Spokane County Public Works

Final Road Safety Plan

March 15, 2023

Spokane County
Public Works

Contents

Introduction

Spokane County Public Works' Local Road Safety Plan is a continuously updated document used for identifying roadway safety problems and implementing roadway safety improvement projects. It is Spokane County's goal to reduce fatalities and serious injuries on county roadways.

Washington State's highway safety 'Target Zero' has been identified as a data-driven strategic plan used to identify priorities and solutions by setting a goal of zero fatal or serious injury collisions by the year 2030 by implementing a strategic highway safety plan called 'Target Zero'. Spokane County is equally committed to implementing their own road safety plan to accomplish this goal.

Spokane County has identified both systemic type projects and hot spot type projects. Systemic safety projects don't necessarily focus on exact locations where collisions are occurring but instead target locations with similar characteristics to high collision locations. Hot spot type projects are projects at specific locations where multiple collisions are occurring or serious or fatal collisions have occurred, and a countermeasure has been identified that may help to prevent similar type collisions.

Data Analysis

By using the Target Zero priorities and data provided by the County Road Administration Board (CRAB), and other various data collection methods, Spokane County will explore areas of the roadway system that may have potential safety risks.

Target Zero Priorities:

- Priority Level One: Contributing factors occurring in at least 30% of total fatal or serious injury collisions.
- Priority Level Two: Contributing factors occurring in at least 10% of total fatal or serious injury collisions.
- Priority Level Three: Contributing factors occurring in less than 10% of total fatal or serious injury collisions.

County Resources:

- Collision data in Geographical Information System (GIS) format
- Citizen input
- Guardrail Priority Array
- Intersection Collision Data
- Traffic Study Data

Target Zero Priorities and WSDOT data

Spokane County used the crash data analysis spreadsheet provided by the Washington State Department of Transportation (WSDOT) to identify collision types that fall under the Target Zero Priority Groups. The following list shows examples of some of the data categories that are included in the WSDOT data.

- Roadway characteristics
  - Roadway surface
  - Roadway curvature
  - Light condition
  - Junction relationship
- Collision Type
  - Fixed Object
  - Overturn
  - Head On
- Functional Class
  - Rural
  - Urban
- Contributing circumstances
  - Exceeding safe speed
  - Distraction
  - Over Centerline
  - Under influence, etc.
- Pedestrian
- Bicycle

Using the WSDOT provided collision data spreadsheet and the Target Zero Priority Groups (at least 30%, 10% to 30%, and less than 10% of factors occurring in our fatal and serious injury collisions) for the initial data analysis, the priority groups revealed the following:

- **Priority Group 1** – Contributing factors that occur in at least 30% of all fatal and serious collisions:
  - Hit fixed object 46.3%
  - Dry roadway 77.9%
  - Daylight 50.3%
  - Non-Intersection 72.5%
  - Horizontal Curve 38.9%
  - FFC Rural Major Collectors 34.9%
  - Speed 45 MPH 52.0%
  - 35 MPH 31.6%
  - Inattention (for pedestrian collisions) 54.5%

- **Priority Group 2** – Contributing factors that occur in 10% to 30% of all fatal and serious collisions:
    - Overturn 11.4%,
    - Dark – No Street Lights 28.9%
    - Intersection Related 18.1%
    - Straight and Grade 12.8%
    - FFC Rural Local Access 20.1%
    - FFC Urban Minor Arterial 11.4%
    - Fixed Object Crashes of varying percentages
- **Priority Group 3** – Contributing factors that occur in less than 10% of all fatal and serious collisions:
    - Hit Pedestrian 8.7%
    - Wet roadway 9.4%
    - Icy roadway 6.7%
    - Angle 6.7%
    - Head on 5.4%
    - Fixed object crashes of varying percentages

Risk Factor Identification

Risk factors contributing to our highest collision rates and the most applicable to the Priority 1 contributing factors include:

- Lane Departure
    - Hit Fixed Object Collisions – 46.3% Serious/Fatal Collisions
    - Vehicle Overturned – 11.4% Serious/Fatal Collisions
- Horizontal Curve – 38.9% Serious/Fatal Collisions
- Rural Major Collectors – 34.9% Serious/Fatal Collisions
- 45 mph roads – 52.0% Serious/Fatal Collisions
- 35 mph roads – 31.6% Serious/Fatal Collisions
- Inattention (Pedestrian Collisions) – 54.5% Serious/Fatal Collisions

By focusing on these overrepresented contributing factors, mitigation efforts can be selected on both a systemic level and for hot spots. Due to the high level of rural roads in Spokane County, the FFC and speed contributing factors will be addressed with lane departure and horizontal curve projects.

Prioritized List of Roadway Locations

The next step in developing the local road safety plan is to use the identified risk factors to come up with a prioritized list of roadway locations where safety issues need to be addressed. This plan focuses on two approaches to determine roadway locations; a systemic approach and hot spot approach.

Systemic Safety

In previous submissions, Spokane County used the Systemic Safety Project Selection Tool to analyze what type of risk factors were over-represented in our system and what sections of roadways contained these risk factors. This tool was created by the County Road Administration Board (CRAB) for the asset management software Mobility. Mobility has since been retired and the replacement software, Vue Works, has not developed a replacement Systemic Safety tool. As this tool is no longer available, other strategies were used to determine the best locations for systemic safety projects.

Lane Departure

When examining the county system, it was apparent that the most overrepresented type of collision type is "lane departure". Lane departures type collisions include fixed object collisions, overturned vehicles, and more. To mitigate lane departures Spokane County is focusing two types of systemic improvements, guardrail improvement and horizontal curve signage improvement.

Guardrail Improvement

To prioritize the best locations for guardrail, Spokane County developed a guardrail priority array. The guardrail priority array is an Excel spreadsheet developed to rank every segment of road in Spokane County by highest risk and hazard severity for run off the road type collisions. Development of the priority array considers many of the risk factors identified for serious and fatal run off the road collisions. These factors include the presence of horizontal curves, routes that have higher serious/fatal collisions, and routes with higher speeds.

To target the worst locations, we used 2 versions of this priority array spreadsheet. The first version is a general guardrail priority array that considers general information over a longer segment. The second version is a site-specific guardrail priority array that requires specific identification of roadside hazard and characteristics at specific locations along the segment. The process used was to select the highest scoring roads on the general guardrail priority array to determine where to perform the site-specific review. Each site-specific location was scored and then ranked by score, with the lowest scoring locations being eliminated from the list. Scores of the locations that remained were grouped by project (road segment) to produce a "score by project". Projects were then prioritized by this "score by project".

