Sisseton Wahpeton Oyate
Roadway Safety Improvement Program

Debbie S. Shinstine, P.E., Ph.D.
Research Engineer

Khaled Ksaibati, Ph.D., P.E.
WYT^2/LTAP Director

Department of Civil and Architectural Engineering
University of Wyoming
Laramie, WY 82071

Dennis Trusty
Northern Plains TTAP Director
United Tribes Technical College
Bismarck, ND 58504

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DISCLAIMER

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ABSTRACT

Tribal communities recognize the need to improve roadway safety. A five-step methodology has been developed by the Wyoming Technology Transfer Center (WYT^2/LTAP) to improve roadway safety on Indian reservations. This methodology was initially implemented on the Wind River Indian Reservation (WRIR) which led to the Wyoming Department of Transportation funding of three system-wide, low-cost safety improvement projects. Due to the success of the program on the WRIR, tribes across the country have become interested in implementing the program. WYT^2/LTAP and the Northern Plains Tribal Technical Assistance Program (NPTTAP) assisted Tribes to implement this program on their reservations in the Great Plains region and have developed criteria to identify tribes to participate.

Reservations in North Dakota and South Dakota applied to TTAP to participate and three tribes were accepted for implementation; the Standing Rock Sioux Tribe (SRST), the Sisseton Wahpeton Oyate Tribe and the Yankton Sioux Tribe. This study describes the implementation on Sisseton Whapeton Oyate (SWO).

Many challenges and differences were identified through the analysis demonstrating that a single procedure would not work for different reservations. Through extensive coordination and collaboration with the tribes and government agencies, WYT^2/LTAP along with the TTAP centers can provide the technical assistance the tribes need to develop their own road safety improvement program.

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CHAPTER 1. INTRODUCTION

The Native American community has suffered greatly over the years with higher fatality rates on their reservation roadways than the general population across the U.S. (National Center for Statistics & Analysis, 2004). State and National Tribal Transportation Safety Summits have been held to identify problem areas and to develop strategies to reduce fatal and serious injury crashes (Herbel & Kleiner, 2010). In order to address the high fatal and serious injury crashes on Indian Reservations, a methodology has been developed by the Wyoming Technology Transfer Center (WYT^2/LTAP) to improve roadway safety. This methodology provides tools for Tribes to utilize in prioritizing safety improvements on their reservations. It was first implemented on the Wind River Indian Reservation (WRIR) in Wyoming and three system-wide low-cost safety improvement projects were funded by the Wyoming Department of Transportation in 2013 (Shinstine & Ksaibati, 2013).

WYT^2/LTAP along with the Northern Plains Tribal Technical Assistance Program (NPTTAP) assisted Tribes to implement this program on their reservations in the Great Plains region. Tribes interested in developing a safety improvement program for their reservation were notified and encouraged to participate in the spring of 2014. Sisseton Wahpeton Oyate Tribe was accepted for implementation.

Background

A five step methodology has been developed by WYT^2/LTAP which identifies high risk crash locations and provides low cost safety improvements to address the hazards on Indian reservations. This methodology was first implemented on the WRIR in Wyoming (Shinstine & Ksaibati, 2013).

A combination of data driven, field verification, and trend analysis is utilized. The five-step procedure is as follows:

1. Crash data analysis.
2. Level I field evaluation of roadway conditions.
3. Combined ranking to identify potential high risk locations based on steps 1 and 2.
4. Level II field evaluation to identify countermeasures.
5. Benefit-cost analysis.

Depending on available data, preference by the Tribes, and other factors, this process can be altered to meet the needs of the Tribes and is intended for low-cost safety improvements. However, other improvements can be identified and presented to the Tribes for other funding consideration. Part of this process includes looking at trends in crash data and developing a systemic approach.

Due to the success of the program on the WRIR, tribes across the country have become interested in implementing the program. The NPTTAP along with WYT^2/LTAP developed criteria to identify and help interested tribes to participate. In order to qualify for the program, a tribe is required to provide at least three years of crash data, be willing to dedicate the resources to the project and the tribal leadership must be committed to follow through on the implementation of the program. The success of the programs on the WRIR was due to the cooperation and collaboration among the various stakeholders and WRIR members' commitment to improve safety on their roadways (Shinstine & Ksaibati, 2013).

As sovereign nations, tribes face different challenges than other communities to address their transportation and roadway safety needs (Martinez, Migliaccio, Albert, & Holt, 2009). Collaboration, communication, and cooperation are essential among the different jurisdictions that are responsible for the

roadways on tribal lands. Federal, State, counties, townships, tribal government and the Bureau of Indian Affairs (BIA) are some of the many agencies involved in the decision making process faced by the tribes.

Tribal communities recognize that crash reporting is inadequate among the many reservations (Herbel & Kleiner, 2010). Crash reports are either incomplete or non-existent. Many factors contribute to this issue. A South Dakota study of the reservations in the state determined that approximately 64 percent of crashes on Tribal lands are under reported (Bailey & Huft, 2008). The study also indicated that the main problems were either the tribal law enforcement's ability to report the crashes or the relationship between the tribes and the state.

The Indian Reservation Road Safety Improvement Program was developed with these challenges in mind. Through the implementation the tribes have the opportunity to address these issues to their satisfaction and realize an effective program for their reservation.

Objectives

The purpose of this report is to present the results of the implementation of a roadway safety improvement program on the Sisseton Wahpeton Oyate Indian Reservation.

Report Organization

This report consists of five sections. Chapter 2 discusses the criteria developed for the regional implementation of the Indian Reservation Safety Improvement Program in the Northern Plains region. Chapter 3 lays out the methodology developed for the program. Chapter 4 is a discussion of crash trends identified on the Sisseton Wahpeton Oyate (SWO) reservation. Chapter 5 discusses the results of the implementation of the program on the SWO. Finally, Chapter 6 provides conclusions and recommendations to the objectives laid out in this report.

CHAPTER 2. REGIONAL IMPLEMENTATION

Due to the success of the Wind River Indian Reservation implementation of the safety improvement program, tribes across the country became interested in implementing their own program. WYT^2/LTAP and the Northern Plains Tribal Technical Assistance Program (NPTTAP) collaborated to develop a regional implementation for the Northern Plains. They developed criteria for the Tribes in the region to apply for implementation of a roadway safety improvement program on their reservation.

Criteria

Coordination efforts between WYT^2/LTAP and NPTTAP resulted in the development of criteria to identify tribes willing and able to participate in the implementation of a road safety program. The following criteria were used to determine a Tribe's eligibility to participate:

1. The Tribe should be willing to invest the energy necessary to work with WYT^2/LTAP and NPTTAP throughout the process and commit the needed resources. The main resources needed are individuals willing to spend the time to meet with WYT^2/LTAP, provide personnel to assist with field reviews and provide feedback.
2. Crash data is critical to addressing safety improvements. The interested reservation needs to have the ability to provide at least three years of crash data as well as provide WYT^2/LTAP and NPTTAP access to that data. WYT^2/LTAP can work with limited crash data but needs to have enough to determine problem areas and trends.
3. Collaboration is key to the success of this program. The Tribe needs to have the ability to work with the state DOT, law enforcement (state, county and tribal), reservation road and transportation office or designated Tribal member able to make decisions on behalf of the Tribe concerning roadway matters.
4. The Tribe would need to provide information about any existing strategic plan or initiatives in place to address roadway safety.
5. Most of all, the Tribe must have a desire to improve roadway safety on their reservation.

A one page application was sent out to interested tribes addressing these criteria. The completed application along with a commitment letter from the tribal leadership was required for a tribe to be considered for implementation.

Selection

Reservations in North Dakota and South Dakota applied to TTAP to participate. Applications were received from three tribes; the Standing Rock Sioux Tribe (SRST), the Sisseton Wahpeton Oyate Tribe and the Yankton Sioux Tribe. Initial meetings were held between WYT^2/LTAP and the transportation contact from each to initiate communications and begin the process.

All three tribes are located in South Dakota. However, SRST is located in both North Dakota and South Dakota. This presented an interesting challenge with crash data collection and coordination with the state agencies. WYT^2/LTAP met with the respective state offices to determine how their safety programs are managed and who is responsible for the crash data.

Sisseton Wahpeton Oyate

Initial meetings established the contacts and processes involved in the transportation program on SWO. Their transportation department consists of a transportation director and a transportation safety officer along with maintenance and administrative personnel. The transportation safety officer is the contact for this project. The Sisseton Wahpeton Oyate (people) reside in northeastern South Dakota within the boundaries of the former Lake Traverse Reservation, with a small portion located in the southeastern

corner of North Dakota. The reservation boundaries extend across five counties in South Dakota; parts of Marshall, Day, Codington, Grant and Roberts Counties. There are 9,894 enrolled members living within the former reservation area, which consists of 106,153 acres (without boundaries). Many non-tribal members reside in the area as well. The safety improvement program implementation on SWO is discussed in detail in Chapter 5.

Chapter Summary

In this chapter, the regional implementation of the Indian Reservation Roadway Safety Improvement Program was discussed. WYT^2/LTAP and NPTTAP collaborated to develop criteria for tribes to participate in the Northern Plains region. The main criteria require the Tribe to have a desire to improve the safety of their roadways with the willingness of the leadership to commit to supporting the implementation.

Three Tribes were selected for participation which includes Standing Rock Sioux Tribe, Sisseton Wahpeton Oyate and Yankton Sioux Tribe. SWO is located in the northeastern corner of South Dakota a land area of about 106,000 acres. They have identified their transportation safety officer as the contact for this project.

CHAPTER 3. METHODOLOGY

The methodology developed and previously implemented on the Wind River Indian Reservation was used for this project. The methodology allows for flexibility depending on available data, preference by the Tribe and other factors. Part of this process includes looking at trends in crash data and developing a systemic approach. A combination of data driven, field verification and trend analysis is utilized. The five-step procedure is as follows:

1. Crash data analysis.
2. Level I field evaluation.
3. Combined ranking to identify potential high risk locations based on steps 1 and 2.
4. Level II field evaluation to identify countermeasures.
5. Benefit-cost analysis.

This procedure is shown graphically in Figure 3.1. Crash data is analyzed and a ranking is established based on the high crash locations. From this ranking, a list of roadways is proposed for field evaluation. From the field evaluation, a ranking of the conditions of the roadway is developed. The two rankings are combined to provide a list of proposed roadways considered for safety improvements. Another field evaluation is performed to identify safety improvements. Cost estimates are developed and a benefit-cost analysis is performed. The combination of historical crash data and field evaluations provides a substantive basis for identifying high risk locations. The benefit-cost analysis gives the Tribe a measure to prioritize the projects.

Other processes within the methodology are intended to give the Tribe the ability to make changes and identify other factors involved in the high risk locations such as behavioral factors. These can then be included in their strategic highway safety plan and addressed in other funding requests. A final step in the process is the evaluation of the effectiveness of those improvements. Once projects have been established, funded and implemented, an after study will need to be performed to determine the actual crash reduction resulting from the safety improvement.

This program is intended for low-cost safety improvements but other improvements can be identified and presented to the Tribe for consideration for other funding opportunities. The methodology provides flexibility for the Tribe to utilize the results the way they consider best to address.

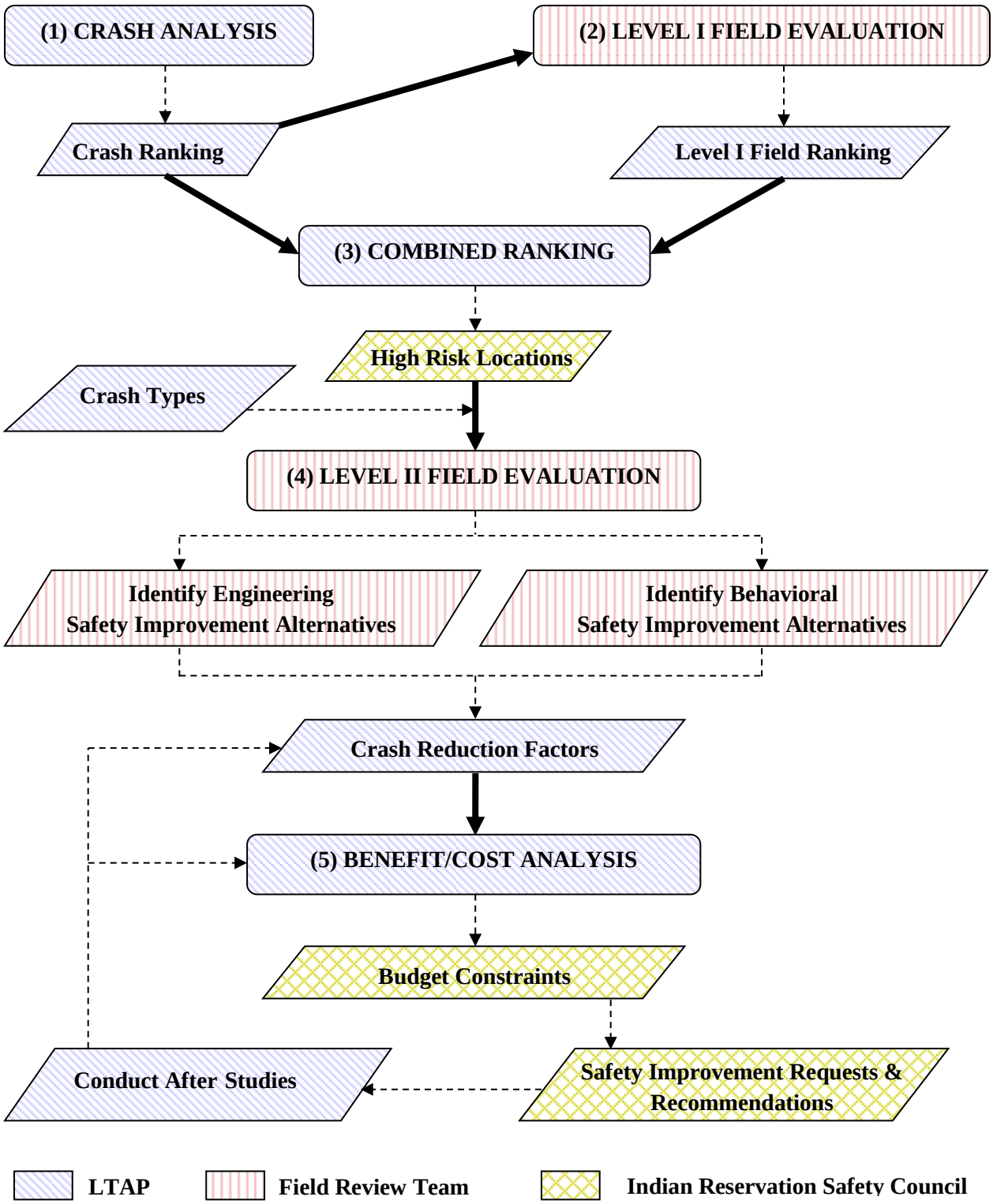

Figure 3.1. Five Step Process for Indian Reservation Safety Improvement Program

Crash Data Analysis

The first step in determining high risk crash locations is the analysis of crash data. All states have some form of crash data analysis capabilities. These data are maintained by either the state DOT, law enforcement or possibly some other state agency or consultant. An analysis should be done for a recent period of time. Five to ten years provides enough data to identify trends or hotspots depending on the state and volume of traffic experienced on the local tribal roads. However, as little as three years of data can be used. Typically, they are very low volume because of their rural nature. Crash rates are difficult to quantify because of the lack of traffic data and challenges in maintaining accurate and updated crash data. As discussed previously, many times Tribes lack complete and accurate crash data.

The crash history obtained will provide the basis for initial ranking of the sites. Based on the number of crashes for a given hotspot, the highest number would receive the highest rank. If traffic volume is available, these crashes can be converted to a crash rate which provides for a more accurate assessment of high crash occurrence.

Beside the total number of crashes and crash rate, several other factors are analyzed to determine causal effects and severity to identify ways to reduce fatal and serious injury crashes. The following criteria are considered for this analysis:

- Total number of crashes.
- Total number of crashes per mile.
- Severity of crashes – Fatal, Injury or Property Damage Only (PDO).
- Road conditions.
- Lighting conditions.
- First harmful event.
- Driver's gender.
- Driver's age.
- Alcohol-drug related crashes.
- Safety device use.
- Speed.

The first six criteria above identify physical aspects of the crashes along with the severity. These will provide a basis for determining high risk locations. Based on direction from the Tribes, several factors are being analyzed that are behavioral in nature. The last five criteria are intended more for the behavioral analysis of the crash data. Behavioral improvements are reviewed along with physical improvements.

The crash analysis includes the number of crashes per one mile segment which are known as hotspots. Each segment is ranked from the largest number of crashes per hotspot to the least number of crashes. Based on this ranking, the top high crash routes are selected and proposed for a Level I field evaluation as the Tribes determine.

Level I Field Evaluation

With the high crash locations identified, a Level I field evaluation is performed on the selected routes. A team of tribal members and transportation experts such as LTAP, TTAP and/or the BIA should perform this evaluation. This team should be selected by the Tribes. The tribal personnel are essential in providing the site expertise because they have first-hand knowledge of the problem areas.

The roadways are reviewed at one-mile segments and each segment is rated from 0 to 10, with 0 being the worst and 10 the best. All segments should begin with a 5 rating as the average. These ratings are applied to five categories as follows:

1. General:
   - Presence of sharp horizontal or vertical curve.
   - Visibility.
   - Pavement defects that could result in safety problems.
   - Ponding or sheet flow areas that could result in safety problems.
   - Presence of loose aggregate/gravel that could cause safety problems.

2. Intersection and Rail Road Crossings:
   - Intersections free of sight restrictions that could result in safety problems.
   - Intersections free of abrupt changes in grade or conditions.
   - Presence of advanced warning signs when intersection traffic control sight restrictions exist.
   - Presence of railroad crossing signs at RR crossing approach.
   - Presence of railroad advanced warning signs when crossing sight restrictions exist.
   - Vegetation and other obstructions restricting sight distance at railroad crossing.
   - Roadway approach grade at railroad crossing level enough to prevent snagging.

3. Signage and Pavement Markings:
   - Signing present at needed locations to improve safety.
   - Presence of unnecessary signage that may cause a safety problem.
   - Effective signage for existing conditions.
   - Presence of pavement markings.
   - Presence of ineffective pavement markings for present conditions.
   - Presence of old or faded pavement markings affecting the safety of the roadway.
   - Presence of needed delineators.
   - Presence of improper or unsuitable delineators.

4. Fixed Objects and Clear Zone:
   - Clear zones free of hazards, non-traversable side slopes without safety barriers.
   - Presence of narrow bridges or cattle guards.
   - Presence of culverts with inadequate extensions.

5. Shoulder and right-of-way:
   - Standard shoulder width.
   - Slope greater than 3:1.
   - Presence of hazards along shoulder.
   - High rollover potential.

For a team of evaluators, either discussion could be ensued to determine one score or each member could score independently. Then these scores would be averaged for each segment of each roadway. Maintaining the same team throughout the evaluation period would ensure consistency in results.

Each segment receives a total score as the sum of the score for each category. All segments from all routes that were evaluated are then ranked from lowest to highest score. The lowest score value is considered to have the highest risk. Similar to the crash ranking, a Level I rank is assigned.

Combined Ranking

The third step in the process is to combine the crash ranking with the Level I ranking. Crash ranking and Level I ranking are tabulated and combined to develop a final ranking for the Level II field evaluation. These rankings are tabulated by road name and/or number, beginning and ending milepost, crash ranking, Level I ranking and finally combined ranking. To combine the ranking, the crash ranking and Level I ranking are added.

The segments are then sorted by the combined rank value, smallest to largest. The segments with the smallest numbers are considered the most hazardous. From these segments, the roads with the smallest combined ranking value are considered for Level II field evaluation for determining countermeasures. Although other segments of the same road may have a much lower rank, each road is looked at in its entirety for safety improvements. Ten to fifteen roads should be selected for the Level II evaluation.

The rankings along with the selected roads are provided to the Tribe for their review and approval to proceed with the Level II evaluation. The Tribes have the option of including more sites or adjusting the rankings based on their insights.

Level II Field Evaluation

Once the Tribe has identified their priority sites, a Level II evaluation is performed on each of the routes selected. This should consist of a team determined by the Tribe and should include Tribal personnel and transportation experts. Further data may need to be collected such as traffic counts and review of behavioral factors as well as other causal factors that would guide decisions on safety improvements. The team reviews each road and revisits the sites as needed to determine the proper countermeasures.

A list of countermeasures is developed for typical applications on rural roadways and crash reduction factors assigned. Information on proven safety countermeasures and crash reduction factors can be obtained from the FHWA Safety website (FHWA, 2008) . The FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads (Atkinson, et al., 2014) was developed specifically for identifying appropriate countermeasures. The Crash Modification Factors Clearinghouse (FHWA) is a repository of CMFs that is regularly updated and provides extensive information on the proper applications. Individual states also may have their own countermeasures and crash reduction factors they have developed. Tribal lands in the state they are located typically have similar conditions unique to that area and thus can utilize those resources of information. Included are behavioral countermeasures that the Tribes can apply.

