Parametrix
ENGINEERING . PLANNING . ENVIRONMENTAL SCIENCES

700 NE MULTNOMAH, SUITE 1000 | PORTLAND, OR 97232 | P 503.233.2400, 360.694.5020

TECHNICAL MEMORANDUM

DATE:	August 1, 2023
TO:	City of Prineville
FROM:	Emily Welter, PE (Parametrix)
SUBJECT:	Methodology Memorandum
CC:	ODOT
PROJECT NUMBER:	274-2395-121
PROJECT NAME:	City of Prineville TSP Update

The City of Prineville published a Transportation System Plan (TSP) in November 2013. This memorandum establishes the methods and assumptions that will be used to develop the existing conditions, future conditions, and alternatives transportation analysis for the updated City of Prineville TSP. This memorandum summarizes the methodology and assumptions developed for the traffic operations analyses, safety analyses, and the multimodal operational analyses. The ODOT Analysis Procedures Manual (APM)1 will guide the methodologies and assumptions used for these analyses. As appropriate, other ODOT plans and strategies as found at the following website will be incorporated into the development of solutions for the TSP: https://www.oregon.gov/odot/Maintenance/Pages/Plans,-Architectures-&-Reports.aspx

STUDY AREA

The updated City of Prineville TSP will focus on 23 study intersections located within the City urban growth boundary (UGB). The study intersection locations and tube count locations are shown in Figure 1.

TRAFFIC VOLUME DEVELOPMENT

Existing Traffic Volumes

Existing conditions traffic operations will be analyzed for the study intersections using 2022 volumes. Following Chapter 5 of the APM, the traffic operations will be analyzed using estimated 2022 30th highest annual hour of traffic (30 HV) conditions. The 30 HV development process for existing conditions includes determination of the system peak and seasonal adjustments.

Study intersections were identified for this TSP update from the 2013 City of Prineville TSP with an additional intersection that has experienced significant growth since 2012 when the intersection volumes were collected. ODOT collected intersection classification and turning movement counts (TMCs) at most of the 23 study intersections in November 2022. Counts were not collected at four of the 23 study intersections (intersections #5, #11, #12, and #20), so intersection volumes will be developed be calculating an average growth rate between 2012 and November 2022 for the surrounding study intersections and applying that growth rate to the peak hour intersection volumes from the 2013 City of Prineville TSP. These four intersections are shown in green in Figure 1. Additional intersection counts were collected for use in the travel demand modeling effort. The existing count date, type, and durations for all the intersection counts are summarized in

[1] Analysis Procedures Manual Version 2, Oregon Department of Transportation, April 2023.

Table 1.