Several of the locations reviewed under the site-specific priority array were not selected from the highest-ranking locations on the general guardrail priority array list. Baltimore Road, Forker Road and the Cheney Plaza projects were selected from the 2021 Spokane County Local Safety Plan. These 3 projects were identified in 2021 as having some of the most deficient existing guardrail locations in Spokane County. A copy of this list is

included in the Appendix A. Additionally, Five Mile Road was added to the site-specific priority array based on citizen concern.

Guardrail Priority Array Equation

Score = [Risk Factor]*[Severity Factor]

Risk Factor = [$SumC_i$ + ADT/250 + AF + GF]

Severity Factor General = [PSL + Off * 25(L_b)/L]

Severity Factor Site-Specific = [PSL + Off * (EF+OF)]

Equation Variables

C_i A sum of the Run-Off the Road vehicular crashes that occurring during the previous 5-year period:

1 – Property Damage Only (PDO)
5 – Injury
10 – Fatality

ADT Average Daily Traffic volume

AF Arterial Factor; 10 if on an arterial, 0 if not (local roadway)

GF

		Vertical Grades		
		Level	Moderate	Steep
Horizontal Curves	Tangent	2	4	6
	Moderate	8	10	12
	Sharp	16	18	20

Level Grades are 0 to 3 percent
Moderate Grades are 3 to 7 percent
Steep Grades are steeper than 7 percent
Moderate Horizontal Curves are curves that are designed to meet or exceed the posted speed limit
Sharp Horizontal Curves are curves that are designed below the posted speed limit

PSL Posted Speed Limit, highest posted speed for corridor

Off Offset from traveled way to hazard subtracted by 15’

Lb Length of barrier need for embankments throughout the corridor

L Overall length of roadway corridor

EF Embankment Factor
IF EH< $EXH_{1600\text{-}6}$, EF=10 + ABS((EH-$EXH_{1600\text{-}6}$/2), max=20

IF EH> $EXH_{1600\text{-}6}$, EF=10 - ABS(2*(EH-$EXH_{1600\text{-}6}$)), IF EF<0 make EF=0

ES = Embankment Slope at steepest location on guardrail run

EH = Embankment Height at highest location on guardrail run

$EXH_{1600\text{-}6}$ = WSDOT Design Manual Exhibit 1600-6 Height. Determine the height at which guardrail would be recommended based on the table.

OF Object Factor

0-5 Based on the percentage of the location that has objects in the clear zone or on the hazardous slope.

0 = No Objects

5 = Entire length is covered by objects

Horizontal Curve Signage

Curve signing will be continually updated and improved systemically on Spokane County roads to address the run-off the road type collisions on curves. As signing is a low-cost improvement, the County is working to update signage systematically over the entire inventory. Several projects have been completed with past safety grants. By the end of 2023 Spokane County will have completed review and update of nearly every rural arterial and collector. To continue the effort to update all County horizontal curve signs, horizontal curve sign projects will be added to the 2023 Local Road Safety Plan to review and update curves on urban arterials/collectors and higher volume local access roads. The County will also replace the oldest curve signage systemwide to improve retro-reflectivity.

Pedestrian Safety Improvements

Spokane County had the highest rate of serious and fatal pedestrian collisions in 2022 as reported by the Washington Traffic Safety Commission (WTSC) (see Appendix C). This troublesome statistic has motivated County staff to include pedestrian projects in the 2023 local safety plan to systemically address this issue.

Pedestrian collisions account for just 0.9% of Spokane Counties collisions but represent 8.7% (13 total) of its serious and fatal collisions. 54.5% of serious/fatal pedestrian collisions are caused by inattention or distraction. 56.3% of these serious/fatal pedestrian collisions occur in the roadway.

Wall Street /Waikiki Road/Whitworth Drive Intersection

The intersection of Wall Street/Waikiki Road/Whitworth Drive has been identified in the Transportation Element of the Spokane County Capital Facilities Plan as having an unacceptable Level of Service. Wall Street is a 4-lane Urban Principal Arterial with an ADT exceeding 16,000. Waikiki Road is a 3-lane Urban Principal Arterial with an ADT

exceeding 14,000. This area is dense with pedestrian activity due to a substantial amount of mixed density residential housing, a popular public park, a neighborhood convenience store, a restaurant, access to public transit line, and Whitworth University. Spokane County has a pedestrian safety and channelization project in its 6-year TIP that will fix the operational issue at this location as well as provide 2 enhanced crosswalks for pedestrian safety. Based on its pedestrian safety merits, this project is suitable to be included in the Local Road Safety Plan

Holmberg Park on Wall Street

Wall Street at Graves Road is a 4-lane roadway with an ADT of 16,600. The Wall Street crosswalk at this location provides access for the neighborhood to the east to Holmberg Park across the busy road. Concerned citizens from the adjacent neighborhood have raised a safety concern of crossing at this location. 4-lane roadway crosswalks have the potential "double threat" safety issue of a vehicle stopping in lane 1, blocking the sight line of a vehicle in lane 2. This can result in the vehicle in lane 2 potentially failing to stop, because they didn't see the crossing pedestrian. Safety concerns have also been raised by staff at North Wall Schools, which is location just south of the park. This park is often used by the schools and crossing four lanes of traffic has proven to be challenging. Installation of an enhanced crosswalk with pedestrian activated beacons and a refuge island would increase pedestrian safety at this location.

Hot Spot Safety

Intersection Collisions

Intersections are often a source of high collision rates due to the multiple points of conflict present. Using the most recent 5 years of collision data provided by CRAB, Spokane County ranked the top 10 intersections from highest to lowest total number of collisions in Table 1 and from highest to lowest rate of collisions in Table 2.