Typical countermeasures that are considered low-cost safety improvements include the installation of advanced warning signs, chevrons at curves, delineators and pavement markings. Others that may require more design and resources would be culvert widening, installation of guardrail, and flashing warning beacons. Countermeasures should be applied based on the type of crashes. For run-off the road crashes, countermeasures such as advanced curve warning signs, pavement marking, and chevrons are effective and low cost.

Each route is evaluated and proposed countermeasures identified. Once all routes have been evaluated and improvements identified, a cost to implement is estimated. This information is used to perform the benefit-cost analysis.

Benefit-Cost Analysis

Based on the selected countermeasures and associated costs, a benefit-cost analysis is performed for each project. If the project is set up for each road, then all the improvements identified for that road are included in the estimate. This provides the Tribe information on the most effective safety improvements. Construction costs are estimated for the safety improvements.

A benefit value associated with each improvement is calculated based on a Crash Reduction Factors (CRF) and societal costs of crashes. The crash reduction factor (CRF) is an estimation of the percent reduction of crashes expected from the implementation of the associated countermeasure. The resources cited in the previous section for identifying countermeasures and crash modification factors should be used to identify the proper CFR for each countermeasure.

This is only an estimate and a general application. Other factors must be considered that apply specifically to the site. The benefit is calculated using the CRF assigned to the particular countermeasure and the cost of that type of crash being avoided. Values for fatal, injury and PDO crashes are assigned and can be obtained from federal or state sources. When two or more countermeasures are applied to a site, then a weighted combined value is calculated.

The ratio of calculated benefit of the countermeasure to the estimated construction cost is then calculated. If any ratio is less than 1.0, it should not be considered because the benefit is actually decreased by the countermeasure. In other words, the countermeasure is increasing the hazard.

Once the benefit-cost analysis is completed for each site, a recommended prioritized list of improvements is provided to the Tribe for their review and approval. When the tribe has decided on what improvements they desire, they can determine what resources they want to allocate to these projects. For the low-cost improvements, the state can provide Highway Safety Improvement Program (HSIP) funds under the High Risk Rural Road Program (HRRRP). Funding could also be obtained through the Tribal Transportation Plan (TTP) Safety Funds.

Chapter Summary

This chapter lays out the five-step methodology designed to assist Tribal governments with developing a safety improvement program. Understanding that Tribes have unique challenges and cultural differences, collaboration between their members, government agencies and other safety stakeholders is key to successfully implementing such programs. Starting with a review of crash data provides the trends that are attributed to the crashes and identification of hotspots is necessary to know where to first look to improve their roadways. A priority ranking is determined based on the high crash locations.

The top locations are considered for field evaluation. The field evaluation provides a scoring of the locations based on the roadway conditions. These locations are then ranked according to the worst condition to best. Then the crash rank and the Level I field evaluation rank are combined, providing a new list of priority locations.

The whole road is considered for a Level II evaluation to determine countermeasures for the hotspot locations. Countermeasures are identified and tabulated for each road. Construction cost estimates are calculated for the safety improvement projects determined from the countermeasures. Low cost improvements include pavement markings, signage and delineators. Other improvements should be considered as well such as culvert widening and guardrail installation. The Tribes can determine whether to pursue all or part of the proposed improvements.

The benefit of installing each countermeasure is calculated based on CRFs and crash costs. A benefit-cost ratio is then calculated. Projects with large benefit-to-cost ratios should be considered first for implementation. A high benefit-to-cost ratio indicates that for small investment of funds, there is a potential for a great reduction in fatal and injury crashes.

CHAPTER 4. CRASH ANALYSIS AND TRENDS

In South Dakota the Department of Public Safety (SD DPS) manages the crash data. They claim that they receive very little data from tribal and BIA law enforcement for the various tribes around the state. South Dakota publishes their crash data which contains personal information on individuals involved in the crash. This presents a problem with many tribes who feel that they do not want such personal information publicized.

Initial analysis has been performed for SWO. South Dakota provided access to the raw crash data for 2004 through 2013 and included information on injury severity, road conditions, lighting conditions, first harmful event (FHE), and FHE location, and person data that included gender, age, alcohol and drug involvement, safety equipment use as well as personal data about each individual such as name and address. Because the person data includes information on every person involved in the crash, some simplifications and assumptions needed to be made to be able to link it to a specific crash. Typically, the first person listed in the person data was the driver. If the crash involved more than one vehicle, only the first driver information was used.

The crash analysis compared the crashes within the reservation boundaries with all state rural roads in the state for a ten year period (2004-2013). This analysis compared severity, alcohol involvement, driver gender and age, safety equipment use, and FHE and FHE location. Comparisons with other tribes in South Dakota were also made.

Results

There were 1065 crashes recorded for SWO from 2004 through 2013. It can be observed in Figure 4.1 that the total number of crashes dropped considerably in 2005 but increased again to 2004 levels by 2010. However, fatal and injury crashes remained fairly consistent. Further study should be done to determine if this is due to better reporting of PDO crashes or if they are in fact increasing.

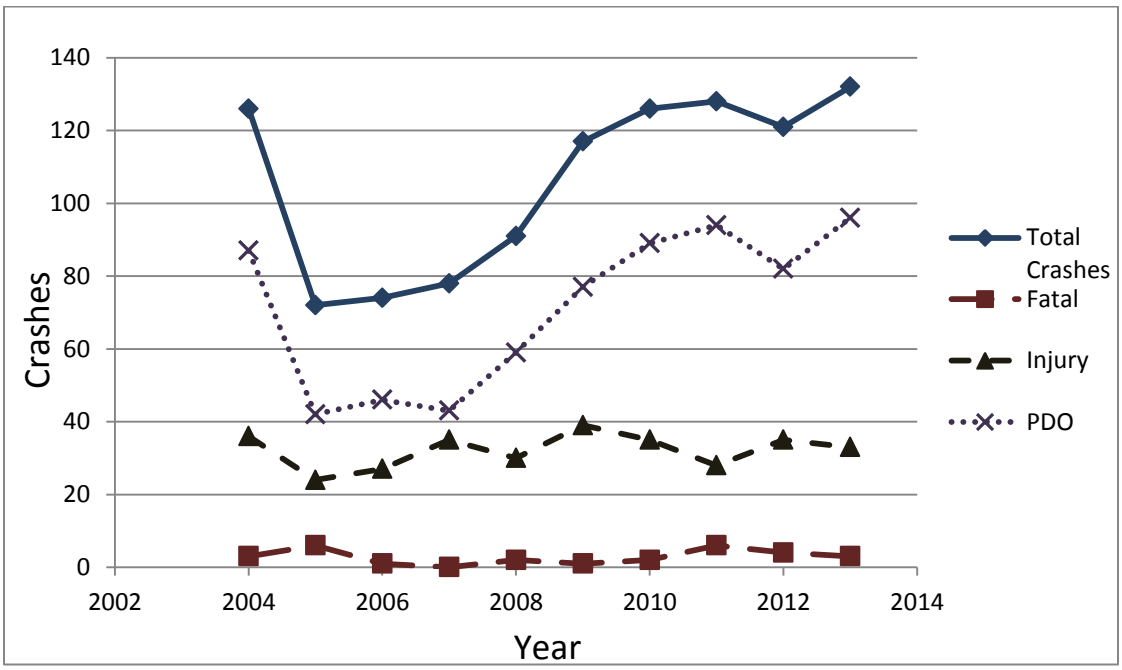

Figure 4.1. SWO Crashes 2004-2013

Crash severity was divided into fatal, injury and property damage only (PDO). As seen in Figure 4.2, three percent of all crashes on SWO were fatal compared to one percent for all crashes in South Dakota.

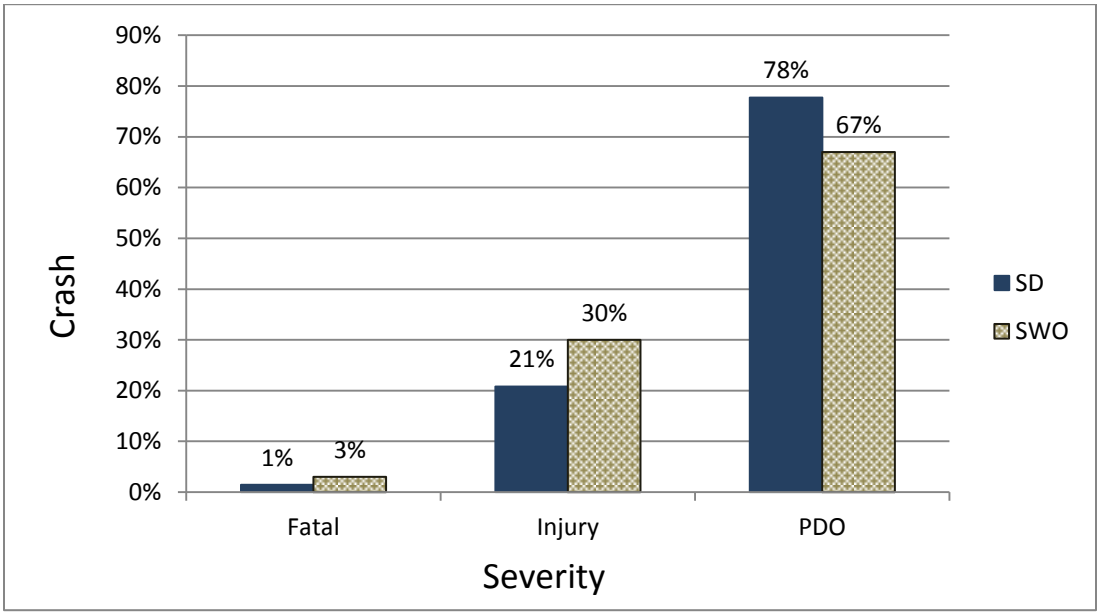

Figure 4.2. Crash Severity in SD and SWO 2004-2013

The first harmful event (FHE) revealed that animal crashes were much lower than the state at 22 percent compared to 52 percent of crashes. Non-collisions were much higher at 25 percent compared to 12 percent for the state. Non-collision crashes include rollover crashes. Motor vehicle and fixed object were also higher. One percent of all crashes involved pedestrian. Most of the reservation is rural with long distances between communities. No extensive pedestrian pathways exist to connect these communities and pedestrian tend to use the rural highways for travel. The FHE results are located in Figure 4.3.

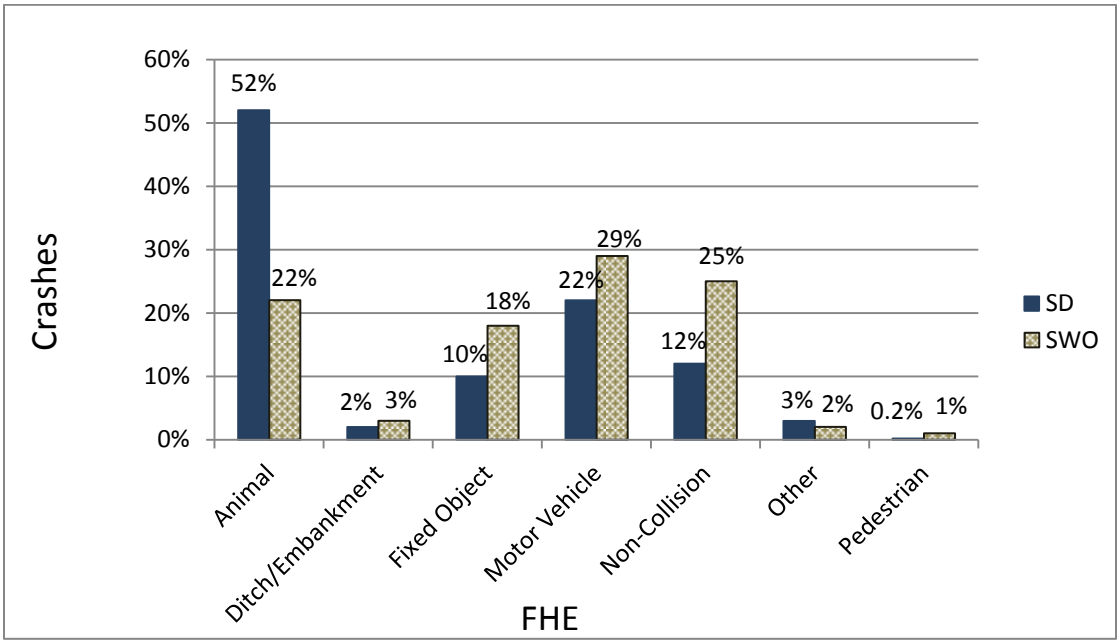

Figure 4.3. First Harmful Event for Crashes in SD and SWO 2004-2013

More off roadway crashes were reported on SWO than the state at 46 percent compared to 23 percent respectively. With 54 percent occurring on the roadway, on road and off road crashes are of equal concern. See Figure 4.4.

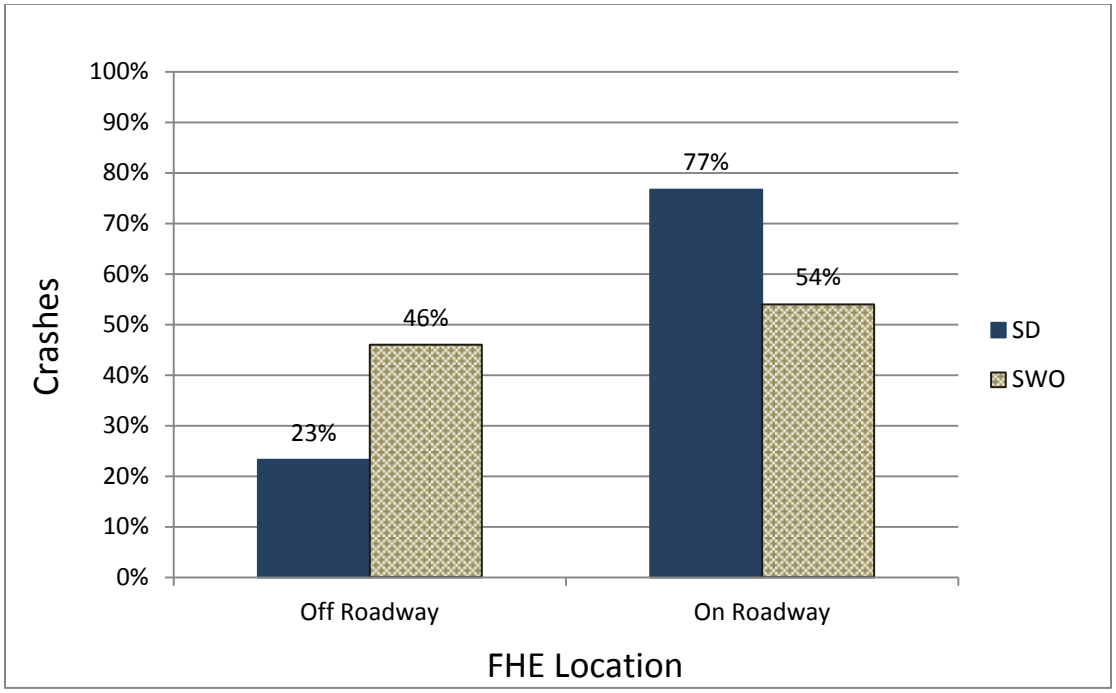

Figure 4.4. FHE Location for SD and SWO 2004-2013

Road conditions were reported as dry for 69 percent of the crashes and as ice, snow, frost, or slush for 24 percent. Wet roads only accounted for six percent of all crashes. See Figure 4.5.

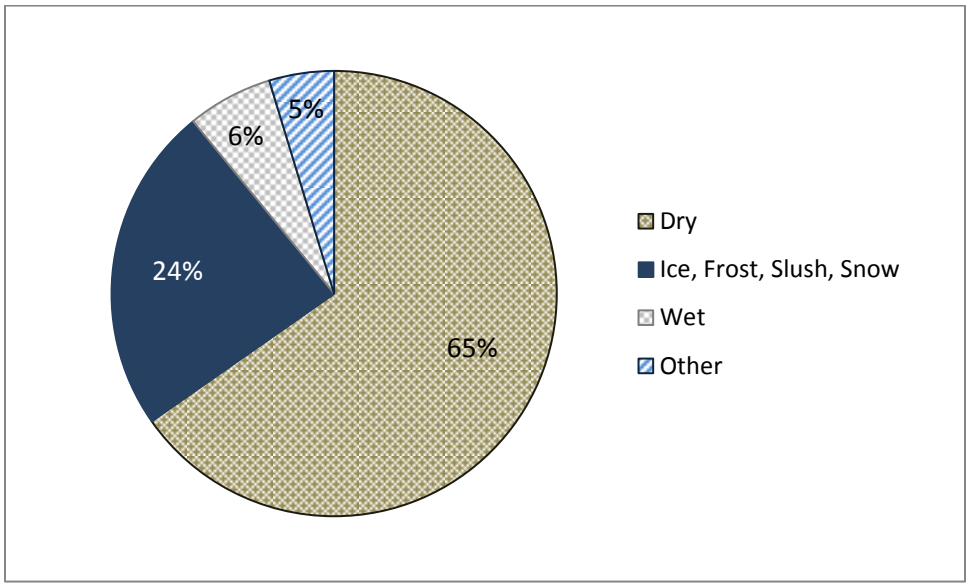

Figure 4.5. SWO Road Conditions 2004-2013

Lighting conditions for the most part showed that crashes were evenly distributed between daylight and dark at 54 percent and 40 percent respectively Figure 4.6 ().

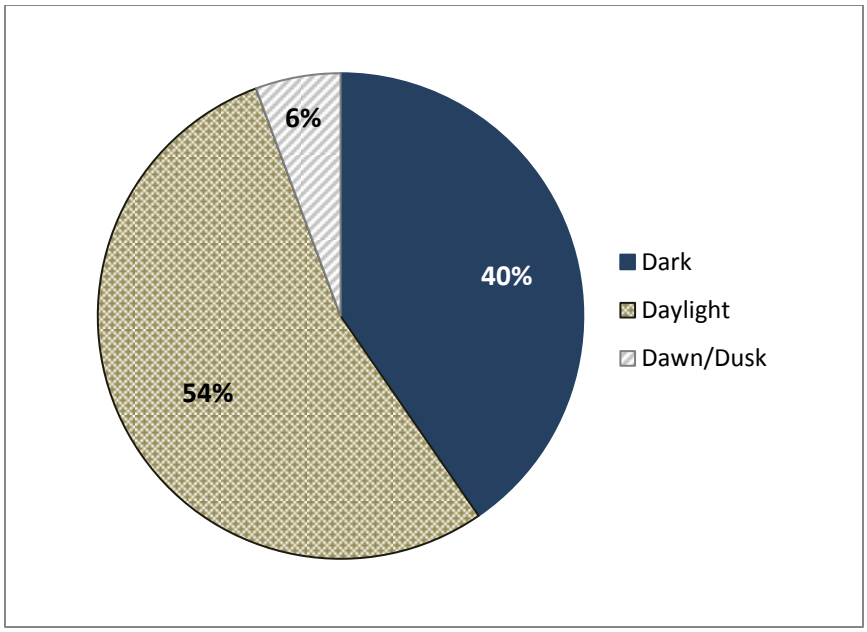

Figure 4.6. SWO Lighting Conditions 2004-2013

More young drivers were involved in crashes on SWO compared to statewide. Twenty-nine percent were between the ages of 15 and 24, and 20 percent were between the ages of 25 and 34. For statewide these values were 21 percent and 17 percent respectively. See Figure 4.7.

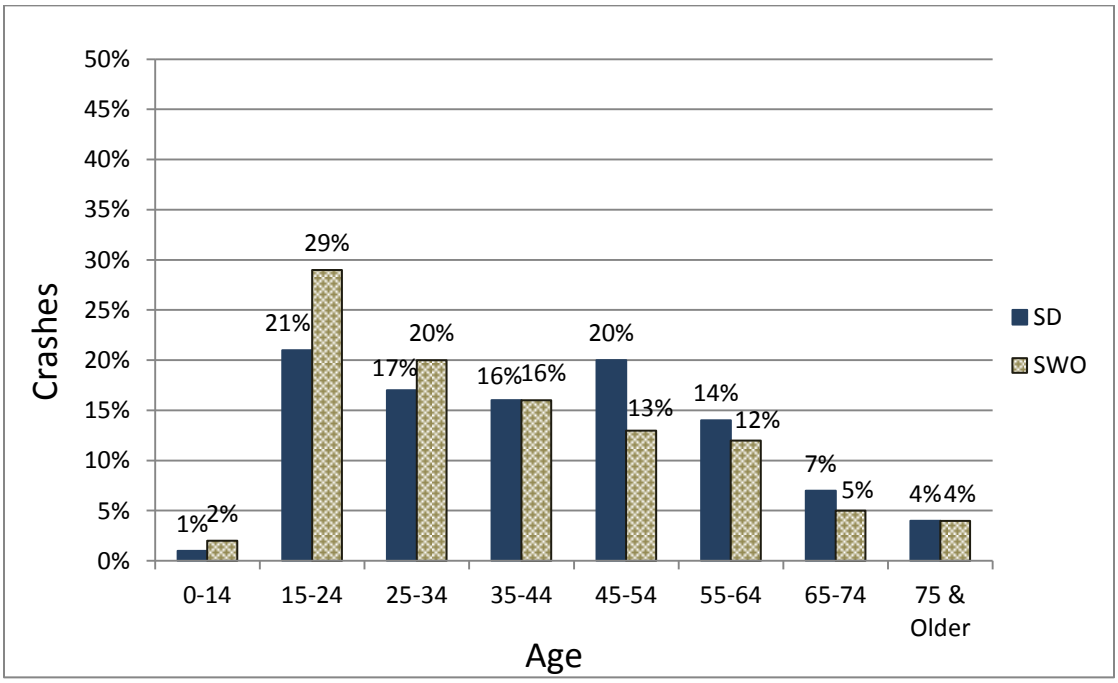

Figure 4.7. Driver Age for SD and SWO 2004-2013

Sixteen percent of all crashes reported that alcohol was involved with the statewide showing only 4 percent impaired. However, it should be noted that the statewide also shows 50 percent as unknown or not reported impairment as compared to SWO at 22 percent unreported. See Figure 4.8.