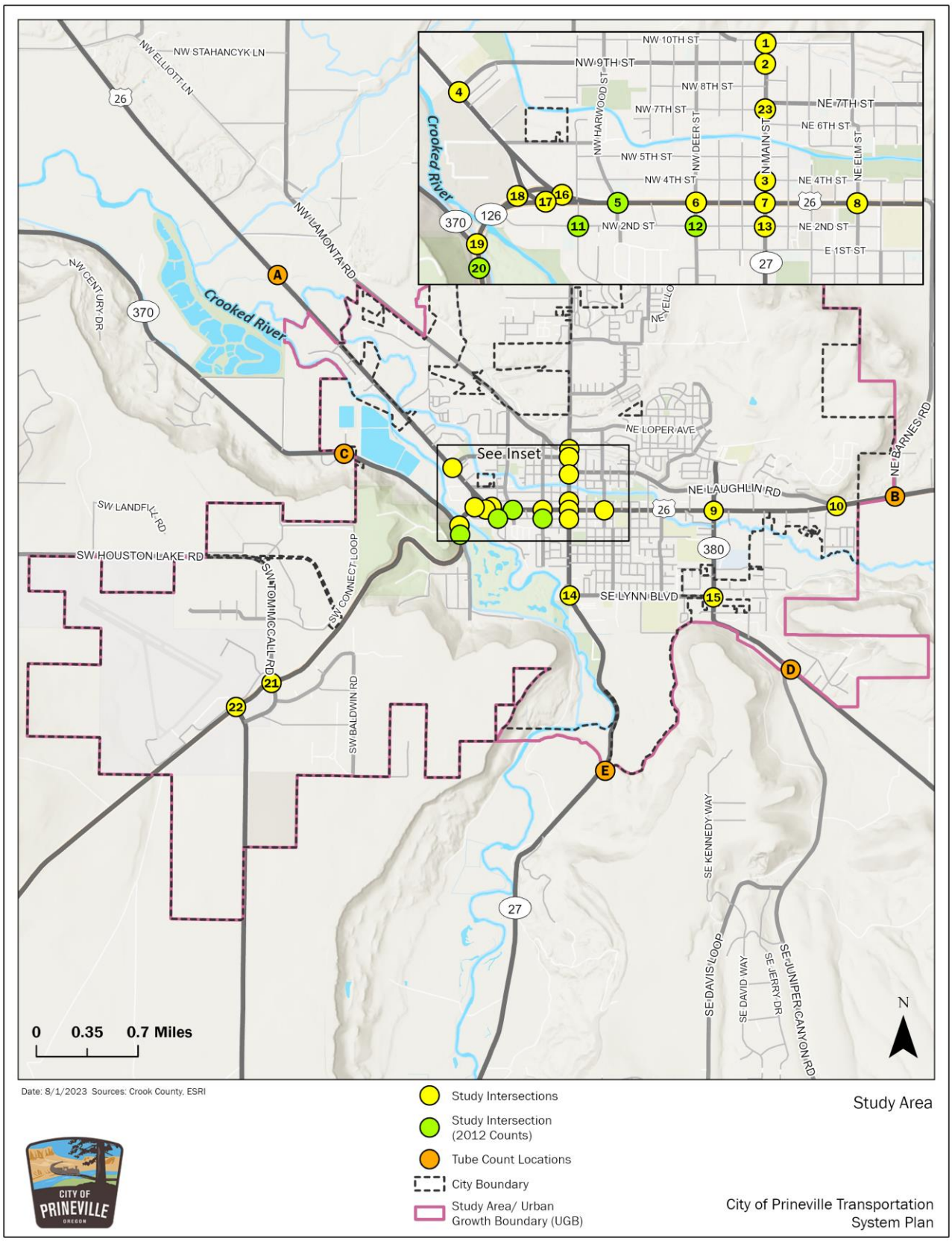
NW 10TH ST
NW 9TH ST
NW 8TH ST
NW 7TH ST
NE 7TH ST
NE 6TH ST
NW 5TH ST
NW 4TH ST
NE 4TH ST
NW 2ND ST
NE 2ND ST
E 1ST ST
NW HARWOOD ST
NW DEER ST
N MAIN ST
NE ELM ST
Crooked River
NW STAHANCYK LN
NW ELLIOTT LN
NW LAMONTA RD
NW CENTURY DR
NE YELLO
NE LOPER AVE
NE BARNES RD
See Inset
NE LAUGHLIN RD
SW LANDFILL RD
SW HOUSTON LAKE RD
SW TOMMYCALL RD
SW CONNECT LOOP
SW BALDWIN RD
SE LYNN BLVD
SE KENNEDY WAY
SE DAVIS LOOP
SE DAVID WAY
SE JERRY DR
SE JUNIPER CANYON RD
26
370
126
27
380
0 0.35 0.7 Miles
N
Date: 8/1/2023 Sources: Crook County, ESRI
Study Intersections
Study Intersection (2012 Counts)
Tube Count Locations
City Boundary
Study Area/ Urban Growth Boundary (UGB)
Study Area
City of Prineville Transportation System Plan
CITY OF PRINEVILLE
OREGON