Table 1 Intersections Ranked by Total Collisions

Intersections Ranked By Total Collisions

Road Name	Entering ADT's North	South	East	West	Total ADT	Total Collisions	Inter Rate	Total Injured	Serious	Fatal
Hastings Rd @ Entrance to Fred Meyer	270	1,830	8,823	8,823	19,746	32	0.8880	11	1	0
Argonne Rd & Upriver Dr	13,205	14,979	4,037	4,807	37,028	27	0.3995	17	1	0
Wall St & Cascade Way	7,175	10,827	4,059		22,061	23	0.5713	5	0	0
Monroe St & Wedgewood Ave	6,962	6,962	300	200	14,424	15	0.5698	11	0	0
Waikiki Rd & Hawthorne Rd	7,206	7,857	2,655	350	18,068	13	0.3942	9	0	0
Bruce Rd & Peone Rd	2,569	4,095	433	2,594	9,691	12	0.6785	14	0	0
Monroe St & Rosewood Ave	6,962	6,962	250	250	14,424	12	0.4559	7	0	0
Country Homes Blvd & Wall St	8,300	7,175	9,226	10,814	35,515	11	0.1697	10	0	0
Palouse Hwy & 57th Ave	2,542	3,326	3,946	5,308	15,122	11	0.3986	7	0	0
Wall St & Carolina Way	7,175	10,827	500	250	18,752	10	0.2922	7	0	0

The rate of collisions per million entering vehicles is a common way to compare how many collisions are occurring per a unit of traffic volume at a location. The following rate formula is provided by the Federal Highway Administration:

Rate Formula:

$$R = \frac{1{,}000{,}000 \times C}{365 \times N \times V}$$

R = Crash rate for the intersection expressed as collisions per million entering vehicles (MEV)
C = Total number of intersection crashes in the study period
N = Number of years of data (in this case 5)
V = Traffic volumes entering the intersection daily (some have been assumed as no vehicle counts taken, highlighted)

Table 2 Intersection Collisions by Rate

Intersections Ranked By Collision Rate

Road Name	Entering ADT's North	South	East	West	Total ADT	Total Collisions	Inter Rate	Total Injured	Serious	Fatal
Hastings Rd @ Entrance to Fred Meyer	270	1,830	8,823	8,823	19,746	32	0.8880	11	1	0
Bruce Rd & Peone Rd	2,569	4,095	433	2,594	9,691	12	0.6785	14	0	0
Wall St & Cascade Way	7,175	10,827	4,059		22,061	23	0.5713	5	0	0
Monroe St & Wedgewood Ave	6,962	6,962	300	200	14,424	15	0.5698	11	0	0
Monroe St & Rosewood Ave	6,962	6,962	250	250	14,424	12	0.4559	7	0	0
Argonne Rd & Upriver Dr	13,205	14,979	4,037	4,807	37,028	27	0.3995	17	1	0
Palouse Hwy & 57th Ave	2,542	3,326	3,946	5,308	15,122	11	0.3986	7	0	0
Waikiki Rd & Hawthorne Rd	7,206	7,857	2,655	350	18,068	13	0.3942	9	0	0
Wall St & Carolina Way	7,175	10,827	500	250	18,752	10	0.2922	7	0	0
Country Homes Blvd & Wall St	8,300	7,175	9,226	10,814	35,515	11	0.1697	10	0	0

County staff developed collision diagrams at each of the intersections listed in table 1 and table 2 and reviewed collision reports to analyze potential reoccurring issues that might be mitigated by safety improvement projects. A discussion of the top 4 intersections in table 1 and table 2 is included below.

Hastings Road at the Entrance to Fred Meyer

Hastings Road at MP 0.935 is a busy commercial driveway intersection that has a history of collisions. This location has both the highest collision rate and the highest total collisions over the last five years of all intersections in unincorporated Spokane County. See Appendix B for collision data. Hastings Road is an Urban Principal Arterial with an ADT over 20,000. Crashes are primarily caused due to the high volume of vehicles attempting to make left hand turns out of the commercial development to the south at a location that is too close to a busy signalized intersection and too close to another high-volume commercial driveway across the street. To mitigate the high collision rates, in June of 2022 Spokane County installed temporary channelization in the middle of Hastings Road to restrict left hand turns in and out of this commercial driveway. This traffic revision has shown to be successful, resulting in only one collision since implementation. As this measure has proven to be affective, the County has added a project to the 6-year TIP to make this temporary improvement permanent.

Bruce Road at Peone Road

The intersection of Bruce Road at Peone Road has the second highest intersection collision rate in unincorporated Spokane County of 0.68 collisions per million entering vehicles. Spokane County Sheriff's Office has reported 4 property damage related crashes and 8 injury related crashes at this intersection in the last 5 years. See Appendix B for collision data. The County has received reports of close calls with motorists running the stop signs on Bruce Road. Low-cost safety improvements of adding reflective strips to the "stop" and "stop ahead" signposts have already been made. Large 48" stop signs were installed in September of 2018. This improvement appeared to have helped as fewer collisions occurred in subsequent years. However, in recent years there have been collisions that spurred citizens calling in to ask for more safety improvements to prevent motorists from failing to yield at the stop signs. Incidents at this intersection are a growing concern and are only expected to increase in this rapidly growing area of Spokane County. This is an area that has many recreational and commercial destinations points and is easily accessible by Argonne Road, a Rural Major Collector and further south is an Urban Principal arterial, as well as I-90 to the south. Bruce Road is used as a commuter route by the community to access Mount Spokane Ski Resort, Green Bluff, and other various recreational activities. Green Bluff is a year-round major local attraction featuring breweries, seasonal festivals, wedding venues, live music, family friendly activities and farm fresh produce. To avoid more serious or potentially fatal collisions, the County is recommending a rural round about as a traffic calming measure.

Argonne Road at Upriver Drive

Argonne Road is a main corridor from North Spokane County to Interstate 90 and has a combination of high volumes of freight and commuter traffic. This intersection has a high number of collisions involving drivers "sideswiping" one another, angle collisions making a turn when it is unsafe, and more showing that there is simply not space for the volumes traveling through it. Funding for a complete intersection redesign has already been secured through another source to address congestion at this location.

Wall Street at Cascade Way

The intersection of Wall Street at Cascade is an urban signalized intersection with a history of ranking high on the Spokane County intersection collision lists. While studying the collisions, County staff could not determine a countermeasure that would be feasible and effective at addressing the collisions. A roundabout may help to reduce the type of collisions observed however the intersection is at the bottom of a grade and there is not room to install a roundabout without purchasing and demolishing homes in this built-up urban area. Spokane County will monitor this intersection to analyze trends so in the future we may find an effective solution.

Monroe Street at Wedgewood Avenue

Monroe Street at Wedgewood is a 2-way stop controlled Principal Arterial/Local Access Road intersection in an urban area. Failure to yield has been a common traffic infraction at the intersection that has resulted in several collisions. Signage was revised in 2021 to make the stop signs more visible and to alert drivers that cross traffic does not stop. So far, these measures have proven to be effective. The County will continue to monitor the intersection to determine if more intervention is necessary.