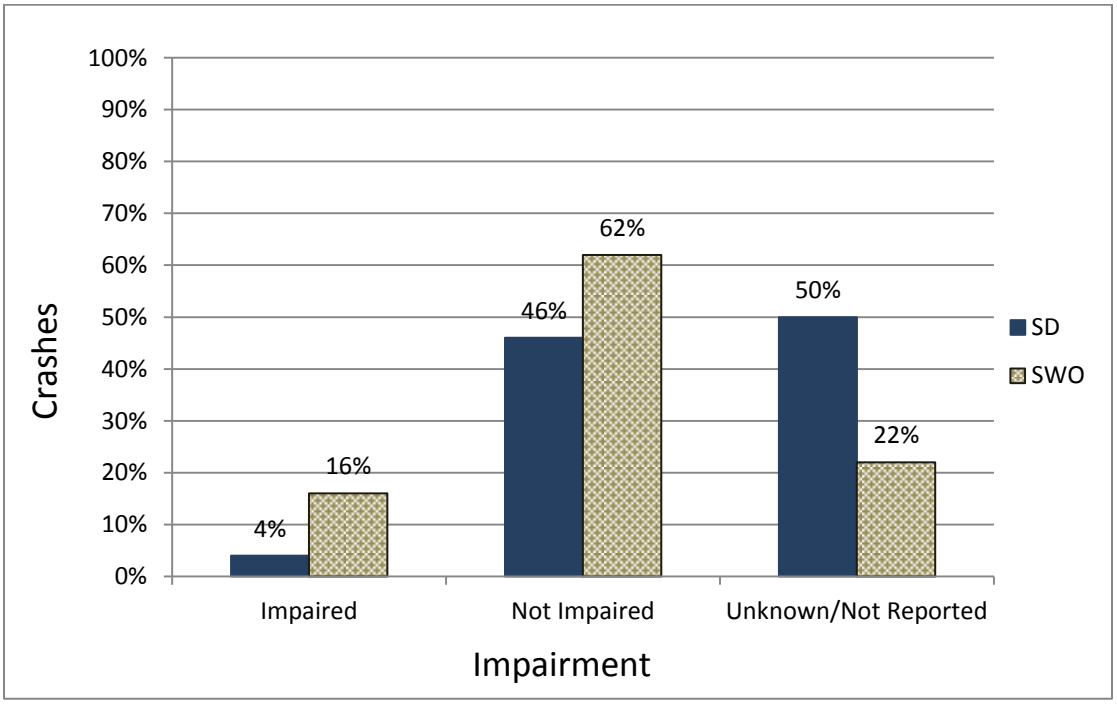

Figure 4.8. Crashes Involving Alcohol in SD and SWO 2004-2013

Safety equipment use is reported as higher on the reservation at 54 percent compared to 37 percent across the state (Figure 4.9). This could account for fewer fatal rollover crashes.

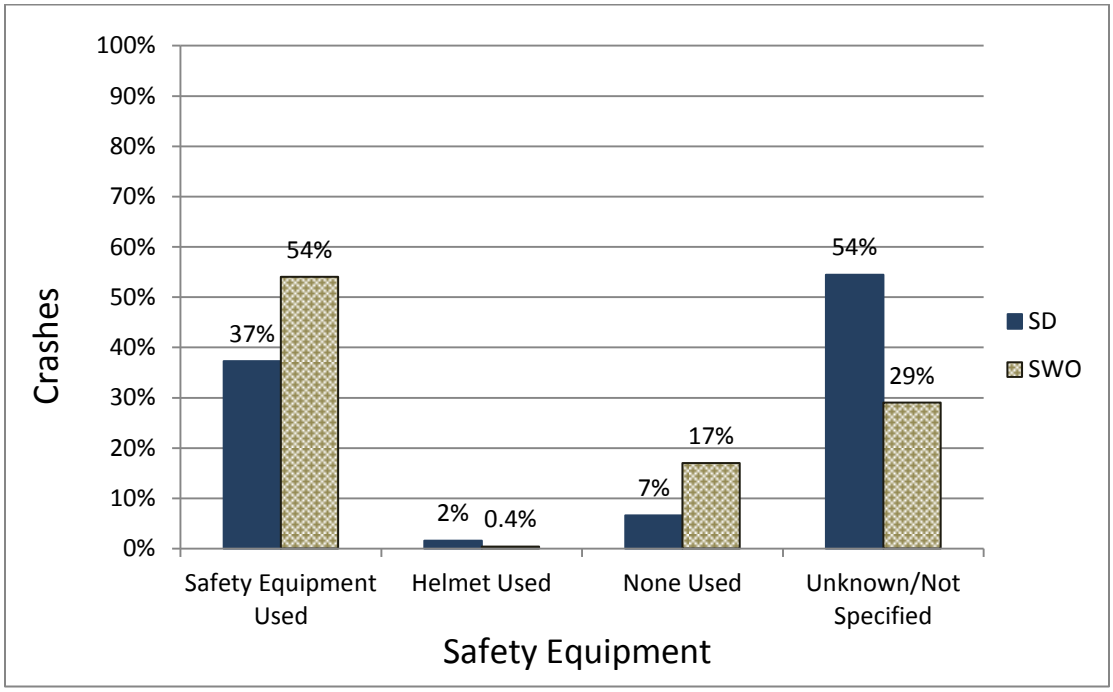

Figure 4.9. Safety Equipment Use in SD and SWO 2004-2013

Chapter Summary

The crash data for SWO was analyzed and trends were identified. South Dakota DPS provided crash data from 2004 through 2013. There were a total of 1065 crashes reported between 2004 and 2013. Crashes dropped considerably in 2005 by returned to 2004 levels in 2010. However, fatal and injury crashes remained fairly constant but PDO crashes increased. This could be due to better reporting of PDO crashes. Three percent of all crashes at SWO were fatal and 30 percent were injury. These rates are higher than statewide fatal and injury crashes at one percent and 21 percent respectively.

Motor vehicle collisions were the highest first harmful event at 29 percent of all crashes followed by non-collision crashes at 25 percent and other fixed object crashes at 18 percent. These are higher than statewide which are at 22, 12 and 10 percent respectively. Animal crashes on SWO are much lower than statewide at 22 percent compared to 52 percent statewide. The non-collision and fixed object crashes account for most run-off-the-road crashes. SWO has a comparable number of on road crashes to off road crashes. Sixteen percent of crashes involved alcohol compared to the statewide at four percent. SWO has a higher percent of safety equipment use at 54 percent of all crashes compared to the state at 37 percent. SWO had a higher percentage of young drivers involved in crashes than the state with 29 percent between the ages of 15 and 24.

CHAPTER 5. SISSETON WAHPETON OYATE IMPLEMENTATION

The Sisseton Wahpeton Oyate (people) reside in northeastern South Dakota within the boundaries of the former Lake Traverse Reservation, with a small portion located in the southeastern corner of North Dakota. The reservation boundaries extend across five counties in South Dakota; parts of Marshall, Day, Codington, Grant and Roberts Counties. There are 9,894 enrolled members living within the former reservation area, which consists of 106,153 acres (without boundaries). Many non-tribal members reside in the area as well. They have a transportation department that consists of a transportation director and a transportation safety officer along with maintenance and administrative personnel. They maintain their BIA roads and share maintenance with the many townships within their boundaries.

Applied Methodology

The methodology was slightly modified to fit the needs of SWO. A preliminary crash ranking was first performed based on mapped locations. A revised crash ranking was performed once mile post locations were established during the field evaluations. In order to maximize resources, the Level I and Level II evaluations were performed simultaneously. See Figure 5.1.

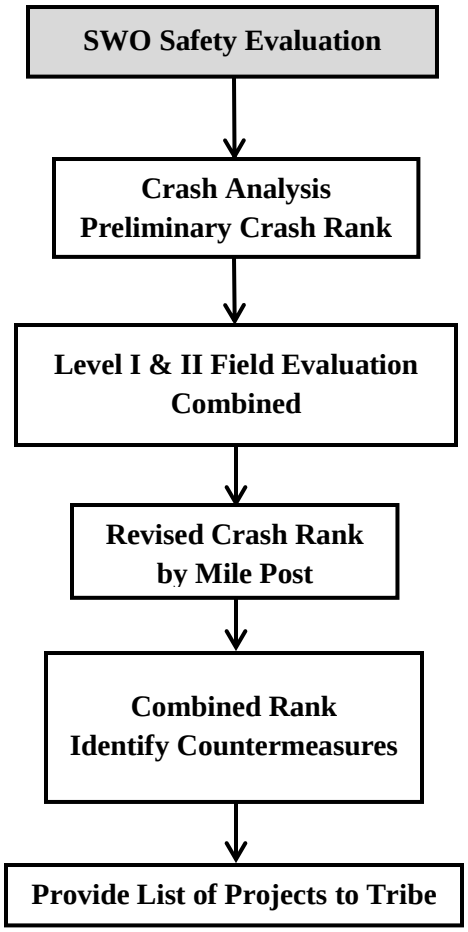

Figure 5.1. Applied Methodology

Crash Analysis

The analysis of crash data is the first steps in the roadway safety program methodology. Safety goals and strategies are driven by data that documents the safety problems. Many factors must be reviewed to

determine appropriate safety measures considering the four E's of safety (engineering, enforcement, education, and emergency response).

The analysis and subsequent ranking proceeded using the crash analysis described in Chapter 3. An initial ranking was performed based on GIS maps with the crashes overlaid on the roadways (Appendix A). Initial data did not include all mile post locations. Once the Level I field evaluation was completed, the crash rankings mileposts were revised to match the Level I mileposts. Table 5.1 is the preliminary crash ranking (See Appendix B for the revised crash ranking). The road segments were then sorted by the highest number of crashes per segment. Ranking was assigned starting at the number one (1). Progressing through the list, equal scores received equal rank.

Table 5.1. SWO Preliminary Crash Ranking (2004-2013)

Highway	Functional Class	No. Crashes	Length (mi)	Crashes/mi	Crash Rank
446 Ave	Rural Major Collector	9	2	5	1
459 Ave	Rural Major Collector	27	7	3.9	2
473 Ave	Rural Major Collector	3	1	3	3
455 Ave	Rural Major Collector	42	16	2.6	4
456 Ave	Rural Local Road	3	1.5	2.0	5
107 St	Rural Major Collector	6	3	2	6
164 St	Rural Major Collector	5	2.5	2	6
446A Ave	Rural Major Collector	8	4	2	6
465 Ave	Rural Major Collector	4	2	2	6
446 Ave	Rural Major Collector	16	9	1.8	10
122 St	Rural Minor Collector	3	1.7	1.8	10
447 Ave	Rural Major Collector	5	3	2	12
127 St	Rural Major Collector	32	20	1.6	13
118 St	Rural Local Road	6	4	1.5	14
445 Ave	Rural Major Collector	3	2	1.5	14
455 Ave	Rural Major Collector	19	13	1.5	14
144 St	Rural Minor Collector	7	5	1.4	17
BIA 7	Rural Major Collector	17	13	1.3	18
463 Ave	Rural Local Road	5	4	1.3	28
448 Ave	Rural Major Collector	5	4	1.3	18
122 St	Rural Minor Collector	10	10	1	21
149 St	Rural Major Collector	5	5	1	21
454 Ave	Rural Major Collector	13	13	1	21
BIA 3	Rural Major Collector	4	4	1	21
Lohre Rd	Rural Major Collector	4	4	1	21
462 Ave	Rural Major Collector	8	9	0.9	26
473 Ave	Rural Major Collector	6	7	0.9	26
County Rd 10	Rural Major Collector	5	6	0.8	28
142 St	Rural Local Road	4	5	0.8	28
446 Ave	Rural Major Collector	12	15	0.8	28
458 Ave	Rural Minor Collector	11	15	0.7	31
118 St	Rural Local Road	2	3	0.7	31
Lake Rd	Rural Major Collector	7	11	0.6	33
101 St	Rural Minor Collector	16	29	0.6	33
457 Ave	Rural Local Road	5	19	0.3	35

Level I Field Evaluation

After consultation with the Tribe, 21 roads were selected to be evaluated including BIA 200 which was requested by the Tribe to look at. The evaluating team consisted of four individuals, SWO Transportation Safety Officer, WYT^2/LTAP, Northern Plains TTAP, and SD LTAP.

Five categories were evaluated, general roadway conditions, intersections, signage and pavement markings, fixed objects and clear zone, and shoulder and right-of-way as described in Chapter 2. The same criterion that was used to score the segments for the initial implementation on the Wind River Indian Reservation was used for the SWO. Each category was evaluated separately for each one-mile segment assigning a score of 0 to 10 for each category. Zero (0) would be the worst condition and 10 would be the best. The starting level is five (5). For each segment the score is totaled for all six categories providing a final score per segment.

The spreadsheets developed for each roadway for Level I can be observed in Appendix C. This process was repeated for each segment of each roadway that was selected from the crash ranking. Each roadway ranged from two mile to up to 18 miles long. Field decisions were made by SWO team members to reduce the length evaluated based on knowledge of recent or upcoming construction and maintenance that would address safety issues. Looking at the hotspots in the context of the entire roadway is a practical approach to address roadway safety improvements. For example, if the field evaluation reveals that the roadway is in poor condition, pavement markings are missing, or shoulders are narrow, the improvement would not only be applied to the hotspot but to the entire portion of the roadway.

SWO lies within several counties and more than one name is assigned to the highways. A revised list of roads evaluated was developed to clarify which roads, what sections and which direction they were evaluated. These are listed in Table 5.2.

Table 5.2. SWO Roads Reviewed During Field Evaluation

Highway	Other Road Names	County	Begin Point	End Point	Beg MP	End MP	Direction Evaluated
101 St	County Rd 25	Roberts	473 Ave	455 Ave	0	18	E - W
118 St	BIA 8	Roberts	455 Ave	459 Ave (SD 127)	0	4	W - E
123 St	County Rd 32	Roberts	459 Ave	454 Ave	0	5	E - W
127 St	County Rd 5	Roberts	449 Ave	465 Ave	0	16	W - E
129 St/128 St	County Rd 4	Day	446 Ave	449 Ave	0	4	W - E
164 St	County Rd 6	Codington	453 Ave	450 Ave	0	3	E - W
445 Ave		Marshall	127 St	BIA 3 (122 St)	0	5.5	S - N
446 Ave (South)	County Rd 19	Day	148 St	US Hwy 12	0	7	S - N
446A/446 Ave	County Rd 19	Day	US Hwy 12	129 St	0	13.3	S - N
447/446 Ave	BIA 15	Marshall	SD Hwy 10	SD Hwy 25	0	15	S - N
453/454 Ave	Lohre Rd	Roberts	US Hwy 12	SD Hwy 10	0	24	S - N
455 Ave (North)	County Rd 30	Roberts	101 St	SD Hwy 10	0	18	N - S
455 Ave (South)	County Rd 30	Roberts	US Hwy 12	158 St	0	16	N - S
456 Ave	Township Rd	Roberts	Goodwill Rd	Nelson Ln	0	4	S - N
459/458 Ave	County Rd 34	Roberts	SD Hwy 10	BIA 200	0	13.4	N - S
462 Ave		Roberts	127 St	136 St (SD 15)	0	9	N - S
473 Ave		Roberts	111 St	101 St	0	10	S - N
475 Ave		Roberts	112 St	110 St	0	2	S - N
BIA 3		Marshall	445 Ave & 122 St	SD Hwy 10	0	5	S - N
BIA 200		Roberts	459 Ave	456 Ave	0	6	E - W
Lake Rd		Roberts	SD Hwy 10	473 Ave & 113 St	0	12	W - E

Once evaluation of all the roads was complete, the segment scores were tabulated. The overall Level I score for each segment was assigned and the segments were sorted from lowest to highest score. From this, ranking was assigned starting at the number one (1). Progressing through the list, equal scores received equal rank. The next rank number would then be that associated with the total number of segments ranked so far. Table 5.3 summarizes the level I ranking for the top 55 segments. See Appendix C for a complete list of the Level I Ranks for all 214 segments.

Table 5.3. SWO Level I Rank

Highway	Beg MP	End MP	Level I Score	Level I Rank
456 Ave	1	2	7	1
446 Ave (S)	7	8	10	2
455 Ave (S)	0	1	12	3
455 Ave (S)	11	12	14	4
446 Ave (S)	6	7	16	5
456 Ave	0	1	16	5
456 Ave	2	3	16	5
456 Ave	3	4	16	5
462 Ave	0	1	17	9
459/458 Ave	0	1	18	10
462 Ave	4	5	18	10
123 St	0	1	19	12
123 St	1	2	19	12
123 St	2	3	19	12
123 St	3	4	19	12
123 St	4	5	19	12
446A/446 Ave	0	1	19	12
446A/446 Ave	1	2	19	12
446A/446 Ave	2	3	19	12
446A/446 Ave	3	4	19	12
462 Ave	1	2	19	12
462 Ave	2	3	19	12
462 Ave	3	4	19	12
127 St	12	13	20	24
127 St	13	14	20	24
127 St	14	15	20	24
127 St	15	16	20	24
118 St	2	3	21	28
118 St	3	4	21	28
Lake Rd	4	5	21	28
455 Ave (S)	4	5	22	31
455 Ave (S)	5	6	22	31
455 Ave (S)	7	8	22	31
459/458 Ave	1	2	22	31
Lake Rd	0	1	22	31
Lake Rd	1	2	22	31
Lake Rd	2	3	22	31
Lake Rd	3	4	22	31
Lake Rd	5	6	22	31
Lake Rd	6	7	22	31
Lake Rd	7	8	22	31
Lake Rd	8	9	22	31
Lake Rd	9	10	22	31
Lake Rd	10	11	22	31
Lake Rd	11	12	22	31
118 St	0	1	23	46
118 St	1	2	23	46
164 St	0	1	23	46
164 St	1	2	23	46
164 St	2	3	23	46
455 Ave (S)	6	7	23	46
455 Ave (S)	8	9	23	46
455 Ave (S)	9	10	23	46
455 Ave (S)	10	11	23	46
Lohre Rd	8	9	23	46

Combining the Crash Ranking and the Level 1 Ranking

With a list of all the segments ranked by highest number crashes and lowest Level I score, the two rankings were combined. The crash rankings were first redone matching the one-mile segments to the Level I one-mile segments for each route. Refer to Appendix B for the revised crash rankings. Then the respective ranks for the respective segments were added. Appendix E provides the combined ranking for all roadway segments.

Once these were all totaled, then the segments were sorted from smallest to largest combined rank value. The road segments with the lowest score were used to select the roads that would be evaluated for safety improvements. Table 5.4 is a list of the top thirteen roads from the combined ranking.

Table 5.4. Combined Rank for Top 13 Roads

Highway	Beg MP	End MP	Combined Rank
118 St	2	3	65
	3	4	45
123 St	0	1	97
	1	2	97
	3	4	49
	4	5	97
127 St	0	1	93
	2	3	93
	3	4	93
	9	10	73
	12	13	61
	15	16	61
164 St	0	1	50
	2	3	55
445 Ave	2	3	93
446 Ave (S)	6	7	9
446A/446 Ave	0	1	13
	1	2	29
	3	4	97
455 Ave (N)	16	17	98
455 Ave (S)	0	1	7
	4	5	68
	5	6	68
	6	7	83
	9	10	47
	10	11	50
	11	12	13
456 Ave	0	1	42
	1	2	86
459/458 Ave	0	1	47
	2	3	90
	4	5	98
	5	6	93
462 Ave	0	1	94
	1	2	97
	2	3	29
Lake Rd	10	11	40

Level II Field Evaluation – Selection of Countermeasures

As previously explained, Level II field evaluations were performed during the Level I field evaluations. The team discussed countermeasures with the understanding that further investigation would be needed. From the combined rankings, the hot spot locations were reviewed for most severe crashes at those locations, roadway geometrics, and other unique conditions to identify appropriate countermeasures. Thirteen roads were identified for recommended safety improvements. The countermeasures are identified for the given roadway segments in Table 5.5.

