Traffic Safety Evaluation
Sherwood Drive and Broadmoor Boulevard

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Prepared by:
Tahir Hameed, M. Eng. P.Eng.

Reviewed by:
Ryan Anders, P.Eng.

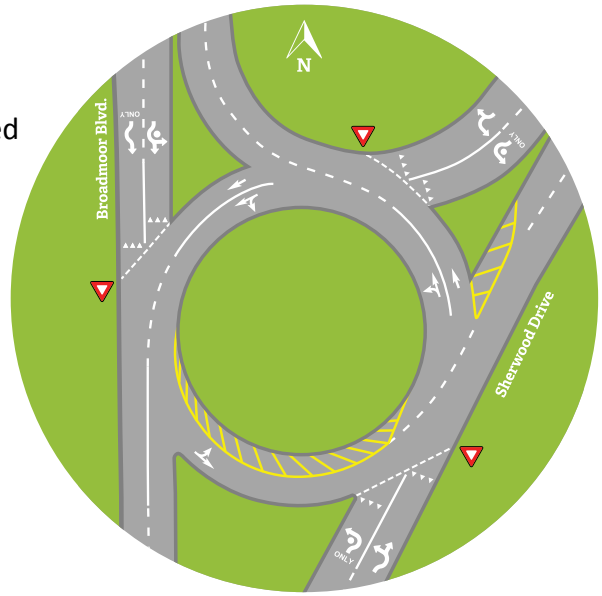
STRATHCONA COUNTY

Background

The purpose of this report is to provide an update on the August 2015 traffic management and safety improvements made at the traffic circle located at the intersection of Sherwood Drive and Broadmoor Boulevard. This traffic circle is a major intersection in Sherwood Park and has three legs forming a 'Y', with the traffic circle at the centre of the 'Y'. The geometry of the traffic circle is not consistent with modern roundabout standards. The traffic circle was built in 1977 and has an approximate diameter of 99 metres. Since the circle is so large, it confuses drivers approaching it and drivers sometimes fail to yield to traffic already within the circle, resulting in traffic collisions. This intersection has been consistently the third highest traffic crash frequency location for several years within Strathcona County. The Traffic Safety and Engineering branch of Transportation and Agriculture Services took the initiative to address this safety issue and retained a consultant to conduct an operational assessment. The operational review process started in December 2014 and the final report was presented to Council in June 2015. Collision history, geometry, traffic operations, traffic control, and driver behaviour were reviewed as part of the operational assessment. Based upon the detailed review, four options were conceptualized and suggested to improve safety at the intersection, including short-term and long-term improvements. Short-term improvements included signage and updated pavement markings with an alternative circulating roadway lane configuration. The intended purpose of the short-term improvement was to improve driver awareness and in-field educational measures about the operation of the intersection and further clarification of the rules of the road. The short term improvements were low cost, under $10k and easily implemented in a short period of time. The long term, reconstruction option for the traffic

circle would convert the intersection into a modern, multi-lane roundabout at a cost of approximately $2.5M.

Short Term Improvement Steps



The changes to the traffic circle were implemented during the last week of August 2015. The Traffic Engineering and Safety branch monitored this location closely and as a result of operational observations and feedback, recommended and implemented additional improvement measures.

Step 1: August 2015

Low cost and short-term improvements recommended in the consultant's final report were implemented:

- Directional arrows were installed with the matching lane designation signs on the north leg of Sherwood Drive and Broadmoor Boulevard
- Two sets of directional arrows and lane designation signs were installed on the south leg of Broadmoor Boulevard
- Yield signs were replaced with updated signs as per the current Manual on Uniform Traffic Control Devices (MUTCD) Standards
- "Yield to Traffic in Roundabout" signs were installed under the yield signs on all three approaches

- Advance warning signs for roundabout with 30 km/h advisory speed tabs were installed on all approaches

Step 2: October 2015

- Larger yield signs were installed on the northbound Sherwood Drive leg to improve driver awareness and understanding

Step 3: February 2016

- Flashing beacons were installed on top of the northbound yield signs on Sherwood Drive

Step 4: May 2016

- Vegetation was removed on the south side of the circle to improve visibility for merging northbound Sherwood Drive traffic
- Additional lane designation signs combined with improved pavement markings were added to the north leg of Broadmoor Boulevard and to the south leg of Sherwood Drive

Analytical Before-and-After Safety Analysis

The before-and-after comparisons were performed based on collision frequency. Comparisons were also reviewed for various collision types and month-by-month comparisons for the last three years since the changes were made.