Countermeasures and Selection Process

Countermeasures were selected from the Washington State Department of Transportation's (WSDOT) Strategic Highway Safety Plan: Target Zero for various collision types and risk factors. The following were countermeasures County staff determined as being appropriate to address specific collision types and risk factors that are over-represented in Spokane County.

Lane Departure Collisions

Spokane County is a predominately rural county and collisions involving lane departure are a great concern as it can lead to potentially serious or fatal collisions with fixed objects, overturned vehicles, other vehicles, and more. County Staff selected the following lane departure countermeasures to focus on:

> LDX.4.3 Install roadside safety hardware such as guardrail, cable barrier, or concrete barrier.
> (P, CMF) (p. 98)
>
> LDX.4.6 Remove or replace existing barrier that is damaged or non-functional. (R, FHWA) (p. 98)

Horizontal Curve Collision

As mentioned, Spokane County is highly rural and does have a substantial number of horizontal curves often combined with speed limits of 35 or 45 MPH, increasing collision and lane departure likelihood. County Staff selected the following horizontal curve collision countermeasures to focus on:

> LDX1.2 Inventory horizontal curves and gather data to support development of programs and projects to reduce the severity of lane departure crashes. (R, WSDOT) (p. 98)
>
> LDX.3.1 Install chevron signs, curve warning signs, and/or sequential flashing beacons in curves. (P, CMF) (p. 98)

Intersection Collisions

In this plan, multiple intersections of concern have been identified, but they each pose their own individual risks needing to be addressed County Staff selected the following intersection collision countermeasures to focus on:

> INT.1.14 Restrict or eliminate turning maneuvers at intersections. (R, NCHRP) (p. 107)
>
> INT.1.15 Implement restricted access to properties/driveways adjacent to intersections using closures or turn restrictions. (R, NCHRP) (p. 107)
>
> INT.1.16 Implement systemic signing, marking, and visibility improvements at intersections. (R, CMF) (p. 107)
>
> INT.1.2 Install or convert intersections to roundabouts. (P, CMF) (p. 107)

Pedestrian Collisions

Because Spokane leads Washington State Counties in serious and fatal pedestrian collisions, Spokane County will prioritize areas that have created concern for future collisions. County Staff selected the following pedestrian collision countermeasures to focus on:

> PAB.1.2 Invest in and construct roadway reconfigurations, roundabouts and other recommended FHWA safety countermeasures specific to pedestrian and bicyclist safety. (R, FHWA) (p. 137)
>
> PAB.2.1 Reduce crash exposure safety at pedestrian and bicyclist crossings by investing in and installing refuge islands and raised crossings and shortening crossing distances with bicycle friendly curb extensions where these crosswalk enhancements are needed. (P, NCHRP) (p. 137)
>
> PAB.2.2 Invest in and increase the use of rectangular rapid flashing beacons and pedestrian hybrid beacons where these crosswalk enhancements are needed. (R, CMF) (p. 137)
>
> PAB.3.3 Invest in and construct more buffered bike lanes, protected separated bicycle lanes, and separated bicycle facilities or shared-use paths, especially in urban areas and adjacent to schools, bus stops, and school walk areas. (U) (p. 137)

Prioritized Project List

The following list of projects was prioritized based on review of the collision history, ranking tools outlined in this document, citizen concern and discussions amongst the team of Spokane County Public Works employees that were part of the 2023 Local Road Safety Plan development. The goal was to select projects that are the most likely to prevent fatal and serious collisions in Spokane County as the highest priority projects.

1. Hasting Road Channelization MP 0.92 to MP 0.95

Install permanent channelization to mitigate high collision area.
Location: MP 0.92 to MP 0.95
Estimated Cost: $118,000

2. Bruce Road and Peone Road Roundabout

Reconstruct intersection from an all-way stop controlled to a single lane roundabout.
Location: Bruce Road and Peone Road Intersection
Estimated Cost: $1,560,000

3. 2023 Horizontal Curve Safety

Upgrade curve signs on urban arterial and high-volume local access and upgrade curve sign retro reflectivity system wide.
Location: County wide
Estimated Cost: $369,000

4. Wall Street and Graves Road Pedestrian Safety

Install rectangular rapid flashing beacons at crosswalk adjacent to Holmberg Park on Wall Street.
Location: Wall Street and Graves Road Intersection
Estimated Cost: $436,000

5. Forker Road Guardrail – MP 4.03 to Farwell Road

Remove section of deficient guardrail and install new guardrail to improve roadside safety.
Location: MP 4.03 to Farwell Road
Estimated Cost: $430,000

6. Five Mile Road Guardrail – MP 1.38 to Wild Bill Hickock Lane

Install new guardrail to improve roadside safety.
Location: MP 1.38 to Wilk Bill Hickock Lane
Estimated Cost: $455,000

7. Palouse Highway Guardrail – MP 0.72 to MP 3.67

Install new guardrail to improve roadside safety.
Location: MP 0.72 to MP 3.62
Estimated Cost: $713,000

8. Wall Street, Waikiki Road, Pedestrian Safety and Channelization – Westview Avenue to Bowling Avenue

Install permanent channelization to improve pedestrian, intersection safety, and improve traffic operations.
Location: Westview Avenue to Bowling Avenue along Wall Street and Waikiki Road
Estimated Cost: $381,000

Summary

Using a data driven approach, Spokane County staff was able to develop projects that will improve safety at high-risk locations on Spokane County roads. Steps were taken to 1.) reviewed collision data, 2) identified risk factors, 3) create prioritized lists of roadway locations, 4) select countermeasures to address risk factors and 5) create a prioritized project list. This safety plan will be used to improve the safety and quality of Spokane County roads for the community.

References

W. (2019). *Strategic Highway Safety Plan: Target Zero*. Washington State Department of Transportation. http://targetzero.com/wp-content/uploads/2020/03/TargetZero2019_Lo-Res.pdf

U. (2019). *Roadway Safety Information Analysis: A Manual for Local Rural Road Owners*. Federal Highway Administration. https://safety.fhwa.dot.gov/local_rural/training/fhwasa1210/s3.cfm

