane will not be adequate for the expected number of heavy and large trucks; these trucks which could not cross Maclay Bridge before because of weight restriction will be able to traverse the proposed South Avenue Bridge and progress along South Avenue and other residential streets.

Increasing the roadway width of the western end of South Avenue as well as extending the 10-ft shared-use path along South Avenue will be challenging and costly because the Missoula Irrigation District has irrigation ditches on both sides of South Avenue, west of Humble Road. The Missoula County will be responsible for any roadway improvement project on this segment of South Avenue. Thus, the County should consider and weigh the cost to acquire the necessary right-of-way to improve South Avenue, west of Humble Road, as well as the possible cost to install noise barriers against the option of rehabilitating Maclay Bridge. Another cost consideration is the necessary complete reconstruction and maintenance of the pavement to support high truck traffic. Figure 8 shows the existing poor pavement condition of South Avenue, west of Humble Road. In order to support a 25-fold increase in traffic volume, the pavement will need to be redesigned with a higher *structural number* to support the projected traffic (i.e., 18-kip equivalent single axle loads).

Figure 8 South Avenue (west of Humble Road) pavement with cracking and disintegration

4.3 Traffic Safety Concerns

4.3.1 South Avenue

Assessment of the safety issues along South Avenue was done on-site in conjunction with Chief Chris Newman, the Fire Chief of Missoula Rural Fire District on Friday, November 16, 2018. Chief Newman has been with the Missoula Rural Fire District for over 20 years. He is intimately familiar with the area and is well versed on the topic of roadway safety. The on-site inspection was performed due to the unavailability of a road safety audit report that documents potential safety issues for all road users by an independent, multidisciplinary team.

There are currently no sidewalks on South Avenue, west of Humble Road. School children are walking or biking along the edge of South Avenue from Humble Road to their homes on the western end of South Avenue. Chief Newman expressed concerns for the safety of school children should traffic on South Avenue increase +77.5% by 2040 (HDR, 2018a) from the proposed bridge. Additionally, if pedestrians and bicyclists using the current shared-use path on South Avenue (from Fort Missoula Park to Humble Road) want to get on the planned 10-ft shared-use path (to be located on the north side of South Avenue), then they will need to cross South Avenue in the presence of heavy traffic. This situation poses another safety risk that requires further consideration.

Chief Newman, Fire Chief of Missoula Rural Fire District, expressed concerns for the safety of school children should traffic on South Avenue increase +77.5% by 2040 from the proposed bridge.

Chief Newman noted during the on-site inspection that South Avenue has an excessively high driveway density. Indeed, there are over 100 driveways (i.e., access points) in 2.89 miles from the western end of South Avenue to Reserve Street. Findings from previous studies agree with Chief Newman's assessment that the higher the driveway density, the higher the likelihood of crashes (e.g., Sawalha and Sayed, 2001). Between 2013 and 2017, there were only 8 crashes on South Avenue. The number and severity of crashes will go up significantly with the expected traffic on South Avenue from the proposed bridge and higher design speed.

4.3.2 Blue Mountain Road and Big Flat Road

Between 2013 and 2017, there were 29 crashes along Blue Mountain Road, 7 of which involved "Roll Over." This data suggests a combination of excessive speed, poor roadway condition and terrain. One particular section of Blue Mountain Road is extremely hazardous, especially during the winter, because of narrow lanes and no shoulders. As shown in Figure 9, the Big Flat Irrigation Ditch is located directly adjacent to Blue Mountain Road on one side (indicated by the yellow pin) and the Bitterroot River on the other side (indicated by the blue pin). Road safety may worsen if there is additional traffic on Blue Mountain Road, especially with large trucks. Reconstruction of this section of Blue Mountain Road to improve safety would be very expensive because of the proximity of the river and irrigation ditch.

Between 2013 and 2017, there were 123 crashes along Big Flat Road. The crashes include 66 "Fixed Object," 34 "Roll Over," 3 "Head On," 5 "Sideswipe, Opposite Direction" and 4 "Wild Animal." The high number of crashes on Big Flat Road indicates that there is a safety issue for the same reasons indicated above for Blue Mountain Road. The proposed South Avenue Bridge will induce more traffic to use Big Flat Road which in turn will exacerbate the safety issue.

Figure 9 Hazardous location on Blue Mountain Road

5 Other Concerns

As shown in Figure 2-2 of the HDR report, the eastern end of the proposed South Avenue Bridge will have about 700 feet of roadway (two 12-ft travel lanes with 4-ft shoulders and a 10-ft shared-use path) extending from the bridge abutment to the end of South Avenue. This proposed segment runs a through a floodplain as shown in Figure 10; these pictures were taken on May 26, 2018 when the Bitterroot River reached its flood stage. As such, the impact to the floodplain and mitigation should be considered.

Figure 10 Floodplain within proposed project limit (western end of South Avenue)

While Chief Newman indicated that there will be no appreciable differences in emergency response times with the proposed South Avenue Bridge, he did express concerns about emergency response being hampered by the expected significant increase in traffic and the lack of a two-way left turn lane on South Avenue.