A simple, one year before-and-after safety evaluation was conducted, and it is noted that engineering best practices for any traffic safety initiative requires a minimum of a three year evaluation period to be relevant and account for normal fluctuations, and the expected increase in collisions caused by simply changing a traffic condition. The “before” period

consisted of reported collisions from September 1, 2014 to August 31, 2015. Collisions between September 1, 2015 and August 31, 2016 were considered the "after" period. Any collisions that occurred at the circle and within 50m of the approaches were considered traffic circle-related collisions. Table 1 shows an overall comparison of collisions by severity.

	Before (Sep 2014 - Aug 2015)	After (Sep 2015 - Aug 2016)	Percent Decrease (-) Percent Increase (+)
Total	33	42	27%
Major Injury	0	0	No Change
Minor Injury	13	19	46%
Property Damage Only	20	23	15%

Table 1: Overall collisions before and after

From Table 1, there is an increase in the number of collisions. Minor injury-related collisions increased by 46 percent and property damage only collisions increased by 15 percent. To understand the increase in the number of collisions, a month-by-month comparison was conducted.

Collisions by Month

Figure 1 shows a month-by-month collision comparison from September 2013 (two years before) to August 2016 (one year after). There was an increase in the number of collisions during the first few months of the changes being made – mainly in September, December 2015 and January 2016. The number of collisions in 2016 has decreased in the months of June, July, and August when compared with the number of collisions in those corresponding months before the changes. An increase in the number of collisions in early months after a traffic change is expected due to drivers' adjusting to the changes. Two approaches of the traffic circle

are straight, and it was observed in the “before” analysis that many drivers were not accustomed to yielding for traffic already within the circle. Due to the changes in lane configuration, it is apparent that some drivers found it surprising and were changing lanes at the last moment, thus causing other drivers to brake, therefore causing rear-end collisions.