Figure 1. Study Area

Table 1. Intersection and Tube Count Locations

Intersection ID	Count ID	Location	Count Date	Type	Duration
1	4	N Main St & NE 10th St	November 8, 2022	Classification	4-hour
2	18	N Main St & NW 9th St	November 10, 2022	Classification	16-hour
3	27	N Main St & N 4th St	November 10, 2022	TMC	4-hour
4	17	US 26 & NW 9th St	November 8, 2022	Classification	16-hour
5	-	NW Harwood Ave & NW 3rd St/US 26	-	-	-
6	7	NW Deer St & NW 3rd St/US 26	November 8, 2022	TMC	4-hour
7	12	N Main St & 3rd St/US 26	November 10, 2022	Classification	16-hour
8	24	NE Elm St & NE 3rd St/US 26	November 9, 2022	TMC	4-hour
9	11	NE Combs Flat Rd/OR 380 & NE 3rd St/US 26	November 8, 2022	Classification	16-hour
10	14	NE Laughlin Rd & NE 3rd St/US 26	November 8, 2022	Classification	16-hour
11	-	NW Meadows Lakes Dr & NW 2nd St	-	-	-
12	-	NW Deer St & NW 2nd St	-	-	-
13	28	N Main St & N 2nd St	November 9, 2022	TMC	4-hour
14	6	S Main St & SE Lynn Blvd	November 8, 2022	Classification	16-hour
15	5	NE Combs Flat Rd/OR 380 & SE Lynn Blvd	November 8, 2022	Classification	16-hour
16	13	WB OR 126 & WB US 26	November 8, 2022	Classification	16-hour
17	13	EB OR 126 & EB US 26	November 8, 2022	Classification	16-hour
18	13	WB OF 126 & EB US 26	November 8, 2022	Classification	16-hour
19	10	OR 126 & O'Neil Highway/OR 370	November 8, 2022	Classification	16-hour
20	-	OR 126 & S Rimrock Rd	-	-	-
21	9	SW Tom McCall Rd & OR 126	November 10, 2022	Classification	16-hour
22	8	SW George Millican Rd & OR 126	November 8, 2022	Classification	16-hour
23	21	N Main St & N 7th St	November 9, 2022	TMC	16-hour
-	1	NE Combs Flat Rd & NE Laughlin Rd	November 8, 2022	Classification	4-hour
-	2	NE Combs Flat Rd & NE Ironhorse Dr	November 9, 2022	Classification	4-hour
-	3	N Main St & NE Peters Rd	November 8, 2022	Classification	4-hour
-	15	NW Lamonta Rd & NW Garden Ln	November 8, 2022	Classification	16-hour
-	16	N Main St & NE Barnes Butte Rd	November 8, 2022	Classification	16-hour
-	19	NW Harwood Ave & NW 9th St	November 9, 2022	TMC	16-hour
-	20	NW Elm St & NE 7th St	November 9, 2022	TMC	16-hour
-	22	SE Fairview St & SE 5th St	November 10, 2022	TMC	16-hour
-	23	US 26 & N Gardner Rd	November 10, 2022	TMC	4-hour
-	25	NE Knowledge St & US 26	November 10, 2022	TMC	4-hour
-	26	NW Harwood Ave & NW Lamonta Rd	November 9, 2022	TMC	4-hour
-	29	N Main St & N 5th St	November 10, 2022	TMC	4-hour
-	30	SE Fairview St & SE Lynn Blvd	November 9, 2022	TMC	4-hour
-	A	US 26, 0.50 miles east of Gumpert Rd	November 8-9, 2022	Tube Count	24-hour
-	B	US 26, 0.02 miles east of Barnes Rd	November 8-9, 2022	Tube Count	24-hour

Intersection ID	Count ID	Location	Count Date	Type	Duration
-	C	OR 370, 0.02 miles west of Westview Rd	November 8-9, 2022	Tube Count	24-hour
-	D	OR 380, 0.05 mile southeast of Juniper Canyon Rd	November 8-9, 2022	Tube Count	24-hour
-	E	OR 27, 1.92 miles south of US 26 (MP 1.92)	November 8-9, 2022	Tube Count	24-hour

Average annual daily traffic (AADT) data was collected in November 2022 at five locations near the study area. ODOT also maintains an automatic traffic recorder (ATR) near the study area along US 26, 2.03 miles west of Ochoco Dam and 2.2 miles east of intersection #10.

Peak Hour Selection

The system-wide peak hour will be determined from the maximum hourly total intersection volumes. The system peak hour will be used at each individual intersection to compare to mobility targets for current and future conditions.