Table 5.5. Level II Field Evaluation and Recommended Countermeasures

Highway	Beg MP	End MP	Most Severe Crash	Road Geometry	Prevalent crashes	Recommended Countermeasure
118 St	1	4	Injury	Level, Gravel	Overturn/ Rollover	Speed Study for compliance and possibly reduced speed
123 St	0	5	Injury	Level, Gravel, 55 MPH	Overturn/ Rollover, Roadside	Speed Study for compliance and possibly reduced speed
127 St	0	16	Injury	Straight & curves, no shoulder	Overturn/ Rollover, Animal, Intersections	Rumble Strip/Stripe, Intersection Ahead Signs at cross streets,
164 St	0	3	Injury	Straight, narrow shoulder	Intersection	Intersection ahead/stop ahead, proper stop signage, transverse Rumble Strip, intersection study
445 Ave	0	6	Fatal	Curves, rough pavement	Roadside	Curve warning signs w/chevrons. Replace right angle curve sign at T-int. Surface treat or overlay
446 Ave (S)	0	7	Fatal	Curves, narrow shoulder	Overturn/ Rollover, Roadside	Rumble stripe, Chevrons in curves
446A/ 446 Ave	0	4	Injury	Curves, entrances	Overturn/ Rollover, Roadside	Speed Study for compliance and possibly reduced speed in high density driveway areas, Chevrons in curves, Rumble Strip/Stripe
455 Ave (N)	5	18	Injury	Straight, No shoulders	Animal, Roadside, collisions	Edgelines, Rumble Strip/Stripe, Safety wedge
455 Ave (S)	0	12	Injury	Straight, No shoulders	Overturn/ Rollover, Roadside, Animal	Replace Guardrail, Remove objects in clear zone, Install intersection ahead signs, Edgelines and centerline
456 Ave	0	2	Fatal	Level, Gravel, rough	Overturn/ Rollover	Increase maintenance, Speed study for possible reduced speed
459/458 Ave	0	9	Fatal*	Straight & curves, no shoulder, good recovery slopes	Overturn/ Rollover, Roadside, Animal	Rumble Strip/Stripe, Safety wedge, Delineators in curve,
462 Ave	0	9	Injury	Straight, No shoulder	Overturn/ Rollover	Edgelines, Rumble Strip/Stripe, Safety wedge
Lake Rd	0	12	Fatal	Curves, narrow shoulders	Overturn/ Rollover, Roadside	Edgelines & Centerline, Clear vegetation in ROW, Replace Guardrail

* Pedestrian Fatality

Gravel Roads

Three roads that are recommended for improvements are gravel, two of which are local Township roads. 118 Street, 123 Street, and 456 Avenue are level, gravel roads. The prevalent crashes are rollovers. Because the surface becomes rough between maintenance, high speeds could be contributing to these crashes. The speed limit on gravel roads is 55 MPH. A speed study is recommended to determine if operating speeds are in compliance and if a lower speed limit should be considered.

The Township roads suffer from lack of maintenance because of the limited resources the small Townships have to work with. The Tribe may want to explore the possibility of partnering with the many Townships within their boundaries and pool their resources to be able to provide more consistent maintenance. Other Township roads were reviewed but were not included in the final combined ranked list.

When the team was traveling from 123 Street to evaluate another road, 124 Street was travelled. This was not on the list of roads to evaluate. However, some discrepancies were noted. This road is very low volume and vegetation is present within the driving lanes. A road closed sign was lying down in the brush on the side of the road. The road ended at water's edge about a mile later (See Figure 5.2). This is potentially dangerous if a driver is unfamiliar with the road or is traveling at night. It is recommended that the road closed sign be re-installed and the proper barricade (MUTCD Type III) be installed at the end of the roadway.

Figure 5.2. 124 Street End of Roadway at Water's Edge

Paved Roads

Several paved roads had similar roadway conditions and similar prevalent crash types. Many were straight, narrow roadways with little or no shoulders. Rollovers or roadside hazards are the typical first

harmful event. This indicates that most crashes on these roadways are run-off-the-road crashes. Because of the narrow widths, no shoulders and non-recoverable roadside slopes, speed could be a factor. A longitudinal rumble strip is recommended for these roadways where enough shoulder exists. On roadways that have no shoulder, a rumble strip could be applied directly to the edgeline. And edgelines should be added to those roads that have no edgeline. Refer to Table 5.5 for specific roadways and countermeasures.

455 Avenue (north) and 462 Avenue are narrow roads with no shoulders. The roadway drops off at the edge of pavement. If a vehicle only slightly departs from the travel lane, the wheel could catch the edge of pavement causing the driver to over correct to return to the pavement. Widening the shoulder with a safety edge would improve recovery for vehicles in these areas.

455 Avenue (south) is a straight roadway with no shoulders. Within the first half mile south of US 12, approximately 2200 feet of cable barrier is located along both sides of the roadway. It appears to be too low and in some locations is in poor condition. This area should be reviewed to replace the cable barrier especially near the approaches of a bridge located at MP 0.4.

Many of the roads with curves were properly signed with advanced curve warning signs including advisory speeds. However, crashes are occurring along the curves. These could be improved by adding chevrons in the curve.

A pedestrian fatality occurred along 459 Avenue. As noted, this road has narrow to no shoulders. There are no pathways connecting the community centers and many Tribal members walk to their destinations. A pedestrian pathway study and plan is recommended for development.

445 Avenue did not have curve warning signs at all curve locations. These should be added along with the chevrons. At mile post 5.7 a right angle curve warning sign is located at a T-intersection. This should be replaced with the proper T-intersection sign. This roadway also has some rough pavement that should be considered for repair with an overlay or surface treatment.

446 Avenue and 446A Avenue is a winding roadway located along some lake areas on the western side of SWO. Heavy recreational traffic and truck traffic occurs along these roads. There are areas with a concentration of driveways and many locations where vehicles park along the roadway to access the adjacent lakes. Rollover crashes mostly along curves are prevalent.

446 Avenue and 446A Avenue have some shoulder and good pavement markings. Longitudinal rumble strip is recommended. With proper advanced curve warning signs and advisory speeds already in place, chevrons should be added in the curves. A speed study is recommended to determine compliance to existing speed limits and to determine if speed reduction should be posted in high density driveway areas. Figure 5.3 is a map of the two roadways showing the existing signage and crashes. At the north end of 446 Avenue where it intersects with 129 Street, the T-intersection could be better marked with a larger double arrow sign and advanced intersection ahead sign.

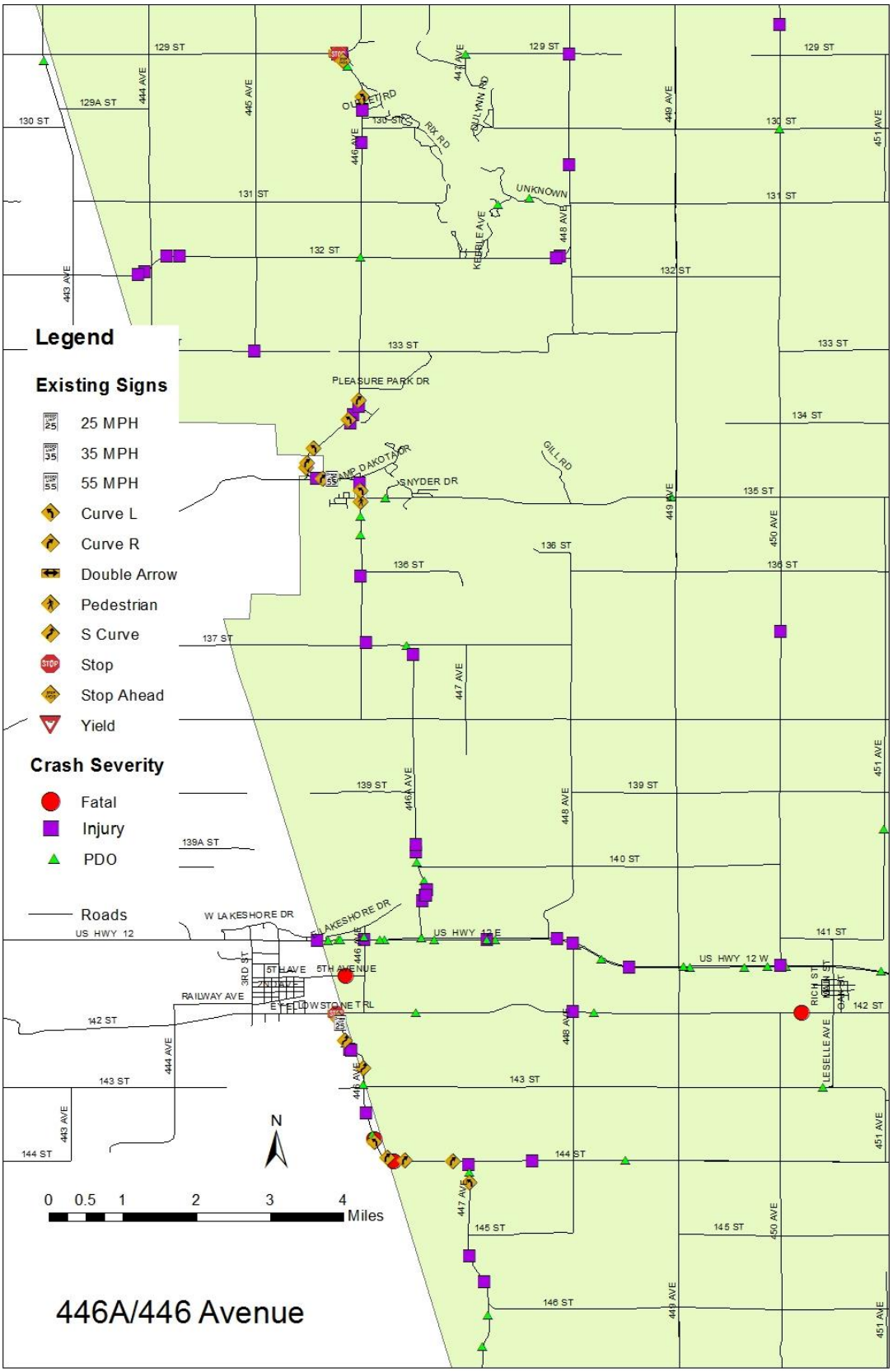

Figure 5.3. Existing Signage and Crashes Along 446 Avenue and 446A Avenue

Lake Road, located at the east side of SWO, is a narrow road with curves and no shoulders. There is vegetation including trees in the right-of-way and possibly encroaching in the clear zone. Clearing the vegetation should be considered during regular maintenance operations along this road. Trees that are encroaching in the clear zone should be considered for removal. Towards the end of Lake Road around mile post 11, the cable barrier along a steep hill is in poor condition and should be considered for replacement.

At mile post 3.7, the intersection of 468 Avenue ties into Lake Road at a skew. 119 Street which crosses 468 Avenue one thousand feet to the north, also ties into Lake Road at a skew less than a half of a mile from the 468 Avenue intersection. These are dangerous intersections and could easily be remedied with a simple realignment of 119 Street. This would involve a single right-angle tie in from 119 Street, closing the segment of 468 Avenue between 119 Street and Lake Road and closing the skew tangent of the 119 Street tie in to Lake Road. See Figure 5.4.

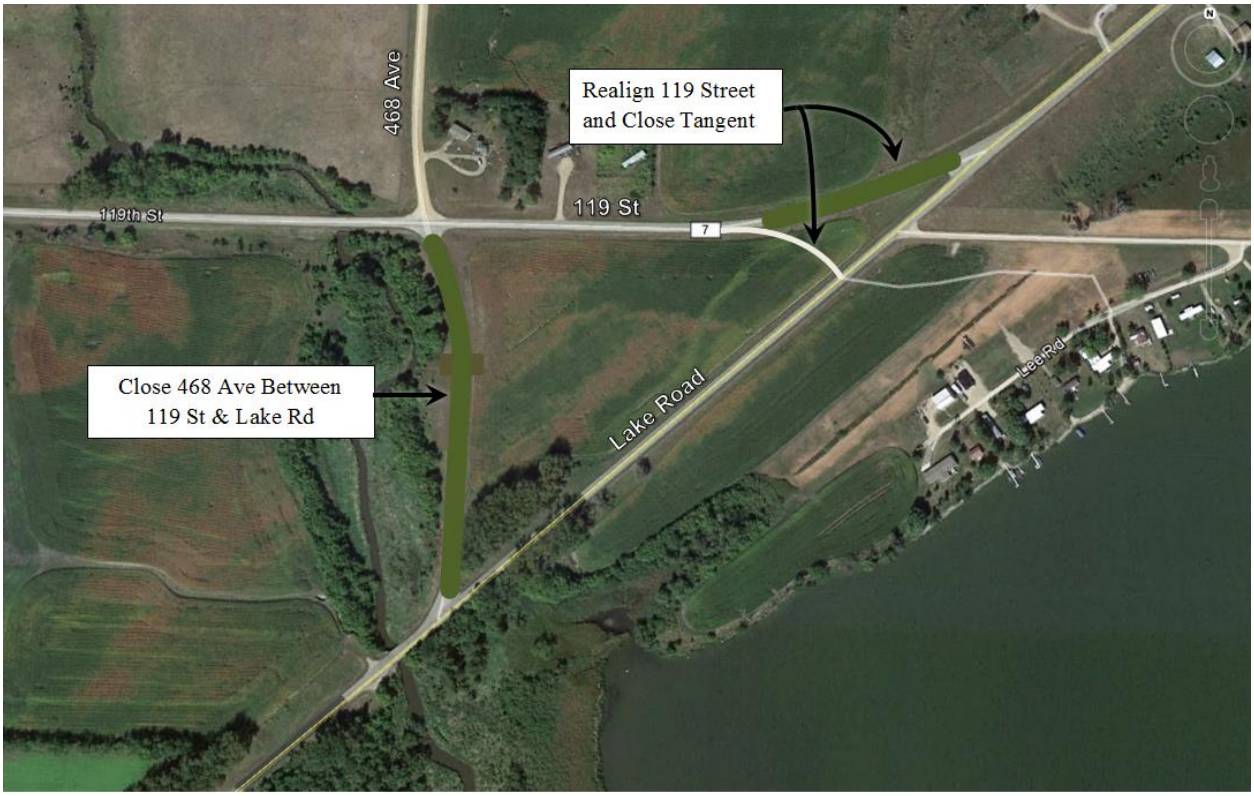

Figure 5.4. Realignment of 119 Street and 468 Ave at Lake Road

Intersections

Over 20 percent of all crashes on SWO are intersection related. With intersections occurring at most section lines, there is a high potential for intersection crashes. Some intersections have been addressed specifically in the field evaluations. 127 Street and 455 Avenue (south) have several intersection related crashes. Intersection ahead signs should be installed along these roads where high volume cross streets are located.

The Dakota Sioux Casino is located on 164 Street (County Road 6). Most traffic travels along 455 Avenue and 447 Avenue to 164 Street to access this casino. These two intersections are outside the boundaries of SWO but affect their tribal members. The intersection of 447 Avenue and 164 Street is a four way intersection but is signed with a 3-way stop. This is improper signing and could be dangerous

because it is unclear to the drivers which leg of the intersection is the through. This should be corrected with a 4-way stop or studied to determine if a 2-way is appropriate.

The intersection of 164 Street and 455 Avenue has experienced several fatalities. A flashing red light is mounted on the large stop sign and stop ahead signs are in place for 164 Street approaches (Figure 5.5). It appears from the crash data that collisions are still occurring at this intersection. Transverse rumble strip at the 164 Street approaches to 455 Avenue is recommended. It is also recommended that a 4-way stop/ signal warrant study be performed for this intersection.

Figure 5.5. 164 Street Approach to 455 Avenue

Because of the large number of intersections, it is difficult to address specific concerns in this report. Following is a list of major roadways traversing SWO and major intersections to these roadways. It is recommended that a reservation-wide study be performed to identify intersection improvements. Improvements such as intersection ahead signs, stop sign warrants and geometric alignments should be addressed in the intersection study. Table 5.6 is a list of recommended intersections to study.

Table 5.6. Intersections Recommended for Further Study

Highway	Intersection
SD 25	SD 10
	107 St
SD 106	455 Ave
	459 Ave
	473 Ave
SD 10	BIA 3
	447 Ave
	Lohre Rd
	455 Ave
	BIA 7
	458 Ave
	119 St
127 St	Lohre Rd
	BIA 7
	459 Ave
	462 Ave
446 Ave	137 St
US 12	446A Ave
	Lohre Rd
	455 Ave
	458 Ave
164 St	447 Ave*
	451 Ave
	455 Ave*

*Intersection outside of SWO

Benefit-Cost Analysis

Once the safety improvements were identified, WYT^2/LTAP proceeded with the benefit-cost analysis. Based on countermeasures provided by FHWA in their Desktop Reference for Crash Reduction Factors (FHWA, 2008) along with the FHWA Manual for Selecting Safety Improvements on High Risk Rural Roads (Atkinson, et al., 2014), the improvements will be matched with the countermeasures and Crash Reduction Factors (CRF) assigned. The countermeasures and their respective reduction factors are listed in Table 5.7.

Table 5.7. Countermeasures and Respective CRFs

Countermeasures	Crash Type	Crash Reduction Factors			Service Life
		Fatal	Injury	PDO	
Install guide signs (general)	All	15%	15%	15%	5
Install advance warning signs	All	40%	40%	40%	5
Install chevron signs on horizontal curves	All	35%	35%	35%	5
Install curve advance warning signs	All	30%	30%	30%	5
Install delineators (general)	All	11%	11%	11%	4
Install delineators (on bridges)	All	40%	40%	40%	4
Install edge lines, centerlines and delineators	All	0%	45%	0%	4
Install centerline markings	All	33%	33%	33%	2
Improve sight distance to intersection	All	56%	37%	0%	15
Flatten crest vertical curve	All	20%	20%	20%	15
Flatten horizontal curve	All	39%	39%	39%	15
Improve horizontal and vertical alignments	All	58%	58%	58%	15
Flatten side slopes	All	43%	43%	43%	15
Install guardrail (at bridge)	All	22%	22%	22%	10
Install guardrail (at embankment)	All	0%	42%	0%	10
Install guardrail (outside curves)	All	63%	63%	0%	10
Improve guardrail	All	9%	9%	9%	10
Improve superelevation	All	40%	40%	40%	15
Widen bridge	All	45%	45%	45%	15
Install shoulder	All	9%	9%	9%	5
Pave shoulder	All	15%	15%	15%	5
Install transverse rumble strips on approaches	All	35%	35%	35%	3
Improve pavement friction	All	13%	13%	13%	5
Install animal fencing	Animal	80%	80%	80%	10
Install snow fencing	Snow	53%	53%	53%	10

The cost of a countermeasure is calculated based on present construction costs. Since the crash analysis was performed for a 10-year period, if the service life of a countermeasure was different than 10 years, it was converted to a 10-year cost. For example, if a countermeasure had a service life of 5 years, the current construction cost would be two times the cost of one application.

Cost estimates were developed based on information provided by the Tribes. Where cost data was missing, WYDOT bid tabs and WYT^2/LTAP resources from other similar safety improvements were utilized. These are preliminary estimates developed to calculate the benefit-cost ratios. The Tribe is encouraged to work with the DOTs to develop final estimates for the projects they select to construct. Table 5.8 contains the results of the initial estimates developed for SWO. Appendix F contains the spreadsheets that identify the specific improvements for each project.

Table 5.8. SWO Improvement Estimates

Highway	From MP	To MP	Recommended Countermeasure	Unit Cost	Unit	Quantity	Total Cost
127 St	0	16	Rumble Strip	$400	Mile	32	$12,800
			Intersection Ahead Signs	$400	Each	6	$2,400
164 St	0	3	Advance warning signs, stop signs	$400	Each	3	$1,200
			Transverse rumble strip	$1,500	Each	2	$3,000
445 Ave	0	6	Curve warning signs & chevrons	$491	Each	35	$17,200
			Advanced warning T intersection	$400	Each	3	$1,200
			Surface treatment/overlay	$42	Ton	6,380	$267,960
446 Ave (S)	1	7	Rumble stripe	$400	Mile	14	$5,600
			Chevrons	$500	Each	20	$10,000
446A/ 446 Ave	0	13	Rumble stripe	$400	Mile	26	$10,400
			Chevrons	$500	Each	48	$24,000
455 Ave (N)	5	18	Widen	$395,000	LS	1	$395,000
			Rumble Stripe	$400	Mile	26	$10,400
			Edgeline	$0.20	Feet	137,280	$27,456
455 Ave (S)	0	15	Replace Guardrail	$40	Feet	4,000	$160,000
			Advanced warning for intersections	$400	Each	8	$3,200
			Edgeline and centerline	$0.20	Feet	190,000	$38,000
456 Ave	0	2	Increase maintenance	$0.55	Sq Yd	12,000	$6,600
459/458 Ave	0	9	Widen	$272,000	LS	1	$272,000
			Rumble stripe	$400	Mile	18	$7,200
			Edgeline	$0.20	Feet	95,000	$19,000
			Delineators in curve	$35	Each	80	$2,800
462 Ave	0	9	Widen	$272,000	LS	1	$272,000
			Rumble Stripe	$400	Mile	18	$7,200
			Edgeline	$0.20	Feet	95,000	$19,000
Lake Rd	0	12	Replace Guardrail	$40	Feet	500	$20,000
			Clear vegetation in ROW	$8,500	Acre	1	$8,500
			Edgeline and centerline	$0.20	Feet	126,720	$25,344

The benefit is calculated based on societal crash costs. It represents the "cost savings" of crashes reduced. A value is assigned to each type of crash severity (fatal, injury or PDO). The values in Table 5.9 are suggested for use in the analysis. However, the others that may be used as the Tribe deems appropriate.