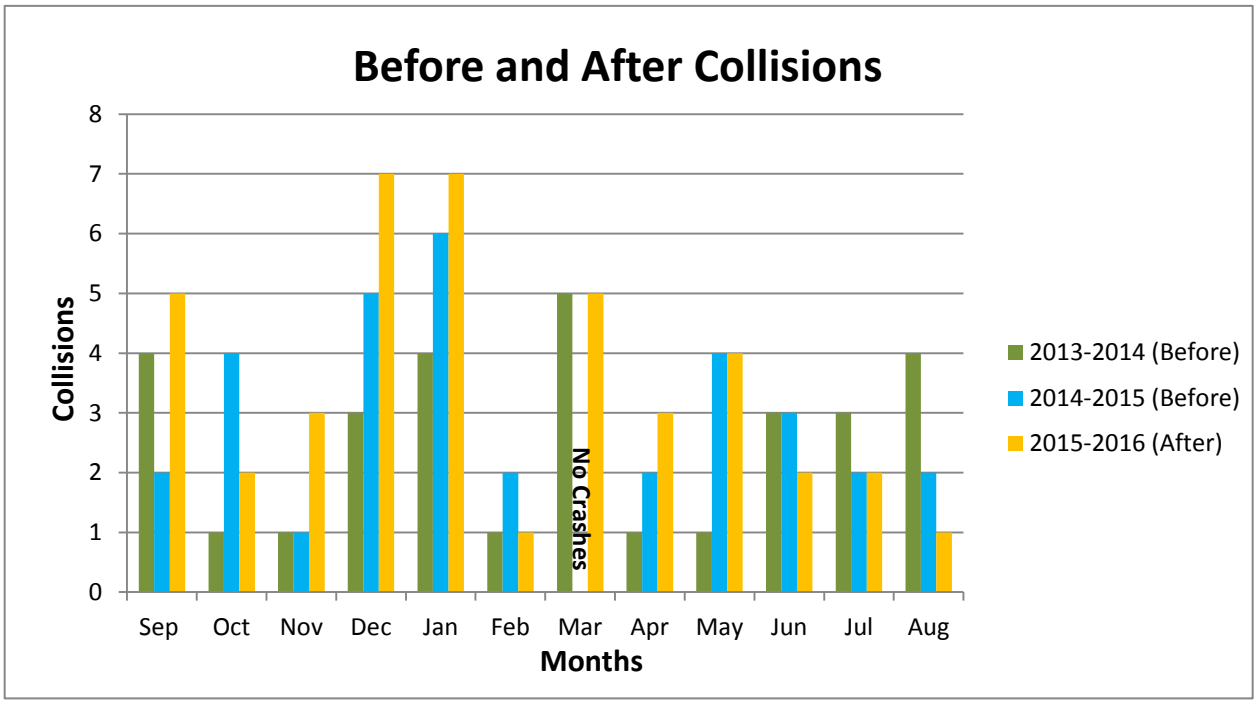


Figure 1: Collisions by month (2014-2016)

Figure 2 indicates the number of collisions that occurred each month after the changes were implemented to the current available data. The initial months after the changes made were part of the transition period when drivers were adjusting to the new traffic patterns. The months of September, December and January experienced more collisions when compared to similar months in previous years. The change in driver behaviour and understanding created with the modifications made to the traffic circle requires time to adjust to the conditions. As a

result, the collision data reflects that learning-curve phenomenon and is to be expected with any change made in traffic control and management systems.

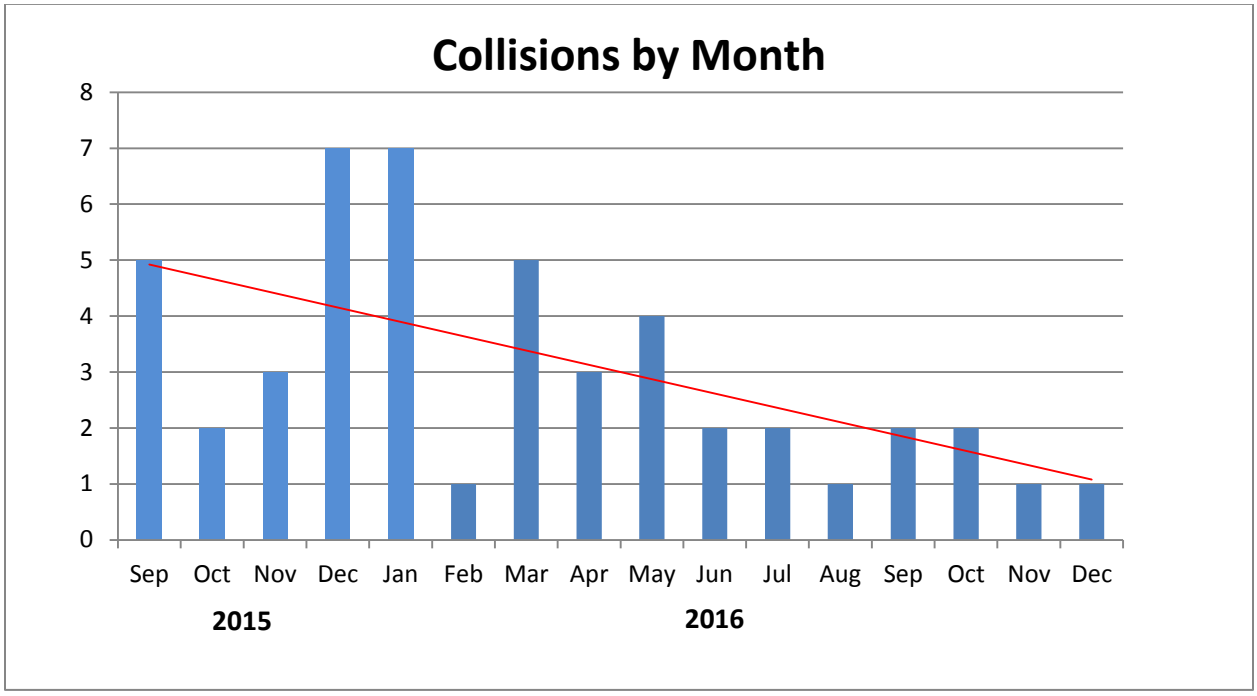


Figure 2: Collisions by month (After period)