Appendix A: Site Specific Guardrail Priority Array

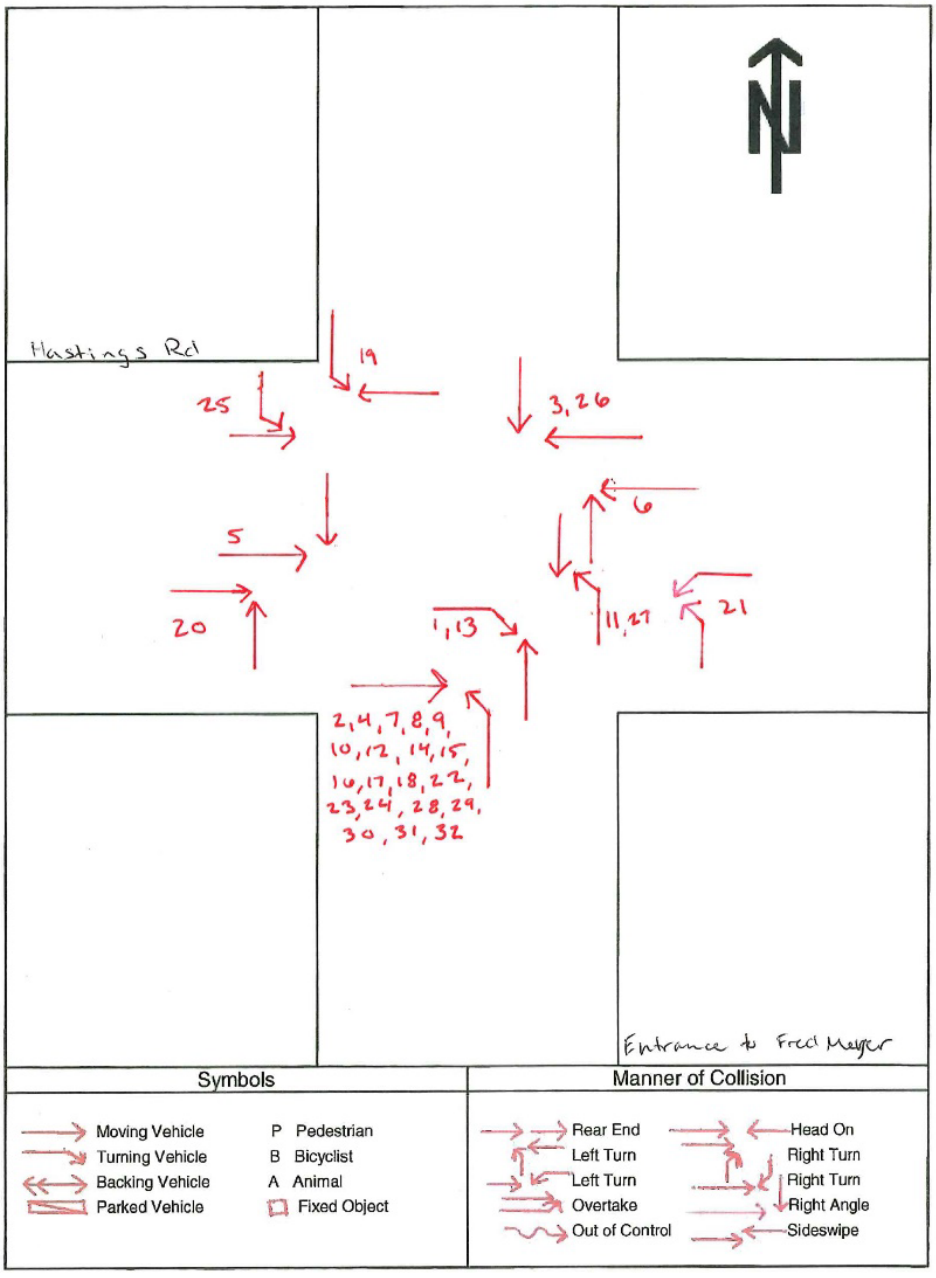
Project				Segment				Specific Guardrail Run															
Rank	Project ID	Score by Project	Project Length (ft)	Road Number	Road Name	FFC	ADT	Begin MP	End MP	Side of Road	Total Crashes	Fatalities	Inuries	Speed Limit	Geometric Factor	Offset	Embankment Slope	Embankment Height	Exhibit 1600-6 Height	Embankment Factor	Object Factor (1-5)	Risk Factor	Severity Factor	Score by Specific Run
1	76	15253	1954	1349	Forker Rd	7	1806	4.040	4.410	L	2	0	2	45	18	2	2.0:1	40	11	20.0	5.0	41	370	15253
2	74	9657	2080	1338	Five Mile Rd	17	5574	1.380	1.610	L	0	0	0	25	12	5	2.3:1	30	8.5	20.0	4.5	44	270	11960
2	74	9657	2080	1338	Five Mile Rd	17	5574	2.155	2.210	L	0	0	0	25	6	6	2.0:1	30	7	20.0	5.0	38	250	9574
2	74	9657	2080	1338	Five Mile Rd	17	5574	1.985	2.005	L	0	0	0	25	6	6	2.0:1	10	9	10.5	4.5	38	160	6127
2	74	9657	2080	1338	Five Mile Rd	17	5574	1.875	1.915	L	0	0	0	25	12	3	2.5:1	5	9	2.0	4.5	44	103	4562
2	74	9657	2080	1338	Five Mile Rd	17	5574	1.660	1.709	L	0	0	0	25	6	4	2.0:1	4	7	4.0	4.5	38	119	4538
3	181	6027	3326	3711	Palouse Hwy	7	2575	2.400	2.490	L	1	0	1	55	2	5	1.7:1	27	7	20.0	5.0	25	305	7717
3	181	6027	3326	3711	Palouse Hwy	7	2575	2.403	2.482	R	1	0	1	55	2	5	1.5:1	28	6	20.0	5.0	25	305	7717
3	181	6027	3326	3711	Palouse Hwy	7	2575	1.740	1.856	R	1	0	0	55	2	4	2.0:1	26	9	18.5	5.0	23	314	7305
3	181	6027	3326	3711	Palouse Hwy	7	2575	3.550	3.662	L	1	0	0	55	16	6	2.2:1	11	10	10.5	1.5	37	163	6080
3	181	6027	3326	3711	Palouse Hwy	7	2575	3.130	3.235	R	1	0	1	55	2	4	1.8:1	9	8	10.5	0.5	25	176	4453
3	181	6027	3326	3711	Palouse Hwy	7	2575	2.780	2.796	L	0	0	0	55	2	6	2.2:1	10	10	10.0	5.0	22	190	4237
3	181	6027	3326	3711	Palouse Hwy	7	2575	1.848	1.960	L	0	0	0	55	2	6	1.7:1	10	8	11.0	2.0	22	172	3836
4	323	5449	539	880	Dishman Mica	7	3658	1.200	1.273	R	1	0	0	45	8	7	2.0:1	18	9	14.5	2.0	34	177	5953
4	323	5449	539	880	Dishman Mica	7	3658	1.643	1.665	L	0	0	0	45	2	7	1.3:1	11	6	12.5	2.0	27	161	4288
4	323	5449	539	880	Dishman Mica	7	3658	1.446	1.453	L	1	0	1	45	8	9	1.1:1	7	6	10.5	0.0	36	108	3848
5	198	4386	3696	381	Baltimore Rd	8	1551	1.230	1.360	L	1	1	0	45	2	6	1.6:1	26	7	19.5	4.5	23	261	6056
5	198	4386	3696	381	Baltimore Rd	8	1551	0.580	0.730	R	0	0	0	45	2	6	1.6:1	34	7	20.0	0.5	18	230	4178
5	198	4386	3696	381	Baltimore Rd	8	1551	1.440	1.600	R	0	0	0	45	2	6	1.7:1	21	8	16.5	3.5	18	225	4096
5	198	4386	3696	381	Baltimore Rd	8	1551	0.910	1.040	L	0	0	0	45	2	6	1.6:1	22	7	17.5	2.0	18	221	4014
5	198	4386	3696	381	Baltimore Rd	8	1551	0.580	0.710	L	0	0	0	45	2	6	1.6:1	21	7	17.0	0.5	18	203	3686
6	279	4307	2798	577	Cheney-Plaza Rd	7	1344	2.100	2.180	L	2	0	1	55	2	6	1.5:1	14	6	14.0	4.0	21	217	4639
6	279	4307	2798	577	Cheney-Plaza Rd	7	1344	2.000	2.300	R	2	0	1	55	2	6	1.5:1	14	6	14.0	2.0	21	199	4254
6	279	4307	2798	577	Cheney-Plaza Rd	7	1344	1.670	1.750	R	1	0	1	55	2	6	1.1:1	12	6	13.0	4.0	20	208	4238
6	279	4307	2798	577	Cheney-Plaza Rd	7	1344	1.680	1.750	L	1	0	1	55	2	6	1.1:1	12	6	13.0	4.0	20	208	4238