Table 5.9. Societal Crash Costs

Crash Cost	
Fatal	$2,500,000
Injury	$60,000
PDO	$6,000

The ratio of benefit to cost is then calculated. Values less than 1.0 would indicate that there is no benefit in the improvement and the project should be eliminated. Two locations were recommended for guardrail replacement. Although the benefit-cost ration is 0.0, it does not indicate that this countermeasure would make these locations less safe. Because the guardrail is already in place, no crashes could indicate that safety is improved. As these guardrails are in need of replacement, they should still be considered viable safety projects.

In the two locations where widening is recommended (455 Ave. (N) and 462 Ave.) the benefit-cost ratios are 0.2 and 0.4 respectively because of the high cost of pavement construction. Shoulder widening should be considered during maintenance overlay projects to reduce the cost.

The benefit-cost ratio of 0.8 for installing advanced warning signs for the intersection on 455 Ave. (S) is not beneficial due to the fact that only PDO crashes were reported for this location. The surface treatment overlay on 455 Ave. also has a low benefit-cost ratio of 0.6. The cost was based on an asphalt overlay. A chip seal overlay would be less expensive and may provide a benefit.

Based on the final analysis the Tribe can use the information for funding requests of the projects. Table 5.10 lists the projects with the benefit-to-cost analysis results for SWO. Appendix G contains the Benefit-cost spreadsheets for each project.

Table 5.10. SWO Benefit-Cost Analysis Results.

Highway	Recommended Countermeasure	Total Cost	B-C Ratio
127 St	Rumble Strip	$12,800	10.4
	Intersection Ahead Signs	$2,400	20.5
164 St	Advance warning signs, stop signs	$1,200	2.0
	Transverse rumble strip	$3,000	50.8
445 Ave	Curve warning signs & chevrons	$17,200	52.8
	Advanced warning T intersection	$1,200	
	Surface treatment/overlay	$267,960	0.6
446 Ave (S)	Rumble stripe	$5,600	117.6
	Chevrons	$10,000	
446A/ 446 Ave	Rumble stripe	$10,400	25.8
	Chevrons	$24,000	
455 Ave (N)	Widen	$395,000	0.2*
	Rumble Stripe	$10,400	2.56
	Edgeline	$27,456	
455 Ave (S)	Replace Guardrail	$160,000	0.0
	Advanced warning for intersections	$3,200	0.8
	Edgeline and centerline	$38,000	1.4
456 Ave	Increase maintenance	$6,600	1.5**
459/458 Ave	Widen	$272,000	4.9*
	Rumble stripe	$7,200	
	Edgeline	$19,000	22.4
	Delineators in curve	$2,800	
462 Ave	Widen	$272,000	0.4*
	Rumble Stripe	$7,200	2.1
	Edgeline	$19,000	
Lake Rd	Replace Guardrail	$20,000	0.0
	Clear vegetation in ROW	$8,500	36.8
	Edgeline and centerline	$25,344	1.7

*B-C Ratio includes all countermeasures
**No CFR for countermeasure, assumed value of 25%

Chapter Summary

The roadway safety improvement program has been implemented on the Sisseton Wahpeton Oyate reservation. A final list of projects is presented to the Tribe to determine their priorities on the reservations.

There are gravel roads that have been identified as high risk crash locations. Some crashes could be due to the lack of maintenance and some appear to be due to high speeds since these roads are posted at 55 MPH. Many of the paved roads were straight with little to no shoulders. Most of the roads with curves had adequate curve warning signs. However, most crashes were run-off-the-road. Recommendations are presented for rumble strip, shoulder widening with safety edge, edgelines, and chevrons in curves for low-cost safety improvements. SWO has many rural intersections that need attention to determine the best signage and improvements.

CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS

Summary

Tribal communities have suffered over the years with higher fatality rates on their roadways than the general population across the U.S. As the country has been successful in decreasing fatal and injury crashes over the past several years, Native Americans have experienced an increase in these types of crashes.

This report presents a five-step methodology developed to assist Tribes to improve their roadway safety through low-cost improvements. The methodology was successfully implemented on the WRIR with three low-cost project funded by the Wyoming DOT and other safety measures implemented through identifying safety concerns in their strategic plan.

WYT^2/LTAP and NPTTAP developed criteria for other tribes in the Northern Plains region to participate in implementing the methodology on their reservations. The criteria require a commitment from the Tribes to follow through in the program and provide support. Three reservations were selected for implementation; Standing Rock Sioux Tribe, Sisseton Wahpeton Oyate. This report covers the implementation on the SWO reservation.

Conclusions

Sisseton Wahpeton Oyate is the third reservation the five-step methodology has been implemented on. Many differences were noted through the process as well as the similar challenges faced by tribal governments in implementing safety improvement programs.

- SWO seemed to have adequate crash data that was obtained from the South Dakota DPS.
- SWO had higher percentage of severe crashes than statewide.
- SWO had more young drivers involved crashes that statewide.
- SWO had a higher percentage of crashes involving alcohol.
- SWO has high compliance with seatbelt/safety equipment use. This could account for fewer fatal rollover crashes.
- There are many intersection crashes on SWO
- There are many run-off-the-road crashes due to narrow roads with little or no shoulders.
- The Tribe has major concerns about the Township roads which receive little maintenance due to limited resources.

Recommendations

Based on the analysis and the projects that have been identified for SWO, the following recommendations are provided:

- The improvement projects identified in this report should be coordinated with the State DOT as well as with the respective counties for funding.
- The strategic highway safety plan should be updated to include the safety concerns identified in this report that are not related to engineering improvements including speeding, impaired driving, intersection improvements, and pedestrian safety.
- A speed safety study should be performed on 118 Street, 123 Street, 446A/446 Avenue, and 456 Avenue by the state DOT.
- An intersection study should be performed system wide to determine best strategy to address intersection crashes.
- The Tribe should consider partnering with the Townships to pool their resources to provide more consistent maintenance.

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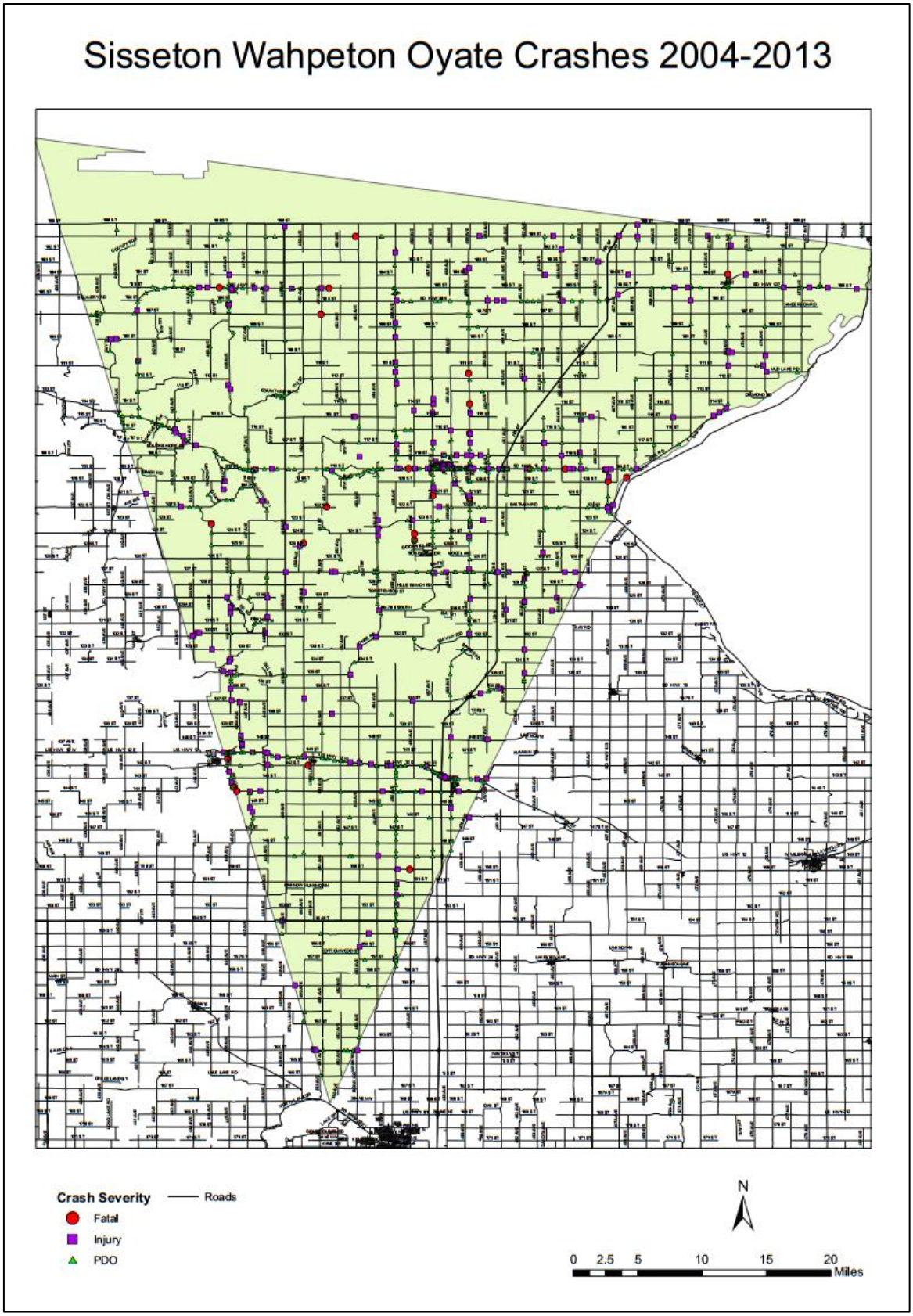
APPENDIX A: MAP OF SWO CRASHES



APPENDIX B: REVISED CRASH RANKINGS

Highway	Beg MP	End MP	Total Crashes	Crash Rank
446A/446 Ave	0	1	6	1
455 Ave (S)	9	10	6	1
459/458 Ave	2	3	6	1
164 St	0	1	5	4
446 Ave (S)	6	7	5	4
455 Ave (S)	0	1	5	4
455 Ave (S)	10	11	5	4
459/458 Ave	5	6	5	4
127 St	8	9	4	9
164 St	2	3	4	9
455 Ave (N)	16	17	4	9
455 Ave (S)	11	12	4	9
455 Ave (S)	12	13	4	9
459/458 Ave	4	5	4	9
BIA 15	13	14	4	9
Lake Rd	10	11	4	9
118 St	3	4	3	17
127 St	9	10	3	17
127 St	10	11	3	17
127 St	11	12	3	17
129/128 St	2	3	3	17
446A/446 Ave	1	2	3	17
446A/446 Ave	4	5	3	17
446A/446 Ave	6	7	3	17
446A/446 Ave	8	9	3	17
446A/446 Ave	12	13	3	17
446A/446 Ave	13	14	3	17
455 Ave (N)	10	11	3	17
455 Ave (N)	11	12	3	17
455 Ave (S)	13	14	3	17
455 Ave (S)	14	15	3	17
459/458 Ave	3	4	3	17
462 Ave	2	3	3	17
473 Ave	6	7	3	17
BIA 3	4	5	3	17
Lohre Rd	10	11	3	17
101 St	0	1	2	37
101 St	8	9	2	37
101 St	9	10	2	37

Highway	Beg MP	End MP	Total Crashes	Crash Rank
101 St	13	14	2	37
118 St	2	3	2	37
123 St	3	4	2	37
127 St	0	1	2	37
127 St	2	3	2	37
127 St	3	4	2	37
127 St	4	5	2	37
127 St	5	6	2	37
127 St	6	7	2	37
127 St	7	8	2	37
127 St	12	13	2	37
127 St	15	16	2	37
445 Ave	2	3	2	37
446 Ave (S)	1	2	2	37
446 Ave (S)	2	3	2	37
446 Ave (S)	4	5	2	37
446 Ave (S)	5	6	2	37
446A/446 Ave	7	8	2	37
455 Ave (N)	1	2	2	37
455 Ave (N)	4	5	2	37
455 Ave (N)	6	7	2	37
455 Ave (N)	9	10	2	37
455 Ave (N)	15	16	2	37
455 Ave (N)	17	18	2	37
455 Ave (S)	4	5	2	37
455 Ave (S)	5	6	2	37
455 Ave (S)	6	7	2	37
455 Ave (S)	15	16	2	37
456 Ave	0	1	2	37
459/458 Ave	0	1	2	37
459/458 Ave	8	9	2	37
459/458 Ave	10	11	2	37
459/458 Ave	11	12	2	37
459/458 Ave	12	13	2	37
459/458 Ave	13	14	2	37
462 Ave	8	9	2	37
473 Ave	1	2	2	37
BIA 15	0	1	2	37
BIA 15	7	8	2	37
BIA 3	1	2	2	37
BIA 3	3	4	2	37

Highway	Beg MP	End MP	Total Crashes	Crash Rank
Lohre Rd	12	13	2	37
Lohre Rd	18	19	2	37
Lohre Rd	19	20	2	37
Lohre Rd	23	24	2	37
101 St	1	2	1	85
101 St	6	7	1	85
123 St	0	1	1	85
123 St	1	2	1	85
123 St	4	5	1	85
129/128 St	0	1	1	85
445 Ave	3	4	1	85
446 Ave (S)	3	4	1	85
446A/446 Ave	3	4	1	85
446A/446 Ave	10	11	1	85
446A/446 Ave	11	12	1	85
455 Ave (N)	2	3	1	85
455 Ave (N)	7	8	1	85
455 Ave (N)	12	13	1	85
455 Ave (N)	13	14	1	85
455 Ave (S)	1	2	1	85
455 Ave (S)	3	4	1	85
455 Ave (S)	7	8	1	85
456 Ave	1	2	1	85
462 Ave	0	1	1	85
462 Ave	1	2	1	85
462 Ave	6	7	1	85
462 Ave	7	8	1	85
473 Ave	0	1	1	85
473 Ave	3	4	1	85
473 Ave	7	8	1	85
473 Ave	9	10	1	85
475 Ave	0	1	1	85
BIA 15	11	12	1	85
BIA 200	5	6	1	85
Lake Rd	0	1	1	85
Lake Rd	2	3	1	85
Lake Rd	3	4	1	85
Lake Rd	6	7	1	85
Lake Rd	9	10	1	85
Lohre Rd	0	1	1	85
Lohre Rd	8	9	1	85

Highway	Beg MP	End MP	Total Crashes	Crash Rank
Lohre Rd	9	10	1	85
Lohre Rd	13	14	1	85
Lohre Rd	14	15	1	85
Lohre Rd	15	16	1	85
Lohre Rd	16	17	1	85
Lohre Rd	21	22	1	85
101 St	2	3	0	128
101 St	3	4	0	128
101 St	4	5	0	128
101 St	5	6	0	128
101 St	7	8	0	128
101 St	10	11	0	128
101 St	11	12	0	128
101 St	12	13	0	128
101 St	14	15	0	128
101 St	15	16	0	128
101 St	16	17	0	128
101 St	17	18	0	128
118 St	0	1	0	128
118 St	1	2	0	128
123 St	2	3	0	128
127 St	1	2	0	128
127 St	13	14	0	128
127 St	14	15	0	128
129/128 St	1	2	0	128
129/128 St	3	4	0	128
164 St	1	2	0	128
445 Ave	0	1	0	128
445 Ave	1	2	0	128
445 Ave	4	5	0	128
445 Ave	5	6	0	128
446 Ave (S)	0	1	0	128
446 Ave (S)	7	8	0	128
446A/446 Ave	2	3	0	128
446A/446 Ave	5	6	0	128
446A/446 Ave	9	10	0	128
455 Ave (N)	0	1	0	128
455 Ave (N)	3	4	0	128
455 Ave (N)	5	6	0	128
455 Ave (N)	8	9	0	128
455 Ave (N)	14	15	0	128

Highway	Beg MP	End MP	Total Crashes	Crash Rank
455 Ave (S)	2	3	0	128
455 Ave (S)	8	9	0	128
456 Ave	2	3	0	128
456 Ave	3	4	0	128
459/458 Ave	1	2	0	128
459/458 Ave	6	7	0	128
459/458 Ave	7	8	0	128
459/458 Ave	9	10	0	128
462 Ave	3	4	0	128
462 Ave	4	5	0	128
462 Ave	5	6	0	128
473 Ave	2	3	0	128
473 Ave	4	5	0	128
473 Ave	5	6	0	128
473 Ave	8	9	0	128
475 Ave	1	2	0	128
BIA 15	1	2	0	128
BIA 15	2	3	0	128
BIA 15	3	4	0	128
BIA 15	4	5	0	128
BIA 15	5	6	0	128
BIA 15	6	7	0	128
BIA 15	8	9	0	128
BIA 15	9	10	0	128
BIA 15	10	11	0	128
BIA 15	12	13	0	128
BIA 15	14	15	0	128
BIA 200	0	1	0	128
BIA 200	1	2	0	128
BIA 200	2	3	0	128
BIA 200	3	4	0	128
BIA 200	4	5	0	128
BIA 3	0	1	0	128
BIA 3	2	3	0	128
Lake Rd	1	2	0	128
Lake Rd	4	5	0	128
Lake Rd	5	6	0	128
Lake Rd	7	8	0	128
Lake Rd	8	9	0	128
Lake Rd	11	12	0	128
Lohre Rd	1	2	0	128

Highway	Beg MP	End MP	Total Crashes	Crash Rank
Lohre Rd	2	3	0	128
Lohre Rd	3	4	0	128
Lohre Rd	4	5	0	128
Lohre Rd	5	6	0	128
Lohre Rd	6	7	0	128
Lohre Rd	7	8	0	128
Lohre Rd	11	12	0	128
Lohre Rd	17	18	0	128
Lohre Rd	20	21	0	128
Lohre Rd	22	23	0	128

APPENDIX C: LEVEL I FIELD EVALUATION RANKING

Highway	Beg MP	End MP	Level I Score	Level I Rank
456 Ave	1	2	7	1
446 Ave (S)	7	8	10	2
455 Ave (S)	0	1	12	3
455 Ave (S)	11	12	14	4
446 Ave (S)	6	7	16	5
456 Ave	0	1	16	5
456 Ave	2	3	16	5
456 Ave	3	4	16	5
462 Ave	0	1	17	9
459/458 Ave	0	1	18	10
462 Ave	4	5	18	10
123 St	0	1	19	12
123 St	1	2	19	12
123 St	2	3	19	12
123 St	3	4	19	12
123 St	4	5	19	12
446A/446 Ave	0	1	19	12
446A/446 Ave	1	2	19	12
446A/446 Ave	2	3	19	12
446A/446 Ave	3	4	19	12
462 Ave	1	2	19	12
462 Ave	2	3	19	12
462 Ave	3	4	19	12
127 St	12	13	20	24
127 St	13	14	20	24
127 St	14	15	20	24
127 St	15	16	20	24
118 St	2	3	21	28
118 St	3	4	21	28
Lake Rd	4	5	21	28
455 Ave (S)	4	5	22	31
455 Ave (S)	5	6	22	31
455 Ave (S)	7	8	22	31
459/458 Ave	1	2	22	31
Lake Rd	0	1	22	31
Lake Rd	1	2	22	31
Lake Rd	2	3	22	31
Lake Rd	3	4	22	31
Lake Rd	5	6	22	31
Lake Rd	6	7	22	31
Lake Rd	7	8	22	31
Lake Rd	8	9	22	31
Lake Rd	9	10	22	31
Lake Rd	10	11	22	31

Highway	Beg MP	End MP	Level I Score	Level I Rank
Lake Rd	11	12	22	31
118 St	0	1	23	46
118 St	1	2	23	46
164 St	0	1	23	46
164 St	1	2	23	46
164 St	2	3	23	46
455 Ave (S)	6	7	23	46
455 Ave (S)	8	9	23	46
455 Ave (S)	9	10	23	46
455 Ave (S)	10	11	23	46
Lohre Rd	8	9	23	46
127 St	0	1	24	56
127 St	1	2	24	56
127 St	2	3	24	56
127 St	3	4	24	56
127 St	9	10	24	56
445 Ave	1	2	24	56
445 Ave	2	3	24	56
445 Ave	3	4	24	56
445 Ave	4	5	24	56
445 Ave	5	6	24	56
455 Ave (S)	1	2	24	56
455 Ave (S)	2	3	24	56
455 Ave (S)	3	4	24	56
475 St	0	1	24	56
475 St	1	2	24	56
BIA 200	2	3	24	56
446 Ave (S)	2	3	25	72
446 Ave (S)	3	4	25	72
446 Ave (S)	4	5	25	72
446 Ave (S)	5	6	25	72
473 Ave	1	2	25	72
101 St	10	11	26	77
101 St	11	12	26	77
101 St	12	13	26	77
101 St	13	14	26	77
101 St	14	15	26	77
101 St	15	16	26	77
101 St	16	17	26	77
101 St	17	18	26	77
BIA 200	1	2	26	77
BIA 200	3	4	26	77
BIA 200	4	5	26	77
BIA 200	5	6	26	77
446A/446 Ave	4	5	27	89
446A/446 Ave	5	6	27	89