From Figure 2, it is evident that there is a significant decrease in the number of collisions since May, 2016. It should be noted that there were some improvements made in the spring of 2016, including removing vegetation from the south side of the circle to improve visibility, adding additional lane assignment signs, and corresponding pavement markings to clarify lane configurations.

Collisions by Type

Collisions were analyzed to determine the difference in “before” and “after” collision types and the locations. Rear-end and sideswipe same direction are the types of collisions which normally

occur at traffic circle intersections. From Figure 3, there were 11 rear-end collisions for the one year “before” period and 26 in the “after” period. The contributing factor of rear-end collisions are drivers slowing down due to upcoming traffic control conditions, roadway conditions, or congestion. The increase in rear-end collisions at a traffic circle is related to drivers starting to slow down or stopping for vehicles already within the circle and colliding with vehicles in front of them, therefore indicating an improvement in driver yielding behaviour. During the same time period, sideswipe same direction collisions have decreased. Sideswipe same direction collisions occur primarily due to driver confusion and failure to yield to traffic in the circle. The reduction in the number of sideswipes also indicates that driver yielding behaviour has improved with the changes.

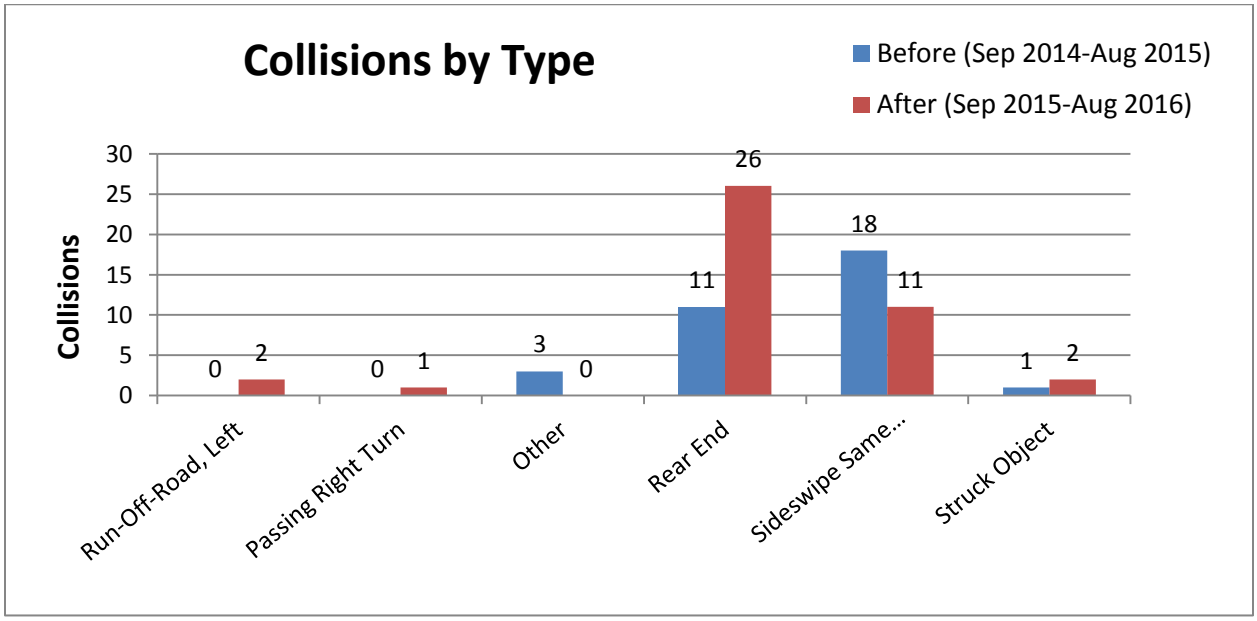


Figure 3: Collisions by Type

The location of collisions was also analyzed and indicates that in the “before” period sideswipes were inside the circle and decreased significantly after the changes were made. Collisions are

largely occurring at the approaches in the “after” period, also indicating an improvement in driver behaviour and the reduction of higher-risk collisions; see Appendix “A” for visual “before” and “after” collision comparisons.