Appendix B: Collision Data

Collision Diagram

Intersection: Hastings Rd at Entrance to Fred Meyer

Date: Jan 01, 2017 - Dec 31, 2021



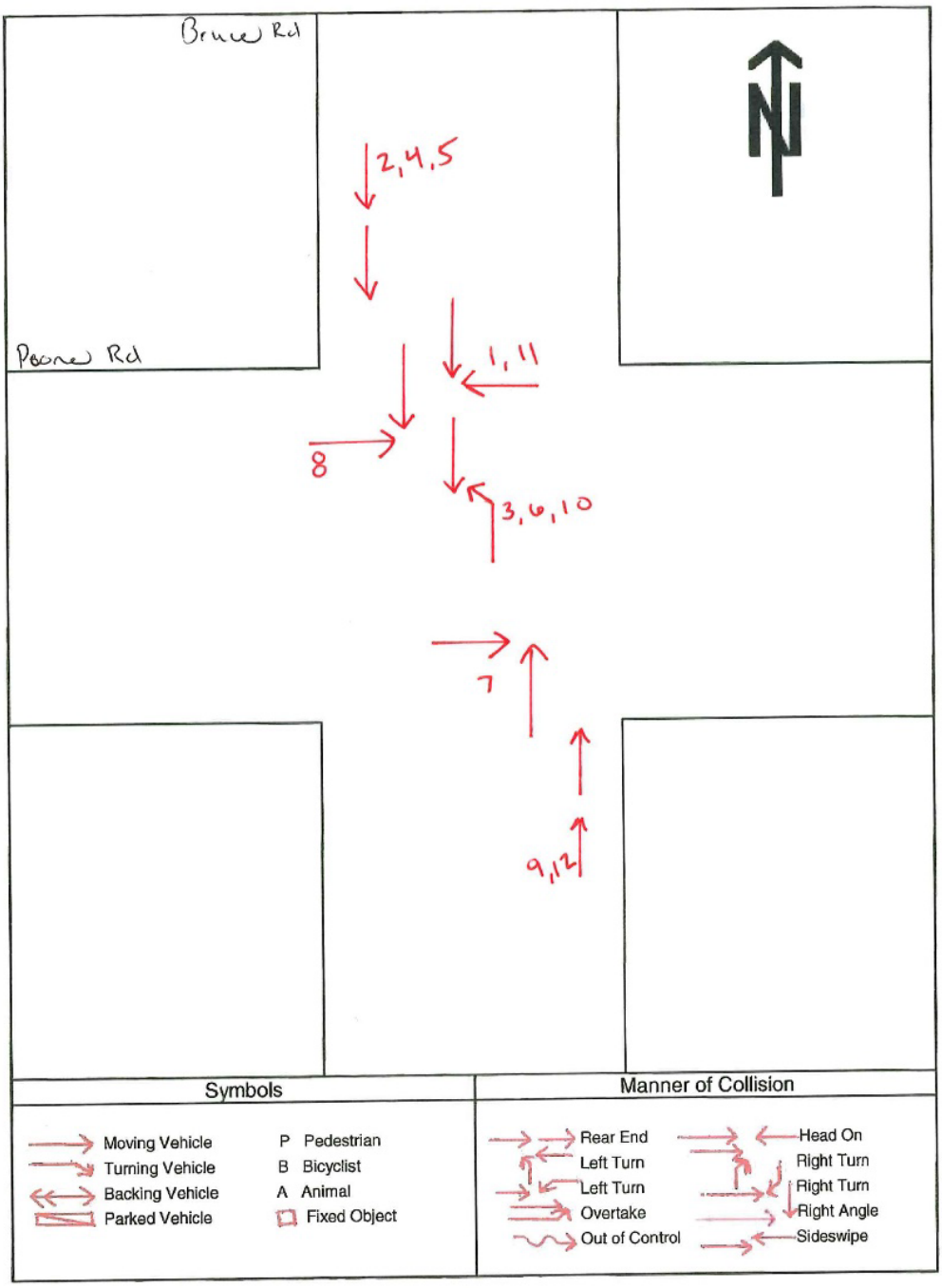
Collision Report - Hastings at Fred Meyer Entrance