Highway	Beg MP	End MP	Level I Score	Level I Rank
446A/446 Ave	6	7	27	89
446A/446 Ave	7	8	27	89
446A/446 Ave	8	9	27	89
446A/446 Ave	9	10	27	89
446A/446 Ave	10	11	27	89
446A/446 Ave	11	12	27	89
446A/446 Ave	12	13	27	89
446A/446 Ave	13	14	27	89
455 Ave (N)	0	1	27	89
455 Ave (N)	1	2	27	89
455 Ave (N)	2	3	27	89
455 Ave (N)	3	4	27	89
455 Ave (N)	4	5	27	89
455 Ave (N)	5	6	27	89
455 Ave (N)	6	7	27	89
455 Ave (N)	7	8	27	89
455 Ave (N)	8	9	27	89
455 Ave (N)	9	10	27	89
455 Ave (N)	10	11	27	89
455 Ave (N)	11	12	27	89
455 Ave (N)	12	13	27	89
455 Ave (N)	13	14	27	89
455 Ave (N)	14	15	27	89
455 Ave (N)	15	16	27	89
455 Ave (N)	16	17	27	89
455 Ave (N)	17	18	27	89
455 Ave (S)	15	16	27	89
459/458 Ave	2	3	27	89
459/458 Ave	3	4	27	89
459/458 Ave	4	5	27	89
459/458 Ave	5	6	27	89
459/458 Ave	6	7	27	89
459/458 Ave	7	8	27	89
459/458 Ave	8	9	27	89
459/458 Ave	9	10	27	89
459/458 Ave	10	11	27	89
473 Ave	0	1	27	89
473 Ave	5	6	27	89
473 Ave	6	7	27	89
473 Ave	7	8	27	89
473 Ave	8	9	27	89
473 Ave	9	10	27	89
BIA 200	0	1	27	89
445 Ave	0	1	28	134
455 Ave (S)	12	13	28	134
455 Ave (S)	13	14	28	134

Highway	Beg MP	End MP	Level I Score	Level I Rank
455 Ave (S)	14	15	28	134
BIA 15	7	8	28	134
BIA 15	13	14	28	134
127 St	8	9	29	140
127 St	10	11	29	140
127 St	11	12	29	140
446 Ave (S)	1	2	29	140
462 Ave	5	6	29	140
462 Ave	6	7	29	140
462 Ave	7	8	29	140
462 Ave	8	9	29	140
BIA 15	5	6	29	140
BIA 15	6	7	29	140
BIA 15	8	9	29	140
BIA 15	9	10	29	140
BIA 15	10	11	29	140
BIA 15	11	12	29	140
BIA 15	12	13	29	140
Lohre Rd	0	1	29	140
Lohre Rd	1	2	29	140
Lohre Rd	2	3	29	140
Lohre Rd	3	4	29	140
Lohre Rd	4	5	29	140
Lohre Rd	5	6	29	140
Lohre Rd	6	7	29	140
Lohre Rd	7	8	29	140
127 St	4	5	30	163
127 St	5	6	30	163
127 St	6	7	30	163
127 St	7	8	30	163
446 Ave (S)	0	1	30	163
473 Ave	4	5	30	163
BIA 15	14	15	30	163
Lohre Rd	9	10	30	163
Lohre Rd	10	11	30	163
Lohre Rd	11	12	30	163
Lohre Rd	12	13	30	163
Lohre Rd	13	14	30	163
Lohre Rd	14	15	30	163
Lohre Rd	15	16	30	163
101 St	4	5	32	177
101 St	5	6	32	177
101 St	6	7	32	177
101 St	7	8	32	177
101 St	8	9	32	177
101 St	9	10	32	177

Highway	Beg MP	End MP	Level I Score	Level I Rank
BIA 15	0	1	32	177
BIA 15	1	2	32	177
BIA 15	2	3	32	177
BIA 15	3	4	32	177
BIA 15	4	5	32	177
101 St	0	1	33	188
101 St	1	2	33	188
101 St	2	3	33	188
101 St	3	4	33	188
473 Ave	3	4	34	192
Lohre Rd	16	17	34	192
Lohre Rd	17	18	34	192
Lohre Rd	18	19	34	192
Lohre Rd	19	20	34	192
Lohre Rd	20	21	34	192
Lohre Rd	21	22	34	192
Lohre Rd	22	23	34	192
Lohre Rd	23	24	34	192
129/128 St	0	1	35	201
129/128 St	1	2	35	201
129/128 St	2	3	35	201
129/128 St	3	4	35	201
459/458 Ave	11	12	35	201
459/458 Ave	12	13	35	201
459/458 Ave	13	14	35	201
473 Ave	2	3	35	201
BIA 3	0	1	38	209
BIA 3	1	2	39	210
BIA 3	2	3	39	210
BIA 3	3	4	39	210
BIA 3	4	5	39	210

APPENDIX D: LEVEL I FIELD EVALUATION WORKSHEETS

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 1
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 454 Avenue	Road Length:
		Road No.:	Road Surface: Asphalt
		Road Class:	Speed Limit: 55

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	3	5	8	9	5	30	Begin at 127 Street (CR 28). No advance warning for int, Stop on 454
1.1 - 2.0	3	5	8	9	5	30	Chip seal over poor pavement, vegetation at edge and into pavment
2.1 - 3.0	3	5	8	9	5	30	2.9 Intersection with BIA 7, no adv. warning, BIA 7 T w/driveway across
3.1 - 4.0	3	5	8	9	5	30	No passing zone no pass with care at end
4.1 - 5.0	3	5	8	9	5	30	5.0 BIA 200 intersection marked -| and double arrow.
5.1 - 6.0	3	5	8	9	5	30	5.5 deteriorated pavement, 6.0 end of chip seal
6.1 - 7.0	3	5	8	9	5	30	
7.1 - 8.0	3	5	8	2	5	23	7.3 curve w trees, skin patching. 7.7 trees in ROW
8.1 - 9.0	3	5	8	8	5	29	8.6 No int sign but has double arrow
9.1 - 10.0	3	5	8	8	5	29	
10.1 - 11.0	3	5	8	8	5	29	
11.1 - 12.0	3	5	8	8	5	29	11.8 No int sign
12.1 - 13.0	3	5	8	8	5	29	
13.1 - 14.0	3	5	8	8	5	29	
14.1 - 15.0	3	5	8	8	5	29	14.1 Object markers for culvert
15.1 - 16.0	3	5	8	8	5	29	15.6 End of road at US 12

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 2
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 455 Avenue (S)	Road Length:
		Road No.: Roberts County Rd. 30	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	3	4	3	1	1	12	Begin at US 12. No stop ahead. 0.4 cable barrier too low, no end mrkrs
1.1 - 2.0	3	4	3	8	6	24	1.7 Old bridge w/markers. 2.0 int w/144 St no int sign, no pvmnt mrk
2.1 - 3.0	3	4	3	8	6	24	
3.1 - 4.0	3	4	3	8	6	24	
4.1 - 5.0	3	4	1	8	6	22	
5.1 - 6.0	3	4	1	8	6	22	6.0 New surface on southbound
6.1 - 7.0	4	4	1	8	6	23	
7.1 - 8.0	3	4	1	8	6	22	8.0 151 St no signs, yield sign on 151 St. Crashes at int
8.1 - 9.0	4	4	1	8	6	23	
9.1 - 10.0	4	4	1	8	6	23	10.0 152 St no sign
10.1 - 11.0	4	4	1	8	6	23	11.0 153 St no signs, high speed right lane, faded stop sign
11.1 - 12.0	4	1	1	2	6	14	No apron, drop off
12.1 - 13.0	5	4	4	8	7	28	12.0 Objects in clear zone, striping at county line
13.1 - 14.0	5	4	4	8	7	28	
14.1 - 15.0	5	4	4	8	7	28	14.2 Old bridge w/ markers. 15.0 Co Rd 20 fatality (Rt 157 St)
15.1 - 16.0	5	4	3	8	7	27	15.5 No curve warning sign, faded pavement marking
							16.0 Sight distance at 158 St? End at 6.0
							*No edgelines, faded centerline
							**Look at MUTCD about yield at intersections

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 3
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: County Road 6	Road Length:
		Road No.: 164 St	Road Surface:
		Road Class:	Speed Limit:

Comments Codington County.
Through to I29 and Casino

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	
							Begin at 455 Ave, outside of Reservation. 4 fatlities, flashing at stop,
							fence and steep drop off, recently resurfaced
0.0 - 1.0	7	5	3	3	5	23	453 Ave start Res. at Casino. Sop out of Casino faded, low & small
1.1 - 2.0	7	5	3	3	5	23	Steep slope. 2.9 Bridge
2.1 - 3.0	7	5	3	3	5	23	End at 450 Ave
							No stop ahead sign, 3-way stop at 4-way int (450 Ave)

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 4
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 446 Ave	Road Length:
		Road No.:	Road Surface: Asphalt
		Road Class:	Speed Limit: 55

Comments: Main route to Watertown, SD (Casino). Heavy traffi, lot of boat traffic to Bitter Lake, weather from lake, cars park on road. Many fatalities.

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	
0.0 - 1.0	6	8	4	7	5	30	Start at south end (148 St). Narrow, no edgeline, no shoulder
1.1 - 2.0	4	8	5	7	5	29	0.7 no curve warning sign but dileneators. hay bails in ROW
2.1 - 3.0	5	3	4	7	6	25	1.0 Road surface change, edgelines, windy. 2.2 top of hill multi-fatality
3.1 - 4.0	5	3	4	7	6	25	1 family, drunk crossed centerline. Truck traffic. 2.2 curve w chevrons
4.1 - 5.0	5	3	4	7	6	25	other curves use delineators. 4.1 fatality, entrance on curve (144 St)
5.1 - 6.0	5	3	4	7	6	25	No passing attached to curve sign. 4.6 curve warning sign
6.1 - 7.0	6	3	4	2	1	16	too close to curve. Fatality at curve. 4.9 access road to lake bad angle
7.1 - 8.0	2	2	2	2	2	10	faded stop . 5.1 fatlaity. 5.6 fatality. End at 6.9 (142 St)
							Turn onto Main St in Wabay, 7.6 RR Xing, rough through town

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 5
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 446A/446 Ave	Road Length:
		Road No.:	Road Surface: Asphalt
		Road Class:	Speed Limit: 55

Comments: Injuries along road, curvy with intersections in curves

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	
0.0 - 1.0	6	2	6	3	2	19	Start at US12 heading north. Curve speed white mph sign
1.1 - 2.0	6	2	6	3	2	19	Lake at edge of road, no barrier or marking, delineators at curve
2.1 - 3.0	6	2	6	3	2	19	1.9 drop off. 3.0 138 St no adv warning for int
3.1 - 4.0	6	2	6	3	2	19	3.7 Slip when wet w/ rec speed. 3.8 137 St in curve no double arrow
4.1 - 5.0	6	2	5	7	7	27	4.5 tangent exit from 137 St high speed and 3 crashes
5.1 - 6.0	6	2	5	7	7	27	5.3 crash at 136 int.
6.1 - 7.0	6	2	5	7	7	27	6.2 many entrances. 6.3 int 135 St (BIA 5) crashes, no stop ahead
7.1 - 8.0	6	2	5	7	7	27	6.4 curve sign w/ Watch for children sign, crashes on curve, ped cross
8.1 - 9.0	6	2	5	7	7	27	7.0 curve w/ high speed int entrance. 7.5 deep ditch w/ delineators
9.1 - 10.0	6	2	5	7	7	27	8.2 Woodland Park Dr ent at end of curve. 9.0 int w 133 St, crashes
10.1 - 11.0	6	2	5	7	7	27	10.1 132 St int & driveways, no marking
11.1 - 12.0	6	2	5	7	7	27	11.6 Business entrances. 131 & 129 bar entrance at top of hill
12.1 - 13.0	6	2	5	7	7	27	12.0 many entrances, boat traffic, RVs. 12.8 hidden driveway sign
13.1 - 14.0	6	2	5	7	7	27	13.3 End at 129 St (Co Rd 5)

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 6
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: County Road 5	Road Length:
		Road No.: 129 Street	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments: Curve from 446 to 448. Mostly intersection crashes. Marshall County
0.0 - 1.0	6	7	5	9	8	35	Start at 446A. No shoulder
1.1 - 2.0	6	7	5	9	8	35	1.0 int at curve
2.1 - 3.0	6	7	5	9	8	35	2.2 Bridge GR needs replaced. 2.7 curve w/ int
3.1 - 4.0	6	7	5	9	8	35	3.2 culvert w/ markers. 3.6 curve w/ int. 3.9 turns into 449
							injury crash at T int.

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 7
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 127 Street	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments: Mostly intersection crashes first 8.0 miles
0.0 - 1.0	7	3	4	5	5	24	Start at 449. No pvmnt mrkng, steep slopes, no shoulder
1.1 - 2.0	7	3	4	5	5	24	
2.1 - 3.0	7	3	4	5	5	24	2.4 curve ahead, 2.5 curve no delineation, 2.8 curve w/ arrow
3.1 - 4.0	7	3	4	5	5	24	3.4 curve w/ arrow
4.1 - 5.0	7	7	4	7	5	30	
5.1 - 6.0	7	7	4	7	5	30	
6.1 - 7.0	7	7	4	7	5	30	
7.1 - 8.0	7	7	4	7	5	30	7.3 steep hill w/sign, 7.9 int at bottom of hill & curve, crashes
8.1 - 9.0	4	7	6	7	5	29	Int w/ BIA 700, skewed, high volumes, stop on BIA 700 *
9.1 - 10.0	4	2	6	7	5	24	9.9 crashes at int w/ 459. *Maybe 4-way stop? Signing needed on 459.*
10.1 - 11.0	4	7	6	7	5	29	
11.1 - 12.0	4	7	6	7	5	29	
12.1 - 13.0	4	2	6	3	5	20	13.0 RR Xing at town of Peever, new overlay
13.1 - 14.0	4	2	6	3	5	20	
14.1 - 15.0	4	2	6	3	5	20	BIA 901 int no crashes
15.1 - 16.0	4	2	6	3	5	20	End at 16.0 int 465 Ave. Guy wire in clear zone.
							** Maybe need 4-way stop at 127 and BIA 700?*

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 8
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: Lake Road	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	3	5	5	5	4	22	Begin at 122/SD10, sight distance at SD10 int? crashes
1.1 - 2.0	3	5	5	5	4	22	Trees in ROW near clear zone, narrow, patches, driveways, no shoulder
2.1 - 3.0	3	5	5	5	4	22	vegetation on shoulder, no edgeline
3.1 - 4.0	3	5	5	5	4	22	3.7 skewed int 468, unnecessary tie in. *Should T & square off 468.*
4.1 - 5.0	3	5	5	5	3	21	
5.1 - 6.0	3	5	5	5	4	22	
6.1 - 7.0	3	5	5	5	4	22	
7.1 - 8.0	3	5	5	5	4	22	
8.1 - 9.0	3	5	5	5	4	22	
9.1 - 10.0	3	5	5	5	4	22	Driveways w/ multiple homes
10.1 - 11.0	3	5	5	5	4	22	
11.1 - 12.0	3	5	5	5	4	22	11.7 curve. Cable barrier in bad shape on steep hill
							End at 473 Ave

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 9
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 475 Avenue	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	5	1	2	8	8	24	Superelevated curve, side entrance at curve, turns to gravel
1.1 - 2.0	5	1	2	8	8	24	Curve at Mudd Lake Road and 111 Street
2.1 - 3.0	0	0	0	0	0	0	
3.1 - 4.0	0	0	0	0	0	0	
4.1 - 5.0	0	0	0	0	0	0	
5.1 - 6.0	0	0	0	0	0	0	
6.1 - 7.0	0	0	0	0	0	0	
7.1 - 8.0	0	0	0	0	0	0	
8.1 - 9.0	0	0	0	0	0	0	
9.1 - 10.0	0	0	0	0	0	0	
10.1 - 11.0	0	0	0	0	0	0	
11.1 - 12.0	0	0	0	0	0	0	
12.1 - 13.0							
13.1 - 14.0							
14.1 - 15.0							
15.1 - 16.0							
16.1 - 17.0							
17.1 - 18.0							
18.1 - 19.0							
19.1 - 20.0							

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 10
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 473 Avenue	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	4	5	4	9	5	27	Start at 111 Street. Int no sight distance, no shoulder, no edgeline
1.1 - 2.0	2	5	4	9	5	25	1.1 int w/110 crashes. 1.4 Deer crossing sign
2.1 - 3.0	7	5	8	9	6	35	
3.1 - 4.0	6	5	8	9	6	34	
4.1 - 5.0	7	5	4	9	5	30	
5.1 - 6.0	4	5	4	9	5	27	
6.1 - 7.0	4	5	4	9	5	27	7.0 Bridge abutment fatality
7.1 - 8.0	4	5	4	9	5	27	
8.1 - 9.0	4	5	4	9	5	27	9.3 Stop sign at abandoned road
9.1 - 10.0	4	5	4	9	5	27	End at 10.0

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 11
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 101 Street	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	6	7	6	9	5	33	Start at 473 Ave, no edgeline, no shoulder
1.1 - 2.0	6	7	6	9	5	33	
2.1 - 3.0	6	7	6	9	5	33	
3.1 - 4.0	6	7	6	9	5	33	
4.1 - 5.0	5	7	6	9	5	32	4.9 no stop ahead at 468, sight distance to south limited w/trees
5.1 - 6.0	5	7	6	9	5	32	
6.1 - 7.0	5	7	6	9	5	32	
7.1 - 8.0	5	7	6	9	5	32	
8.1 - 9.0	5	7	6	9	5	32	
9.1 - 10.0	5	7	6	9	5	32	
10.1 - 11.0	1	8	3	9	5	26	
11.1 - 12.0	1	8	3	9	5	26	
12.1 - 13.0	1	8	3	9	5	26	
13.1 - 14.0	1	8	3	9	5	26	
14.1 - 15.0	1	8	3	9	5	26	459 int no stop ahead, on hill, stop sign too small
15.1 - 16.0	1	8	3	9	5	26	
16.1 - 17.0	1	8	3	9	5	26	
17.1 - 18.0	1	8	3	9	5	26	End at 455 Ave

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 12
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 455 Ave (N)	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit: 55

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	5	7	6	5	4	27	Start at 101 Street, N to S
1.1 - 2.0	5	7	6	5	4	27	Several rollover and animal crashes
2.1 - 3.0	5	7	6	5	4	27	Straight and flat, possibly high speeds
3.1 - 4.0	5	7	6	5	4	27	Power poles in clear zone
4.1 - 5.0	5	7	6	5	4	27	*Maybe edgeline rumble strips. Shoulder wedge (safety edge) would help*
5.1 - 6.0	5	7	6	5	4	27	
6.1 - 7.0	5	7	6	5	4	27	
7.1 - 8.0	5	7	6	5	4	27	
8.1 - 9.0	5	7	6	5	4	27	
9.1 - 10.0	5	7	6	5	4	27	
10.1 - 11.0	5	7	6	5	4	27	
11.1 - 12.0	5	7	6	5	4	27	
12.1 - 13.0	5	7	6	5	4	27	
13.1 - 14.0	5	7	6	5	4	27	
14.1 - 15.0	5	7	6	5	4	27	
15.1 - 16.0	5	7	6	5	4	27	
16.1 - 17.0	5	7	6	5	4	27	
17.1 - 18.0	5	7	6	5	4	27	End at SD Hwy 10

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 13
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 459 Ave (N)	Road Length:
		Road No.:	Road Surface: Asphalt
		Road Class: Rural Major Collector	Speed Limit: 65

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	5	3	5	2	3	18	Begin at SD Hwy 10, N to S. Narrow, no pvmet mrk but recent surface
1.1 - 2.0	5	7	5	2	3	22	No Shoulder
2.1 - 3.0	5	7	5	7	3	27	2.5 curve w several crashes, 1 fatal
3.1 - 4.0	5	7	5	7	3	27	
4.1 - 5.0	5	7	5	7	3	27	Rollover and animal crashes
5.1 - 6.0	5	7	5	7	3	27	Narrow, straight - posssibly high speeds
6.1 - 7.0	5	7	5	7	3	27	
7.1 - 8.0	5	7	5	7	3	27	
8.1 - 9.0	5	7	5	7	3	27	8.2 County Rd 5, intersection crash at 125
9.1 - 10.0	5	7	5	7	3	27	High volume through at 459
10.1 - 11.0	5	7	5	7	3	27	*Maybe Transverse Rumble Stips on 127 at approach*
11.1 - 12.0	5	7	5	7	3	27	
12.1 - 13.0	5	7	5	7	3	27	End at 127 St
13.1 - 14.0							
14.1 - 15.0							
15.1 - 16.0							
16.1 - 17.0							
17.1 - 18.0							
18.1 - 19.0							
19.1 - 20.0							