Public Feedback

March 2015 online survey

Before any changes were implemented, Transportation and Agriculture Services conducted an online survey to ensure resident concerns and priorities were reflected in the plans for the traffic circle.

Over 2,200 residents participated in the survey.

- Respondents showed support for keeping the traffic circle, with greater than 80% indicating that keeping the circle was a priority.
- Less than 10% disliked the circle and felt it should be removed.
- The majority of residents that completed the survey felt the circle is very effective in keeping traffic flowing; however, this statement was often qualified with “as long as drivers know how to use it”.
- Residents felt that poor driver behaviour at the traffic circle resulted from a lack of driver understanding. The lack of signage at the circle (both way-finding signs and lane designation signs) and the uncommon design of the circle were both identified as factors, which may contribute to driver confusion.

The use of resident feedback in combination with the observed driver behaviour helped to develop the proposed short-term signing, line marking, and lane designation plan. The short-term improvement plan provides drivers with understanding and education on the rules of the road and the safe use of the traffic circle. In addition to the physical changes, additional educational materials, including a video, were prepared and shared on the County website and social media sites.

Feedback after changes implemented

Public feedback about the changes were tracked by email and phone since the safety improvements were made. Feedback was mixed with 62 residents expressing concerns and seeking additional clarification about the changes; seven additional residents provided positive feedback for the changes. This feedback and clarification was also common in the 2015 online survey results.

As the intersection is the third highest collision frequency location in the County, engineering changes were required to improve safety and reduce collision frequencies. Education alone would not have been sufficient, as not all drivers would have the ability or want to view educational materials; therefore the implementation of on-site signing, lane marking, and lane control was determined to be the most effective information and educational options. The recommended signing, lane marking, and lane control were developed as an interim solution to address the identified safety concerns and improve driver education and understanding.

As with the collision frequency, the number of calls, complaints and inquiries received in regards to the traffic circle safety improvement changes has steadily declined since the final configuration was achieved in May of 2016 - with only four cases being documented. The decline in resident feedback is indicative of drivers gaining understanding and acceptance of the traffic control changes.

Conclusion

Based on the one year “before” and “after” collision history comparison, there is a decreasing trend in collisions. A majority of collisions occurred during the month’s right after the initial stage 1 changes were made. In the months following the finalized stage 3 and stage 4 changes, drivers appear to have adapted and adopted improved driving behaviours, vehicle collisions and resident feedback are shown to be decreasing and safety is shown to be continually improving as a result of the total changes.

The decrease in sideswipe same direction and increase in rear-end collisions indicates that more drivers are yielding at the traffic circle for drivers with the right-of-way already within the circle. The majority of the collisions are now occurring within the approaches rather than within the circle, indicating driver understanding, awareness of the circle, and improved yielding behaviour for through traffic within the circle.