Road #	Road Name	MP	Date	Time	Severity	Collision Type	Road Condition	Collision #	Diagram #
01746	Hastings Rd	0.930	3/24/2017	17:58	1-Property Damage Only	Entering at angle	Wet	E655567	1
01746	Hastings Rd	0.930	4/18/2017	12:14	2-Injury	Entering at angle	Dry	E663220	2
01746	Hastings Rd	0.930	6/16/2017	15:18	2-Injury	Entering at angle	Dry	E682693	3
01746	Hastings Rd	0.930	6/20/2017	16:48	1-Property Damage Only	Entering at angle	Dry	3760237	4
01746	Hastings Rd	0.930	9/7/2017	11:34	1-Property Damage Only	Entering at angle	Dry	E710127	5
01746	Hastings Rd	0.930	9/19/2017	16:54	1-Property Damage Only	Entering at angle	Wet	E713634	6
01746	Hastings Rd	0.930	11/20/2017	17:37	2-Injury	Entering at angle	Dry	E744062	7
01746	Hastings Rd	0.930	1/12/2018	17:29	2-Injury	Entering at angle	Wet	E761763	8
01746	Hastings Rd	0.930	2/23/2018	14:02	1-Property Damage Only	Entering at angle	Dry	E773186	9
01746	Hastings Rd	0.930	11/2/2018	16:28	1-Property Damage Only	Entering at angle	Wet	E856971	10
01746	Hastings Rd	0.930	11/20/2018	14:23	1-Property Damage Only	From opposite direction - one left turn - one straight	Dry	E864571	11
01746	Hastings Rd	0.930	12/8/2018	13:06	1-Property Damage Only	Entering at angle	Dry	3815631	12
01746	Hastings Rd	0.930	12/10/2018	17:30	1-Property Damage Only	Entering at angle	Snow/Slush	3815985	13
01746	Hastings Rd	0.930	12/17/2018	12:18	1-Property Damage Only	Entering at angle	Dry	E873336	14
01746	Hastings Rd	0.930	3/9/2019	16:52	1-Property Damage Only	Entering at angle	Dry	3815993	15
01746	Hastings Rd	0.930	7/2/2019	13:42	1-Property Damage Only	Entering at angle	Dry	E937712	16
01746	Hastings Rd	0.930	8/5/2019	20:38	1-Property Damage Only	Entering at angle	Dry	E947304	17
01746	Hastings Rd	0.930	8/13/2019	11:30	1-Property Damage Only	Entering at angle	Dry	E950039	18
01746	Hastings Rd	0.930	2/14/2020	15:40	1-Property Damage Only	Entering at angle	Dry	3837102	19
01746	Hastings Rd	0.930	2/17/2020	12:36	1-Property Damage Only	Entering at angle	Dry	EA17503	20
01746	Hastings Rd	0.930	3/16/2020	13:05	1-Property Damage Only	Entering at angle	Dry	EA24283	21
01746	Hastings Rd	0.930	6/25/2020	11:03	1-Property Damage Only	Entering at angle	Dry	EA43496	22
01746	Hastings Rd	0.930	10/17/2020	12:52	1-Property Damage Only	Entering at angle	Dry	EA74102	23
01746	Hastings Rd	0.930	12/17/2020	10:56	1-Property Damage Only	Entering at angle	Wet	EA91226	24
01746	Hastings Rd	0.930	2/20/2021	14:53	1-Property Damage Only	Entering at angle	Dry	EB08314	25
01746	Hastings Rd	0.930	3/26/2021	15:34	1-Property Damage Only	Entering at angle	Dry	EB17398	26
01746	Hastings Rd	0.930	6/7/2021	15:08	1-Property Damage Only	From opposite direction - one left turn - one straight	Dry	EB37030	27
01746	Hastings Rd	0.930	6/9/2021	16:11	2-Injury	Entering at angle	Dry	EB42508	28
01746	Hastings Rd	0.930	7/8/2021	16:59	1-Property Damage Only	Entering at angle	Dry	EB47394	29
1746	Hastings Rd	0.930	9/3/2021	10:31	2-Injury	Entering at angle	Dry	EB65024	30
01746	Hastings Rd	0.930	10/19/2021	16:29	2-Injury	Entering at angle	Dry	EB79862	31
01746	Hastings Rd	0.930	11/23/2021	14:46	2-Injury	Entering at angle	Wet	EB93194	32