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 14
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 454 Ave. (Lohre Rd.)	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	4	8	8	9	5	34	Start at 127 Street (S to N)
1.1 - 2.0	4	8	8	9	5	34	
2.1 - 3.0	4	8	8	9	5	34	3.0 Int 124, good sight distance, crashes
3.1 - 4.0	4	8	8	9	5	34	
4.1 - 5.0	4	8	8	9	5	34	4.8 Deep drop to culvert >15'
5.1 - 6.0	4	8	8	9	5	34	
6.1 - 7.0	4	8	8	9	5	34	6.8 Deer crossing sign
7.1 - 8.0	4	8	8	9	5	34	
8.1 - 9.0	4	8	8	9	5	34	8.3 end at SD Hwy 10

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 15
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 118 Street	Road Length:
		Road No.: BIA 8	Road Surface: Gravel
		Road Class:	Speed Limit: 45

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	4	8	5	3	3	23	Start at 455 (E to W). Watch for Children sign w/35 mph white sign
1.1 - 2.0	4	8	5	3	3	23	*Road needs reshaping, pull shoulders*
2.1 - 3.0	2	8	5	3	3	21	1.4 Watch for Children sign, 35 mph, residential area
3.1 - 4.0	2	8	5	3	3	21	1.9 Missing object marker at culvert
							2.0 Debris from shaping in lane
							3.0 wide intersection w/ Yield sign on 458, stop on 118 each direction
							End at 4.0 SD Hwy 127 (459 Ave)

Level I Field Evaluation	Evaluator: DSS	Date: 9/11/14	Page: 16
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 456 Ave	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	**Comments:** Township Roads
0.0 - 1.0	2	5	2	5	2	16	Start at BIA 701 & Goodwill Rd. Rough, washboard, no crown,
1.1 - 2.0	2	2	1	1	1	7	gravel washed off road. 0.5 turn onto 456, no signage at int
2.1 - 3.0	2	5	2	5	2	16	1.7 Bridge to be replaced w/10' CMP.
3.1 - 4.0	2	5	2	5	2	16	1.8 int w/124, poor visibility from 124, acute angle w/2 entr from 124.
							Guy wire & PP in clear zone on 124, veg on shldr, fatality at old br on 124
							456 is thru, 124 ends at int.
							3.6 int w/123, poor sight dist due to veg & hill. End at 3.6
							Traveling from 123 and 454:
							124 very low volume, veg in road
							Road closed sign at 452 down in brush
							about 1 mile road ends at water w/ no advanced warning or barricade
							452 fence in ROW near 127

Level I Field Evaluation	Evaluator: DSS	Date: 9/11/14	Page: 17
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 123 Street	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments: Township Roads
0.0 - 1.0	3	5	5	3	3	19	Start at 459. 123 wider, no shoulder, curve sign
1.1 - 2.0	3	5	5	3	3	19	School School bus route sign
2.1 - 3.0	3	5	5	3	3	19	
3.1 - 4.0	3	5	5	3	3	19	
4.1 - 5.0	3	5	5	3	3	19	
5.1 - 6.0	3	5	5	3	3	19	End at 454 (Lohre Rd)

Level I Field Evaluation	Evaluator: DSS	Date: 9/11/14	Page: 18
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 445 Avenue	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	7	7	3	8	3	28	Begin at 127 (S to N). Newer surface, no pvmnt marking
1.1 - 2.0	3	7	3	8	3	24	Cross county line, old surface, patching, rough
2.1 - 3.0	3	7	3	8	3	24	
3.1 - 4.0	3	7	3	8	3	24	3.5 curve sign, fatality, driveway in curve
4.1 - 5.0	3	7	3	8	3	24	no curve sign from other direction
5.1 - 6.0	3	7	3	8	3	24	5.7 right angle curve sign for T int and no stop ahead
							End at BIA 3 (122 St)

Level I Field Evaluation	Evaluator: DSS	Date: 9/11/14	Page: 19
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: BIA 3	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	8	8	8	9	5	38	Begin at 445 (122). Overlayed 2009, new signs & pvmnt markings
1.1 - 2.0	8	8	8	9	6	39	0.2 right angle curve sign should be standard curve sign
2.1 - 3.0	8	8	8	9	6	39	chevrons on curve, delineators on curve. 2.0 shoulder wider
3.1 - 4.0	8	8	8	9	6	39	2.0, 2.6 vegetation over sign.
4.1 - 5.0	8	8	8	9	6	39	4.9 end at SD Hwy 10

Level I Field Evaluation	Evaluator: DSS	Date: 9/11/14	Page: 20
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: BIA 15	Road Length:
		Road No.: 447 & 446 Ave	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	7	7	7	5	6	32	Begin at SD Hwy 10. Reconditioned, new gravel w/in 5 yrs for 5 miles
1.1 - 2.0	7	7	7	5	6	32	Needs shoulder work. Trees in ROW
2.1 - 3.0	7	7	7	5	6	32	2.6 shoulder washed out, 2.9 no pipes in approaches
3.1 - 4.0	7	7	7	5	6	32	3.3 shoulder washed out, no pipes in approaches
4.1 - 5.0	7	7	7	5	6	32	4.7 wash out. 4.9 int 115 (Marshal Co 10) confusing signs
5.1 - 6.0	3	7	7	8	4	29	Narrow & rough, needs to be reshaped & gravel
6.1 - 7.0	3	7	7	8	4	29	7.0 deep rutting, drop off
7.1 - 8.0	2	7	7	8	4	28	
8.1 - 9.0	3	7	7	8	4	29	
9.1 - 10.0	3	7	7	8	4	29	
10.1 - 11.0	3	7	7	8	4	29	
11.1 - 12.0	5	7	7	5	5	29	11.3 start gravel again at each end. PP in ROW
12.1 - 13.0	5	7	7	5	5	29	Minimum maintained road - travel at your own risk sign
13.1 - 14.0	4	7	7	5	5	28	12.5 445 yield sign. 13.9 fatality - rollover, high speed
14.1 - 15.0	7	5	6	7	5	30	14.0 paved
							15.0 end at SD Hwy 25

Level I Field Evaluation	Evaluator: DSS	Date: 9/11/14	Page: 21
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 462 Avenue	Road Length:
		Road No.:	Road Surface: Asphalt
		Road Class:	Speed Limit: 55

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	4	4	4	2	3	17	Begin at 127 St (N to S). Houses on east, several int, no edgeline
1.1 - 2.0	3	4	4	5	3	19	Rollovers & 2 domestic animal crashes, all but 2 in winter
2.1 - 3.0	3	4	4	5	3	19	
3.1 - 4.0	3	4	4	5	3	19	
4.1 - 5.0	2	4	4	5	3	18	road breakup
5.1 - 6.0	3	7	7	8	4	29	Int 133 crash poor visibility due to veg, no stop ahead
6.1 - 7.0	3	7	7	8	4	29	
7.1 - 8.0	3	7	7	8	4	29	
8.1 - 9.0	3	7	7	8	4	29	9.0 End at136 St

Level I Field Evaluation	Evaluator: DSS	Date: 9/11/14	Page: 22
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: BIA 200	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Comments: Overlay & shoulder wedge, submitted for BIA for BIA safety funds $5M

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	
0.0 - 1.0	5	5	6	7	4	27	Begin at 459, int crash
1.1 - 2.0	4	5	6	7	4	26	
2.1 - 3.0	4	5	6	7	2	24	Steep slopes & deep
3.1 - 4.0	4	5	6	7	4	26	pot holes & break up about 6 miles
4.1 - 5.0	4	5	6	7	4	26	
5.1 - 6.0	4	5	6	7	4	26	6.0 end at 456 Ave
							Recommend shoulder rumble strip w/ project

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page: 23
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 459 (S)	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments
0.0 - 1.0	7	7	7	9	5	35	Begin at BIA 200 (S to N)
1.1 - 2.0	7	7	7	9	5	35	Ditches relatively steep, road straight
2.1 - 3.0	7	7	7	9	5	35	Rollover & animal crashes, trees in ROW
3.1 - 4.0	7	7	7	9	5	35	
4.1 - 5.0	7	7	7	9	5	35	4.9 End at 127 St
5.1 - 6.0	0	0	0	0	0	0	
6.1 - 7.0	0	0	0	0	0	0	
7.1 - 8.0	0	0	0	0	0	0	
8.1 - 9.0	0	0	0	0	0	0	
9.1 - 10.0	0	0	0	0	0	0	
10.1 - 11.0	0	0	0	0	0	0	
11.1 - 12.0	0	0	0	0	0	0	
12.1 - 13.0							
13.1 - 14.0							
14.1 - 15.0							
15.1 - 16.0							
16.1 - 17.0							
17.1 - 18.0							
18.1 - 19.0							
19.1 - 20.0							

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page:
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 459 Ave	Road Length:
		Road No.:	Road Surface: Asphalt
		Road Class: Rural Major Collector	Speed Limit: 65

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments: This is a combined worksheet for 459 Ave (South) and 459 Ave (North) with revised Mile Posts.
0.0 - 1.0	5	3	5	2	3	18	Begin at SD Hwy 10, N to S. Narrow, no pvmet mrk but recent surface
1.1 - 2.0	5	7	5	2	3	22	No Shoulder
2.1 - 3.0	5	7	5	7	3	27	2.5 curve w several crashes, 1 fatal
3.1 - 4.0	5	7	5	7	3	27	
4.1 - 5.0	5	7	5	7	3	27	Rollover and animal crashes
5.1 - 6.0	5	7	5	7	3	27	Narrow, straight - posssibly high speeds
6.1 - 7.0	5	7	5	7	3	27	6.2 County Rd 5, intersection crash at 125
7.1 - 8.0	5	7	5	7	3	27	High volume through at 459
8.1 - 9.0	5	7	5	7	3	27	8.3 Intersection with 127 St
9.1 - 10.0	5	7	5	7	3	27	Maybe Transverse Rumble Stips on 127 at approach
10.1 - 11.0	5	7	5	7	3	27	Intersection with 127 St
11.1 - 12.0	7	7	7	9	5	35	Rollover & animal crashes, trees in ROW
12.1 - 13.0	7	7	7	9	5	35	Ditches relatively steep, road straight
13.1 - 14.0	7	7	7	9	5	35	13.4 End at BIA 200 (S to N)

Level I Field Evaluation	Evaluator: DSS	Date: 9/10/14	Page:
Notes: Evaluation Team: SWO Transportation Coordinator, Cliff Eberhardt; BIA representative; NP TTAP Director, Dennis, Trusty; WYT^2/LTAP, Debbie Shinstine		Road Name: 454 Ave. (Lohre Rd.)	Road Length:
		Road No.:	Road Surface:
		Road Class:	Speed Limit:

Mile Post	General	Intersections / RR Crossings	Signage / Pavement Markings	Fixed Objects/ Clear Zones	Shoulder / ROW	Segment Score	Comments: This is a combined worksheet for 454 Ave (South) and 454 Ave (North) with revised Mile Posts.
0.0 - 1.0	3	5	8	8	5	29	Begin at US 12 (S to N)
1.1 - 2.0	3	5	8	8	5	29	1.5 Object markers for culvert
2.1 - 3.0	3	5	8	8	5	29	
3.1 - 4.0	3	5	8	8	5	29	
4.1 - 5.0	3	5	8	8	5	29	3.8 No int sign
5.1 - 6.0	3	5	8	8	5	29	
6.1 - 7.0	3	5	8	8	5	29	
7.1 - 8.0	3	5	8	8	5	29	7.0 No int sign but has double arrow
8.1 - 9.0	3	5	8	2	5	23	8.3 curve w trees, skin patching. 7.9 trees in ROW
9.1 - 10.0	3	5	8	9	5	30	
10.1 - 11.0	3	5	8	9	5	30	10.1 deteriorated pavement, 9.6 end of chip seal
11.1 - 12.0	3	5	8	9	5	30	10.6 BIA 200 intersection marked -| and double arrow.
12.1 - 13.0	3	5	8	9	5	30	No passing zone no pass with care at end
13.1 - 14.0	3	5	8	9	5	30	12.7 Intersection with BIA 7, no adv. warning, BIA 7 T w/driveway across
14.1 - 15.0	3	5	8	9	5	30	Chip seal over poor pavement, vegetation at edge and into pavment
15.1 - 16.0	3	5	8	9	5	30	Intersection w/ 127 St (CR 28). No advance warning for int, Stop on 454
16.1 - 17.0	4	8	8	9	5	34	
17.1 - 18.0	4	8	8	9	5	34	
18.1 - 19.0	4	8	8	9	5	34	19.0 Int 124, good sight distance, crashes
19.1 - 20.0	4	8	8	9	5	34	
20.1 - 21.0	4	8	8	9	5	34	20.8 Deep drop to culvert >15'
21.1 - 22.0	4	8	8	9	5	34	
22.1 - 23.0	4	8	8	9	5	34	22.8 Deer crossing sign
23.1 - 24.0	4	8	8	9	5	34	
24.1 - 25.0	4	8	8	9	5	34	end at SD Hwy 10

APPENDIX E: COMBINED RANKING

Highway	Beg MP	End MP	Total Crashes	Crash Rank	Level I Score	Level I Rank	Combined Rank
101 St	0	1	2	37	33	188	225
101 St	1	2	1	85	33	188	273
101 St	2	3	0	128	33	188	316
101 St	3	4	0	128	33	188	316
101 St	4	5	0	128	32	177	305
101 St	5	6	0	128	32	177	305
101 St	6	7	1	85	32	177	262
101 St	7	8	0	128	32	177	305
101 St	8	9	2	37	32	177	214
101 St	9	10	2	37	32	177	214
101 St	10	11	0	128	26	77	205
101 St	11	12	0	128	26	77	205
101 St	12	13	0	128	26	77	205
101 St	13	14	2	37	26	77	114
101 St	14	15	0	128	26	77	205
101 St	15	16	0	128	26	77	205
101 St	16	17	0	128	26	77	205
101 St	17	18	0	128	26	77	205
118 St	0	1	0	128	23	46	174
118 St	1	2	0	128	23	46	174
118 St	2	3	2	37	21	28	65
118 St	3	4	3	17	21	28	45
123 St	0	1	1	85	19	12	97
123 St	1	2	1	85	19	12	97
123 St	2	3	0	128	19	12	140
123 St	3	4	2	37	19	12	49
123 St	4	5	1	85	19	12	97
127 St	0	1	2	37	24	56	93
127 St	1	2	0	128	24	56	184
127 St	2	3	2	37	24	56	93
127 St	3	4	2	37	24	56	93
127 St	4	5	2	37	30	163	200
127 St	5	6	2	37	30	163	200
127 St	6	7	2	37	30	163	200
127 St	7	8	2	37	30	163	200
127 St	8	9	4	9	29	140	149
127 St	9	10	3	17	24	56	73
127 St	10	11	3	17	29	140	157
127 St	11	12	3	17	29	140	157

Highway	Beg MP	End MP	Total Crashes	Crash Rank	Level I Score	Level I Rank	Combined Rank
127 St	12	13	2	37	20	24	61
127 St	13	14	0	128	20	24	152
127 St	14	15	0	128	20	24	152
127 St	15	16	2	37	20	24	61
129/128 St	0	1	1	85	35	201	286
129/128 St	1	2	0	128	35	201	329
129/128 St	2	3	3	17	35	201	218
129/128 St	3	4	0	128	35	201	329
164 St	0	1	5	4	23	46	50
164 St	1	2	0	128	23	46	174
164 St	2	3	4	9	23	46	55
445 Ave	0	1	0	128	28	134	262
445 Ave	1	2	0	128	24	56	184
445 Ave	2	3	2	37	24	56	93
445 Ave	3	4	1	85	24	56	141
445 Ave	4	5	0	128	24	56	184
445 Ave	5	6	0	128	24	56	184
446 Ave (S)	0	1	0	128	30	163	291
446 Ave (S)	1	2	2	37	29	140	177
446 Ave (S)	2	3	2	37	25	72	109
446 Ave (S)	3	4	1	85	25	72	157
446 Ave (S)	4	5	2	37	25	72	109
446 Ave (S)	5	6	2	37	25	72	109
446 Ave (S)	6	7	5	4	16	5	9
446 Ave (S)	7	8	0	128	10	2	130
446A/446 Ave	0	1	6	1	19	12	13
446A/446 Ave	1	2	3	17	19	12	29
446A/446 Ave	2	3	0	128	19	12	140
446A/446 Ave	3	4	1	85	19	12	97
446A/446 Ave	4	5	3	17	27	89	106
446A/446 Ave	5	6	0	128	27	89	217
446A/446 Ave	6	7	3	17	27	89	106
446A/446 Ave	7	8	2	37	27	89	126
446A/446 Ave	8	9	3	17	27	89	106

Highway	Beg MP	End MP	Total Crashes	Crash Rank	Level I Score	Level I Rank	Combined Rank
446A/446 Ave	9	10	0	128	27	89	217
446A/446 Ave	10	11	1	85	27	89	174
446A/446 Ave	11	12	1	85	27	89	174
446A/446 Ave	12	13	3	17	27	89	106
446A/446 Ave	13	14	3	17	27	89	106
455 Ave (N)	0	1	0	128	27	89	217
455 Ave (N)	1	2	2	37	27	89	126
455 Ave (N)	2	3	1	85	27	89	174
455 Ave (N)	3	4	0	128	27	89	217
455 Ave (N)	4	5	2	37	27	89	126
455 Ave (N)	5	6	0	128	27	89	217
455 Ave (N)	6	7	2	37	27	89	126
455 Ave (N)	7	8	1	85	27	89	174
455 Ave (N)	8	9	0	128	27	89	217
455 Ave (N)	9	10	2	37	27	89	126
455 Ave (N)	10	11	3	17	27	89	106
455 Ave (N)	11	12	3	17	27	89	106
455 Ave (N)	12	13	1	85	27	89	174
455 Ave (N)	13	14	1	85	27	89	174
455 Ave (N)	14	15	0	128	27	89	217
455 Ave (N)	15	16	2	37	27	89	126
455 Ave (N)	16	17	4	9	27	89	98
455 Ave (N)	17	18	2	37	27	89	126
455 Ave (S)	0	1	5	4	12	3	7
455 Ave (S)	1	2	1	85	24	56	141
455 Ave (S)	2	3	0	128	24	56	184
455 Ave (S)	3	4	1	85	24	56	141
455 Ave (S)	4	5	2	37	22	31	68
455 Ave (S)	5	6	2	37	22	31	68
455 Ave (S)	6	7	2	37	23	46	83
455 Ave (S)	7	8	1	85	22	31	116
455 Ave (S)	8	9	0	128	23	46	174
455 Ave (S)	9	10	6	1	23	46	47
455 Ave (S)	10	11	5	4	23	46	50
455 Ave (S)	11	12	4	9	14	4	13
455 Ave (S)	12	13	4	9	28	134	143
455 Ave (S)	13	14	3	17	28	134	151

Highway	Beg MP	End MP	Total Crashes	Crash Rank	Level I Score	Level I Rank	Combined Rank
455 Ave (S)	14	15	3	17	28	134	151
455 Ave (S)	15	16	2	37	27	89	126
456 Ave	0	1	2	37	16	5	42
456 Ave	1	2	1	85	7	1	86
456 Ave	2	3	0	128	16	5	133
456 Ave	3	4	0	128	16	5	133
459/458 Ave	0	1	2	37	18	10	47
459/458 Ave	1	2	0	128	22	31	159
459/458 Ave	2	3	6	1	27	89	90
459/458 Ave	3	4	3	17	27	89	106
459/458 Ave	4	5	4	9	27	89	98
459/458 Ave	5	6	5	4	27	89	93
459/458 Ave	6	7	0	128	27	89	217
459/458 Ave	7	8	0	128	27	89	217
459/458 Ave	8	9	2	37	27	89	126
459/458 Ave	9	10	0	128	27	89	217
459/458 Ave	10	11	2	37	27	89	126
459/458 Ave	11	12	2	37	35	201	238
459/458 Ave	12	13	2	37	35	201	238
459/458 Ave	13	14	2	37	35	201	238
462 Ave	0	1	1	85	17	9	94
462 Ave	1	2	1	85	19	12	97
462 Ave	2	3	3	17	19	12	29
462 Ave	3	4	0	128	19	12	140
462 Ave	4	5	0	128	18	10	138
462 Ave	5	6	0	128	29	140	268
462 Ave	6	7	1	85	29	140	225
462 Ave	7	8	1	85	29	140	225
462 Ave	8	9	2	37	29	140	177
473 Ave	0	1	1	85	27	89	174
473 Ave	1	2	2	37	25	72	109
473 Ave	2	3	0	128	35	201	329
473 Ave	3	4	1	85	34	192	277
473 Ave	4	5	0	128	30	163	291
473 Ave	5	6	0	128	27	89	217
473 Ave	6	7	3	17	27	89	106
473 Ave	7	8	1	85	27	89	174
473 Ave	8	9	0	128	27	89	217
473 Ave	9	10	1	85	27	89	174
475 Ave	0	1	1	85	24	56	141