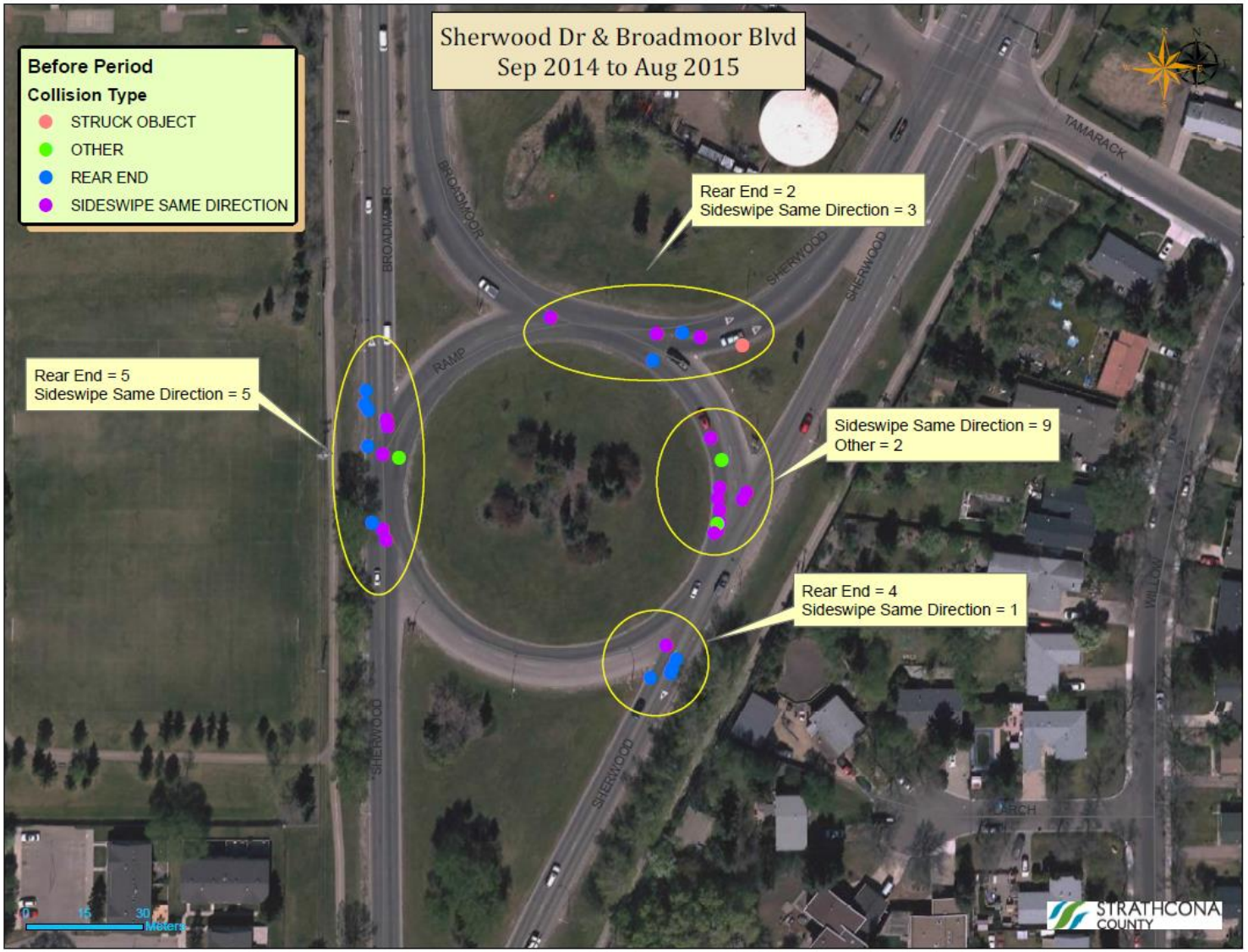
In order to effectively evaluate the traffic management and safety changes at the traffic circle, a three year “before” and “after” period is recommended for analysis. A one year period is inconclusive and includes collisions that occurred during the period of time when drivers are

adjusting to the changes; therefore, the results are not considered conclusive. Ongoing monitoring of the intersection and follow-up analysis is recommended to be conducted each year until the collision analysis can be considered conclusive and compliant with recommended industry and engineering best practices.

Recommendations

Based on the reducing trend in collisions and the improving safety shown in and around the intersection, it is recommended that the alterations to the traffic circle remain in place until such time that the traffic circle requires rehabilitation construction or improvement, due to capacity and level of service deficiencies according to County Design and Construction Standards. In the interim, safety reviews including annual collision evaluations are to be performed and published to the website and provided to Council for information.

APPENDIX “A”
Collision Map (“Before” and “After”)



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