Collision Diagram

Intersection: Bruce Rd & Peone Rd

Date: Jan 01, 2017 - Dec 31, 2021

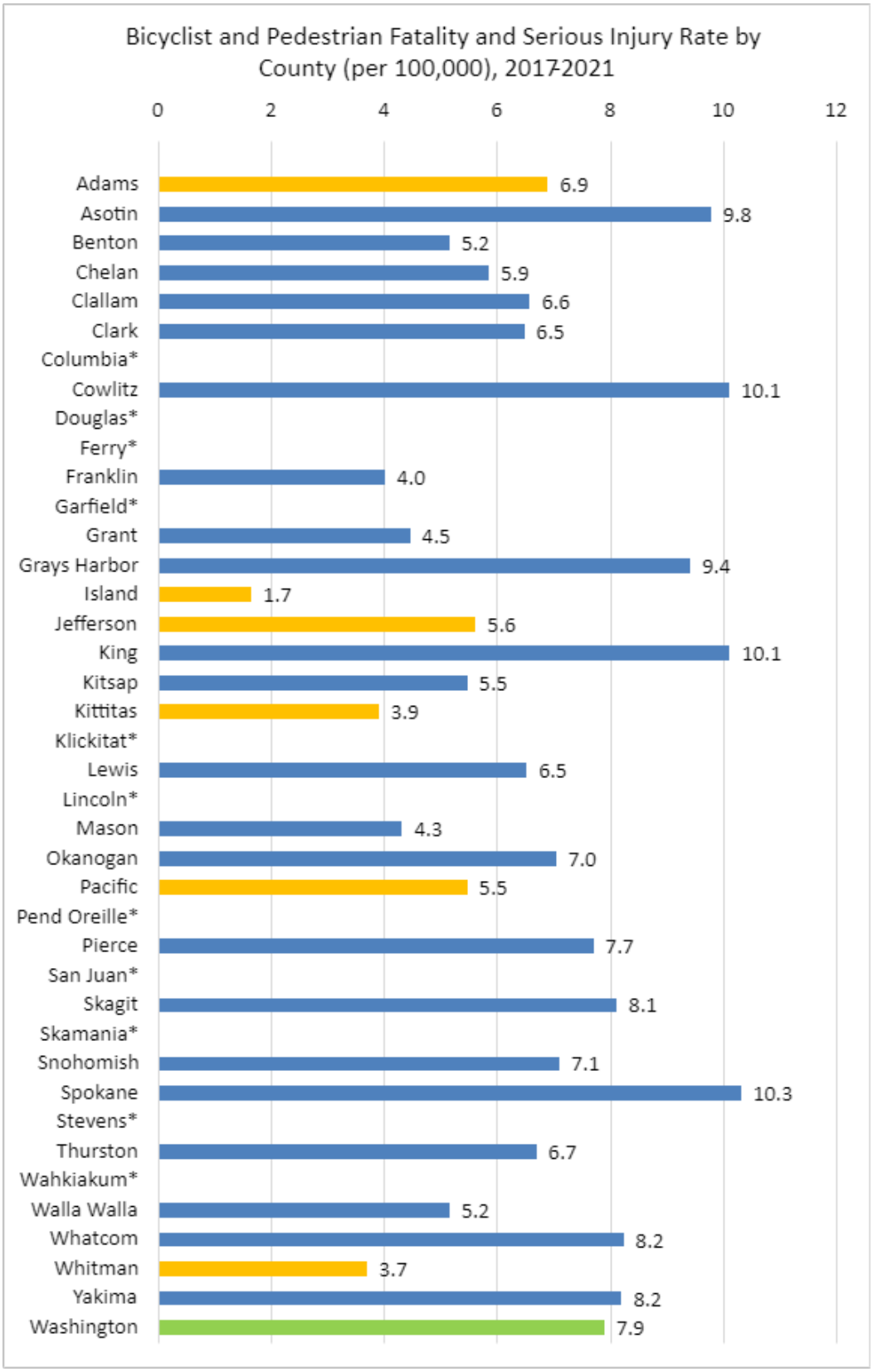


Collision Report - Bruce at Peone

Road #	Road Name	MP	Date	Time	Severity	Collision Type	Road Condition	Collision #	Diagram #
00481	Bruce Rd	0.760	6/8/2017	06:40	1-Property Damage Only	Entering at angle	Dry	E685049	1
00481	Bruce Rd	0.760	6/30/2017	11:57	2-Injury	From same direction - both going straight - one stopped - rear-end	Dry	E688032	2
00481	Bruce Rd	0.760	6/30/2017	09:30	2-Injury	From opposite direction - one left turn - one straight	Dry	E688036	3
00481	Bruce Rd	0.760	9/9/2017	21:27	1-Property Damage Only	From same direction - both going straight - both moving - rear-end	Dry	E710135	4
00481	Bruce Rd	0.760	1/8/2018	14:22	1-Property Damage Only	From same direction - both going straight - one stopped - rear-end	Wet	E756759	5
00481	Bruce Rd	0.760	6/12/2018	16:35	2-Injury	From opposite direction - one left turn - one straight	Dry	E808000	6
00481	Bruce Rd	0.760	8/6/2018	06:43	2-Injury	Entering at angle	Dry	E825352	7
00481	Bruce Rd	0.760	9/4/2018	12:43	2-Injury	Entering at angle	Dry	E834901	8
00481	Bruce Rd	0.760	9/8/2018	03:05	1-Property Damage Only	From same direction - both going straight - one stopped - rear-end	Wet	E837122	9
00481	Bruce Rd	0.760	5/31/2019	15:48	2-Injury	From opposite direction - one left turn - one straight	Dry	E926378	10
00481	Bruce Rd	0.760	2/23/2020	08:48	2-Injury	Entering at angle	Dry	EA17506	11
00481	Bruce Rd	0.760	10/8/2021	12:32	2-Injury	From same direction - both going straight - one stopped - rear-end	Dry	EB76729	12

Appendix C: Pedestrian Serious and Fatal Collision Rates by County

County	Serious Injuries	Fatals	Total	2017-2021 Population	County	Fatality & Serious Injury Rate per 100,000
Adams	7		7	101390	Adams	6.9
Asotin	10	1	11	112370	Asotin	9.8
Benton	44	8	52	1007820	Benton	5.2
Chelan	21	2	23	392710	Chelan	5.9
Clallam	19	6	25	379900	Clallam	6.6
Clark	119	40	159	2451300	Clark	6.5
Columbia	2		2	20545	Columbia*	
Cowlitz	40	15	55	544160	Cowlitz	10.1
Douglas	1		1	213660	Douglas*	
Ferry			0	38510	Ferry*	
Franklin	15	4	19	472660	Franklin	4.0
Garfield			0	11155	Garfield*	
Grant	16	6	22	492650	Grant	4.5
Grays Harbor	30	5	35	371510	Grays Harbor	9.4
Island	6	1	7	424100	Island	1.7
Jefferson	5	4	9	160140	Jefferson	5.6
King	920	205	1125	11118050	King	10.1
Kitsap	57	17	74	1351420	Kitsap	5.5
Kittitas	8	1	9	230265	Kittitas	3.9
Klickitat	3		3	111840	Klickitat*	
Lewis	17	9	26	398250	Lewis	6.5
Lincoln	1		1	54420	Lincoln*	
Mason	9	5	14	323590	Mason	4.3
Okanogan	9	6	15	212810	Okanogan	7.0
Pacific	6		6	109575	Pacific	5.5
Pend Oreille		1	1	67975	Pend Oreille*	
Pierce	265	78	343	4448820	Pierce	7.7
San Juan	1		1	85660	San Juan*	
Skagit	35	17	52	640270	Skagit	8.1
Skamania	3	1	4	59610	Skamania*	
Snohomish	226	64	290	4081520	Snohomish	7.1
Spokane	209	58	267	2587700	Spokane	10.3
Stevens	2		2	227755	Stevens*	
Thurston	74	22	96	1433200	Thurston	6.7
Wahkiakum			0	21005	Wahkiakum*	


Bicyclist and Pedestrian Fatality and Serious Injury Rate by County (per 100,000), 2017-2021
0
2
4
6
8
10
12
Adams 6.9
Asotin 9.8
Benton 5.2
Chelan 5.9
Clallam 6.6
Clark 6.5
Columbia*
Cowlitz 10.1
Douglas*
Ferry*
Franklin 4.0
Garfield*
Grant 4.5
Grays Harbor 9.4
Island 1.7
Jefferson 5.6
King 10.1
Kitsap 5.5
Kittitas 3.9
Klickitat*
Lewis 6.5
Lincoln*
Mason 4.3
Okanogan 7.0
Pacific 5.5
Pend Oreille*
Pierce 7.7
San Juan*
Skagit 8.1
Skamania*
Snohomish 7.1
Spokane 10.3
Stevens*
Thurston 6.7
Wahkiakum*
Walla Walla 5.2
Whatcom 8.2
Whitman 3.7
Yakima 8.2
Washington 7.9