Highway	Beg MP	End MP	Total Crashes	Crash Rank	Level I Score	Level I Rank	Combined Rank
475 Ave	1	2	0	128	24	56	184
BIA 15	0	1	2	37	32	177	214
BIA 15	1	2	0	128	32	177	305
BIA 15	2	3	0	128	32	177	305
BIA 15	3	4	0	128	32	177	305
BIA 15	4	5	0	128	32	177	305
BIA 15	5	6	0	128	29	140	268
BIA 15	6	7	0	128	29	140	268
BIA 15	7	8	2	37	28	134	171
BIA 15	8	9	0	128	29	140	268
BIA 15	9	10	0	128	29	140	268
BIA 15	10	11	0	128	29	140	268
BIA 15	11	12	1	85	29	140	225
BIA 15	12	13	0	128	29	140	268
BIA 15	13	14	4	9	28	134	143
BIA 15	14	15	0	128	30	163	291
BIA 200	0	1	0	128	27	89	217
BIA 200	1	2	0	128	26	77	205
BIA 200	2	3	0	128	24	56	184
BIA 200	3	4	0	128	26	77	205
BIA 200	4	5	0	128	26	77	205
BIA 200	5	6	1	85	26	77	162
BIA 3	0	1	0	128	38	209	337
BIA 3	1	2	2	37	39	210	247
BIA 3	2	3	0	128	39	210	338
BIA 3	3	4	2	37	39	210	247
BIA 3	4	5	3	17	39	210	227
Lake Rd	0	1	1	85	22	31	116
Lake Rd	1	2	0	128	22	31	159
Lake Rd	2	3	1	85	22	31	116
Lake Rd	3	4	1	85	22	31	116
Lake Rd	4	5	0	128	21	28	156
Lake Rd	5	6	0	128	22	31	159
Lake Rd	6	7	1	85	22	31	116
Lake Rd	7	8	0	128	22	31	159
Lake Rd	8	9	0	128	22	31	159
Lake Rd	9	10	1	85	22	31	116
Lake Rd	10	11	4	9	22	31	40
Lake Rd	11	12	0	128	22	31	159
Lohre Rd	0	1	1	85	29	140	225

Highway	Beg MP	End MP	Total Crashes	Crash Rank	Level I Score	Level I Rank	Combined Rank
Lohre Rd	1	2	0	128	29	140	268
Lohre Rd	2	3	0	128	29	140	268
Lohre Rd	3	4	0	128	29	140	268
Lohre Rd	4	5	0	128	29	140	268
Lohre Rd	5	6	0	128	29	140	268
Lohre Rd	6	7	0	128	29	140	268
Lohre Rd	7	8	0	128	29	140	268
Lohre Rd	8	9	1	85	23	46	131
Lohre Rd	9	10	1	85	30	163	248
Lohre Rd	10	11	3	17	30	163	180
Lohre Rd	11	12	0	128	30	163	291
Lohre Rd	12	13	2	37	30	163	200
Lohre Rd	13	14	1	85	30	163	248
Lohre Rd	14	15	1	85	30	163	248
Lohre Rd	15	16	1	85	30	163	248
Lohre Rd	16	17	1	85	34	192	277
Lohre Rd	17	18	0	128	34	192	320
Lohre Rd	18	19	2	37	34	192	229
Lohre Rd	19	20	2	37	34	192	229
Lohre Rd	20	21	0	128	34	192	320
Lohre Rd	21	22	1	85	34	192	277
Lohre Rd	22	23	0	128	34	192	320
Lohre Rd	23	24	2	37	34	192	229

APPENDIX F: SAFETY IMPROVEMENT WORKSHEETS

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 127 Street						**Route: County Rd 5**					**Date:** 1/8/2016			Beg MP0 at 449 Ave
Road Class:				**Speed:**					**Road Surface:** Asphalt										End MP16 at 465 Ave
LOCATION	PAVEMENT MARKINGS	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER DROP OFF W8-9A	OTHER - Rumble Strip	COMMENTS
MP 0																			Rumble Strip both sides
MP 1																			
MP 2																			
MP 3																			
MP 4																			
MP 5 (454 Av)			2																Locate on 454 Av
MP 6																			
MP 7																			
MP 8 (BIA 700)			2																Locate on BIA 700
MP 9																			
MP 10 (459 Av)			2																Locate on 127 Street
MP 11																			
MP 12																			
MP 13																			
MP 14																			
MP 15																			
MP 16																			
TOTAL		0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			6																

Animal Crashes:	1 Injury		Intersection Crashes:	4 Injury		ROR/Rollover Crashes:	6 Injury		
	6 PDO			1 PDO			9 PDO		

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 164 Street						**Route: County Rd 6**					**Date:** 1/8/2016			Beg MP0 at 453 Ave
Road Class:				**Speed:**					**Road Surface:** Asphalt										End MP16 at 450 Ave
LOCATION	PAVEMENT MARKINGS	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER DROP OFF W8-9A	OTHER - Transverse Rumble Strip	COMMENTS
MP 0 (453 Av)								2											Locate on 164 Street (near casino)
MP 1																			
MP 2																			
MP 3 (450 Av)		1																	Remove 3-way plates
455 Av Int																		2	Locate on 164 St (off reservation)
TOTAL		1	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			3																

Animal Crashes:	0 Injury		Intersection Crashes:	0 Injury		ROR/Rollover Crashes:	1 Injury		4 fatalities at 455 Av intersection
	2 PDO			0 PDO			2 PDO		

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 445 Avenue					**Route: County Rd 16**					**Date:** 1/8/2016				Beg MP0 at 127 Street
Road Class:				**Speed limit:** 60 mph					**Road Surface:** Asphalt										End MP6 at 122 Street (BIA 3)
LOCATION	PAVEMENT MARKINGS	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER DROP OFF W8-9A	OTHER - Overlay	COMMENTS
MP 0																			2" overlay (6400 tons)
MP 1																			
MP 2																			
MP 3																			
MP 3.5						12													Two chevrons per sign post
MP 4							1												South bound
MP 4.3						10													
MP 5						10													
MP 6 (122 St)			1						1									√	Replace 90° Curve sign
TOTAL		0	1	0	0	32	1	0	1	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			35																

Animal Crashes:	0 Injury		Intersection Crashes:	0 Injury		ROR/Rollover Crashes:	0 Injury		1 fatal crash at curve
	2 PDO			0 PDO			0 PDO		

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 446/447 Ave (S)					**Route: County Rd 19**					**Date:** 1/8/2016				Beg MP0 at 148 St
Road Class:				**Speed:**					**Road Surface:** Asphalt										End MP7 at 142 St
LOCATION	PAVEMENT MARKINGS	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER DROP OFF W8-9A	OTHER - Rumble Strip	COMMENTS
MP 0																			Rumble Strip both sides
MP 1																			
MP 2																			
MP 3																			
MP 4						5													Two chevrons per sign post
MP 4.6						5													
MP 4.8						3													
MP 5																			
MP 6						5													
MP 6.3						2													
MP 7																			
TOTAL		0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			20																

Animal Crashes:	0 Injury		Intersection Crashes:	0 Injury		ROR/Rollover Crashes:		6 Injury		2 Fatal ROR/Rollover Crashes
	1 PDO			0 PDO				6 PDO		

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 446A/446 Ave				**Route: County Rd 19**				**Date:** 1/8/2016						Beg MP0 at US 12
Road Class:				**Speed:**					**Road Surface:** Asphalt										End MP13 at 129 St
LOCATION	PAVEMENT MARKINGS	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER DROP OFF W8-9A	OTHER - Rumble Strip	COMMENTS
MP 0																			Rumble Strip both sides
MP 0.4						3													
MP 0.6						5													
MP 1																			
MP 2																			
MP 3																			
MP 3.8						6													
MP 4																			
MP 4.3						6													
MP 6.6						6													
MP 7						5													
MP 7.4						5													
MP 8						6													
MP 10																		↓	
MP 11																			
MP 12.5						6													
MP 13																			
TOTAL		0	0	0	0	48	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			48																

Animal Crashes:	0 Injury		Collision Crashes:		0 Injury		ROR/Rollover Crashes:				19 Injury		
	0 PDO				1 PDO						7 PDO		

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 455 Ave (N)					**Route: County Rd 6**					**Date:** 1/8/2016			Beg MP5 at 106 St (SD 106)
Road Class:				**Speed:**					**Road Surface:** Asphalt									End MP18 at SD 10
LOCATION	PAVEMENT MARKINGS	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER Widen 2 ft	OTHER - Rumble strip	COMMENTS
MP 5																			
MP 6																			
MP 7																			
MP 8																			
MP 9																			
MP 10																			
MP 11																			
MP 12																			
MP 13																			
MP 14																			
MP 15																			
MP 16																			
MP 17																			
MP 18	↓																↓	↓	
TOTAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			0																

Animal Crashes:	0 Injury		Intersection Crashes:	2 Injury		ROR/Rollover Crashes:	5 Injury
	9 PDO			2 PDO			1 PDO

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 455 Ave (S)						**Route: County Rd 30**					**Date:** 1/8/2016			Beg MP0 at US 12
Road Class:				**Speed:**					**Road Surface:** Asphalt										End MP15 at 157 St (SD 20)
LOCATION	PAVEMENT MARKINGS - EL&CL	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER DROP OFF W8-9A	OTHER - Guard Rail	COMMENTS
MP 0																			
MP 0.4																			Replace 2000ft cable barrier both sides
MP 1																			
MP 2 (144 St)								2											Locate on 144 St
MP 3																			
MP 4																			
MP 5																			
MP 6																			
MP 7																			
MP 8 (150 St)								2											Locate on 150 St
MP 9																			
MP 10																			
MP 11																			
MP 12																			
MP 13																			
MP 14																			
MP 15 (SD 20)	↓							4											
TOTAL		0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			8																

Animal Crashes:	0 Injury		Intersection Crashes:	0 Injury		ROR/Rollover Crashes:	5 Injury
	19 PDO			2 PDO			18 PDO

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 456 Ave						**Route: Township Road**					**Date:** 1/8/2016			Beg MP0 at BIA 701/Goodwill Rd
Road Class:				**Speed:**					**Road Surface:** Gravel										End MP2 at 124 St
LOCATION	PAVEMENT MARKINGS	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER DROP OFF W8-9A	OTHER - Increase Maintenance	COMMENTS
MP 0																			
MP 1																			
MP 2																			
TOTAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			0																

Animal Crashes:	0 Injury		Intersection Crashes:	0 Injury		ROR/Rollover Crashes:	0 Injury		2 Fatal ROR/Rollover Crashes
	0 PDO			0 PDO			1 PDO		

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 458/459 Av					**Route: County Rd 34**					**Date:** 1/8/2016				Beg MP0 at SD 10
Road Class:				**Speed:**					**Road Surface:** Asphalt										End MP9 at127 St
LOCATION	PAVEMENT MARKINGS (EL)	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	DELINEATORS	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	WIDEN SHOULDER 2 FT	OTHER - Rumble Strip	COMMENTS
MP 0																			Rumble Strip both sides
MP 1																			
MP 2											80								Delineators on curve (assume 50 ft spacing)
MP 3																			
MP 4																			
MP 5																			
MP 6																			
MP 7																			
MP 8																			
MP 9																			
	↓																↓	↓	
TOTAL		0	0	0	0	0	0	0	0	0	80	0	0	0	0	0	0	0	
TOTAL SIGNS =			80																

Animal Crashes:	0 Injury		Intersection Crashes:	0 Injury		ROR/Rollover Crashes:		9 Injury		1 Fatal ROR/Rollover crash
	4 PDO			0 PDO				14 PDO		

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: 462 Ave						**Route: County Rd 26**					**Date:** 1/8/2016			Beg MP0 at 127 St
Road Class:				**Speed:**					**Road Surface:** Asphalt										End MP9 at SD 15 (136 St)
LOCATION	PAVEMENT MARKINGS (EL)	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER Widen 2 ft	OTHER - Rumble strip	COMMENTS
MP 0																			Widen, Rumble Strip & Edgeline both sides
MP 1																			
MP 2																			
MP 3																			
MP 4																			
MP 5																			
MP 6																			
MP 7																			
MP 8																			
MP 9	↓																↓	↓	
TOTAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			0																

Animal Crashes:	0 Injury		Intersection Crashes:	1 Injury		ROR/Rollover Crashes:	3 Injury	
	2 PDO			0 PDO			2 PDO	

Sisseton Whapeton Oyate Proposed Improvements

					Road Name: Lake Road					**Route: County Rd 5**					**Date:** 1/8/2016				Beg MP0 at SD 10/122 St
Road Class:				**Speed:**					**Road Surface:** Asphalt										End MP12 at 473 Ave & 113 St
LOCATION	PAVEMENT MARKINGS (EL & CL)	STOP R1-1	STOP AHEAD W3-1	CURVE W1-1 (90°)	CURVE W1-2	CHEVRON W1-8	WINDING ROAD W1-5	INTERSECTION W2-1	INTERSECTION W2-2 (T)	PAVEMENT ENDS W8-3	OBJECT MARKER OM-3	SPEED LIMIT 20 R2-1	SPEED LIMIT 35 W13-1	ARROW W1-6	ROAD NARROWS W5-1	OPEN RANGE	SHOULDER DROP OFF W8-9A	OTHER - Clear Vegetation	COMMENTS
MP 0																			
MP 1																			
MP 2																			Clear vegetation in area of fatality
MP 3																			
MP 4																			
MP 5																			
MP 6																			
MP 7																			
MP 8																			
MP 9																			
MP 10																			
MP 11																			
MP 11.7																			Replace Guard Rail 500 ft one side
MP 12																			
TOTAL		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
TOTAL SIGNS =			0																

Animal Crashes:	0 Injury		Intersection Crashes:	0 Injury		ROR/Rollover Crashes:	4 Injury		1 Fatal ROR/Rollover Crash
	1 PDO			0 PDO			3 PDO		

APPENDIX G: BENEFIT-COST WORKSHEETS

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	127 Street (Co Rd 4)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Rumble Strip	Segment Length (mi.)	16

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
127 Street (Co Rd 4)	0	6	9	24				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$12,800.00					$12,800.00
Benefit	$132,480.00					$132,480.00
B/C Ratio	10.35					10.35

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	127 Street (Co Rd 4)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Intersection/Stop Ahead	Segment Length (mi.)	16

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
127 Street (Co Rd 4)	0	4	1	2				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$4,800.00					$4,800.00
Benefit	$98,400.00					$98,400.00
B/C Ratio	20.50					20.50

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	164 Street (Co Rd 6)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Advance warning/Stop signs	Segment Length (mi.)	3

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
164 Street (Co Rd 6)	0	0	2	2				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$2,400.00					$2,400.00
Benefit	$4,800.00					$4,800.00
B/C Ratio	2.00					2.00

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	164 Street (Co Rd 6)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Transverse Rumble Strip	Segment Length (mi.)	3

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
164 Street (Co Rd 6)	4	0	0	2	22	25		

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$3,200.00	$10,000.00	$126,000.00			$139,200.00
Benefit	$4,000,000.00	$3,500,000.00	$2,500,000.00			$7,075,000.00
B/C Ratio	1250.00	350.00	19.84			50.83

Note: Includes previous improvements of flashing beacon and advanced warning.

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	445 Ave (Co Rd 16)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Advanced warning signs	Segment Length (mi.)	6

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
445 Ave (Co Rd 16)	1	0	0	2	3	4		

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$1,600.00	$32,000.00	$800.00			$34,400.00
Benefit	$1,000,000.00	$875,000.00	$750,000.00			$1,817,500.00
B/C Ratio	625.00	27.34	937.50			52.83

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	445 Ave (Co Rd 3b, 16)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Overlay	Segment Length (mi.)	6

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
445 Ave (Co Rd 3b, 16)	1	0	2	23				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$535,920.00					$535,920.00
Benefit	$326,560.00					$326,560.00
B/C Ratio	0.61					0.61

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	446A/446 Ave (Co Rd 1)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Rumble Strip & Chevrons	Segment Length (mi.)	13

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
446A/446 Ave (Co Rd 1)	0	19	7	24	3			

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$5,600.00	$20,000.00				$25,600.00
Benefit	$378,240.00	$413,700.00				$659,556.00
B/C Ratio	67.54	20.69				25.76

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	446 Ave (S) (Co Rd 1)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Rumble Strip & Chevrons	Segment Length (mi.)	7

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
446 Ave (S) (Co Rd 1)	2	6	6	24	3			

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$5,600.00	$20,000.00				$25,600.00
Benefit	$1,726,720.00	$1,888,600.00				$3,010,968.00
B/C Ratio	308.34	94.43				117.62

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	455 Av (N)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	RS, EL	Segment Length (mi.)	13

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
455 Av (N)	0	5	1	7	24			

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$68,640.00	$5,600.00				$74,240.00
Benefit	$135,000.00	$97,920.00				$189,720.00
B/C Ratio	1.97	17.49				2.56

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	455 Av (N)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Widen, RS, EL	Segment Length (mi.)	13

Inputs

Crash Cost

Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
455 Av (N)	0	5	1	7	21	24		

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$68,640.00	$790,000.00	$5,600.00			$864,240.00
Benefit	$135,000.00	$45,900.00	$97,920.00			$207,162.00
B/C Ratio	1.97	0.06	17.49			0.24

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	455 Av (S) (Co Rd 30)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Edgeline & Centerline	Segment Length (mi.)	15

Inputs

Crash Cost

Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
455 Av (S) (Co Rd 30)	0	5	18	7				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$95,000.00					$95,000.00
Benefit	$135,000.00					$135,000.00
B/C Ratio	1.42					1.42

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	455 Av (S) (Co Rd 30)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Guardrail, EL & CL	Segment Length (mi.)	15

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
455 Av (S) (Co Rd 30)	0	0	3	7	15			

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$95,000.00	$160,000.00				$255,000.00
Benefit	$0.00	$0.00				$0.00
B/C Ratio	0.00	0.00				0.00

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	455 Av (S) (Co Rd 30)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Advance Warning Signs	Segment Length (mi.)	12

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
455 Av (S) (Co Rd 30)	0	0	2	2				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$6,400.00					$6,400.00
Benefit	$4,800.00					$4,800.00
B/C Ratio	0.75					0.75

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	456 Ave (Township Rd)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Increase Maintenance	Segment Length (mi.)	2

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
456 Ave (Township Rd)	2	0	1	25				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$825,000.00					$825,000.00
Benefit	$1,251,500.00					$1,251,500.00
B/C Ratio	1.52					1.52

Note: No CRF exists for incresased maintenance. Assumed value of 25% and maintenance once per month

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	458/459 Ave (Co Rd 34)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	EL, RS, Delineators	Segment Length (mi.)	2

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
458/459 Ave (Co Rd 34)	1	9	14	5	7	24		

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$7,000.00	$47,500.00	$7,200.00			$61,700.00
Benefit	$343,640.00	$243,000.00	$999,680.00			$1,380,418.80
B/C Ratio	49.09	5.12	138.84			22.37

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	458/459 Ave (Co Rd 34)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Widen, EL, RS, Delineators	Segment Length (mi.)	2

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
458/459 Ave (Co Rd 34)	1	9	14	5	7	21	24	

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$7,000.00	$47,500.00	$272,000.00	$7,200.00		$333,700.00
Benefit	$343,640.00	$243,000.00	$468,600.00	$999,680.00		$1,641,955.98
B/C Ratio	49.09	5.12	1.72	138.84		4.92

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	Lake Road (Co Rd 7)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Clear Vegetation	Segment Length (mi.)	1

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
Lake Road (Co Rd 7)	1	0	0	25				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$17,000.00					$17,000.00
Benefit	$625,000.00					$625,000.00
B/C Ratio	36.76					36.76

Note: Countermeasure applied only in one-mile segment where fatality occurred.

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	462 Ave (Co Rd 26)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Widen, RS, EL	Segment Length (mi.)	13

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
462 Ave (Co Rd 26)	0	3	2	7	21	24		

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$47,500.00	$272,000.00	$7,200.00			$326,700.00
Benefit	$81,000.00	$28,800.00	$61,440.00			$127,842.00
B/C Ratio	1.71	0.11	8.53			0.39

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	Lake Road (Co Rd 7)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Clear Vegetation	Segment Length (mi.)	12

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
Lake Road (Co Rd 7)	1	4	3	7				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$63,360.00					$63,360.00
Benefit	$108,000.00					$108,000.00
B/C Ratio	1.70					1.70

Benefit to Cost (B/C) Ratio Analysis for Safety Improvement

General Information		Site Information	
Analyst	DSS	Facility	SWO
Agency/Company	UW	Road	Lake Road (Co Rd 7)
Project	Sisseton Whapeton Oyate	Analysis Time Period	2004 to 2013
Date Performed	1/7/2016	Analysis Year	2015
Improvements	Guardrail	Segment Length (mi.)	12

Inputs

Crash Cost	
Fatal	2,500,000
Injury	60,000
Property Damage Only (PDO)	6,000

Number of Crashes				Countermeasures				
Road Segment	*Fatal*	*Injury*	*PDO*	*A*	*B*	*C*	*D*	*E*
Lake Road (Co Rd 7)	0	0	1	15				

Calculation

	Countermeasures					
	A	*B*	*C*	*D*	*E*	Combined
Cost	$20,000.00					$20,000.00
Benefit	$0.00					$0.00
B/C Ratio	0.00					0.00