While Chief Newman indicated that there will be no appreciable differences in emergency response times with the proposed South Avenue Bridge, he did express concerns about emergency response being hampered by the expected significant increase in traffic and the lack of a two-way left turn lane on South Avenue.

A concern with the TDM used in the MBPS and HDR Study is that it projected 650 or 400 vpd will use the proposed South Avenue Bridge instead of the Buckhouse Bridge and yet showed that the AADT on Blue Mountain Road (500 feet north of Highway 93) would decrease by 7.4% or 400 vpd (Figure 6, Page 63 of MBPS). Similarly, the TDM logic is flawed to indicate that the AADT on Blue Mountain Road (south of Big Flat Road) in 2040 would decrease by 8% or 350 vpd (Table 14, Page 61 of MBPS) when some traffic on Highway 93 will divert onto Blue Mountain Road to use the proposed South Avenue Bridge. For these reasons, the TDM input data and model parameters should be reexamined.

According to the HDR study (HDR, 2018b), the estimated total cost for the South Avenue Bridge is approximately $12.8M (2018 dollars). Of this amount, $12.6M is for the bridge and roadway construction and $200K is for the right-of-way acquisition. The South Avenue Bridge cost estimate does not include the cost of providing a connection along South Avenue from the westernmost end of the existing shared-use path at Humble Road to the proposed project, cost of South Avenue pavement reconstruction and maintenance, and cost to upgrade Blue Mountain Road and Big Flat Road to minimize expected rise in crashes. The Missoula County has not developed plans and cost estimates for extending the proposed 10-ft shared-use path along South Avenue to Humble Road and connecting it to the existing shared-use path. Alternatively, the Maclay Bridge can be rehabilitated to accommodate 36-ton vehicles with a pedestrian and bicycle lane for approximately $1.54M (option 1, Kim and Kim, 2015). For an additional $800K, a new single span can be installed to allow for the removal of two piers (option 1a, Kim and Kim, 2015). These options are comparable to the $1.72M the MDT would be responsible for at 13.42% for the South Avenue Bridge (HDR, 2018a).

6 Conclusions

This study examined the TDM projected AADT on River Pines Road used in the MBPS to identify preferred options. The recent data indicate that the AADT on River Pines Road has experienced a steady decline since 2010. This trend was not captured by the TDM model, and thus, its input data and model parameters should be reexamined. One particular concern with the TDM is that it projected 650 vpd will use the proposed South Avenue Bridge instead of the Buckhouse Bridge and yet showed that the AADT on Blue Mountain Road would decrease by 7.4% and 8% at 500 feet north of Highway 93 and south of Big Flat Road, respectively (Figure 6, Page 63 of MBPS). This inconsistency suggests the TDM either did not use the correct input data or was not properly calibrated.

The safety analysis revealed that between 2013 and 2017, there was only one crash (head-on collision) where the one-lane design of Maclay Bridge may have played a role. However, the actual cause could have been some other reasons such as driving under the influence. As shown in Figure 5, both Kona Bridge and Old Steel Bridge have two lanes and they each have a right-angle crash that occurred on the bridge between 2013 and 2017. Thus, no particular highway and/or bridge design can entirely eliminate crashes that are due to driver error.

The TDM projected that 7,200 vpd would cross the proposed South Avenue Bridge. Thus, residents on the western end of South Avenue, between Humble and the proposed bridge, would see a 25-fold increase in traffic. The actual number is likely to be higher because the proposed bridge will provide a quicker alternative for those coming from the Bitterroot Valley going into town, given that congestion on Reserve Street will get worse by 2040 with a 29% to 39% increase in traffic and with no proposed plan to improve level of service during peak hours. Additionally, the TDM did not consider traffic coming from the north side of town that would use the proposed bridge to bypass traffic on Reserve Street.

The expected traffic generated by the proposed South Avenue Bridge will have significant safety implications on South Avenue, Blue Mountain Road, Big Flat Road. The cost to upgrade these facilities and cost to connect the proposed shared-use path to the existing one on South Avenue could be prohibitively expensive and there could be challenges with acquiring the necessary right-of-way on South Avenue due to irrigation ditches, belonging to the Missoula Irrigation District, on both sides of South Avenue. These costs were not considered in the $12.8M estimate for the proposed South Avenue Bridge. Rehabilitating the Maclay Bridge yields a much lower cost alternative, $1.54M or $2.34M depending on the option selected. Either option would have no impact on floodplain, is consistent with the Target Range neighborhood plan, does not require condemnation of private property, minimizes cut-through traffic and minimizes the number and severity of crashes.

In summary, when compared to the proposed South Avenue Bridge, the safety and operational benefits of Maclay Bridge, once rehabilitated with a pedestrian and bicycle lane, include:

- Reducing number of vehicle travel lanes for pedestrians to cross
- Avoiding side-swipe crashes
- Decreasing crash severity when crashes do occur
- Improving speed limit compliance
- Reducing cut-through traffic

7 References

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