Seasonal Factors

As shown in Table 1 above, the traffic counts in the study area were collected in November 2022. This time may represent a period where traffic volumes are lower than the 30 HV conditions, so adjustments may be required to develop 30 HV for the traffic analysis, as outlined in Chapter 5 of the APM. ODOT maintains ATR location 07-001 near Prineville, so an on-site ATR method was used to determine the seasonal adjustment factor.

The intersection counts were collected mid-week, so percentages of weekday ADT at ATR 07-001 were evaluated between 2017 and 2021. The highest and lowest count month and peak month percentages were eliminated to account for construction activity that may have occurred in the vicinity during the five-year period. An average percent of weekday ADT was then calculated for the remaining three years. The percentages of weekday ADT for the count month (November) and peak months (June/July) were 83 percent and 126 percent, respectively. A seasonal adjustment factor of 1.52 (126 percent divided by 83 percent) will be applied to the November 2022 counts when developing the 2022 30 HV intersection volumes.

Future Traffic Volumes

Future traffic forecasts for the horizon year 2045 will be developed using a linear growth rate or rates from the 2045 City travel demand model. For state highways, a linear growth factor was calculated using 2021 and 2041 volumes provided in the ODOT Future Highway Volume Table. The overall growth rates will be applied to the 2022 30 HV intersection volumes to develop 2045 intersection volumes.

- US 26 west of OR 126 is the Madras-Prineville highway (ODOT Highway Number 360). At MP 26.00, the annual growth rate is +0.86% or 19.78% over 23 years.
- US 26 east of OR 126 is the Ochoco highway (ODOT Highway Number 041). Between MP 18.30 and 20.75, the average annual growth rate is +0.87% or 20.01% over 23 years.
- OR 126 is the Ochoco highway (ODOT Highway Number 041). Between MP 15.75 and 17.94, the average annual growth rate is +2.23% or 51.29% over 23 years.
- OR 370 is the O'Neil highway (ODOT Highway Number 370). At MP 17.65, the annual growth rate is +0.87% or 20.01% over 23 years.
- OR 380 is the Paulina highway (ODOT Highway Number 380). Between MP 0.02 and 0.62, the average annual growth rate is +2.34% or 53.82% over 23 years.

TRAFFIC ANALYSIS METHODOLOGY

Intersection Operations

Traffic operations will be analyzed for all study intersections under existing (2022) and future (2045) conditions using the design hour volumes. Synchro 11 will be used to analyze all intersections. Results will be reported using Highway Capacity Manual (HCM) 6th Edition methodology. If HCM 6th Edition results cannot be reported due to intersection geometry or other limitations, HCM 2000 will be used. The reported results will include volume-to-capacity (v/c) ratios, level of service (LOS), delay, and 95th percentile queue lengths. SimTraffic will not be used.

Intersection Mobility Targets

State highway mobility targets were developed for the 1999 Oregon Highway Plan (OHP)[2] as a method to gauge reasonable and consistent targets for traffic flow along state highways. The ODOT v/c targets are based on highway classification and posted speeds and will be used for intersections under ODOT's jurisdiction. As part of the 2013 City of Prineville TSP, the City identified operations standards for level of service, v/c ratio, and 95th percentile queueing, which will be used for intersections under the City's jurisdiction.

The future build mobility targets are from Table 1200-1 of the Highway Design Manual[3] and are considered guidelines, as there is a design exception process. The characteristics of the state highways in the study area that were used to identify mobility targets are shown below.

- US 26 west of OR 126 is the Madras-Prineville highway (ODOT Highway Number 360) and is classified as a regional highway, a freight route, and a reduction review route. The posted speed limit in the study area is 30 mph.
- US 26 east of OR 126 is the Ochoco highway (ODOT Highway Number 041) and is classified as a statewide highway and a reduction review route. For the purposes of mobility targets, it is not classified as a freight route. The posted speed limit is 30 mph for most of the study area and 45 mph at the NE Laughlin Road intersection.
- OR 126 is the Ochoco highway (ODOT Highway Number 041) and is classified as a statewide highway, a freight route, and a reduction review route. South of O'Neil Highway, OR 126 is classified as an OHP expressway. The posted speed limit is 45 mph for most of the study area and 35 mph at the US 26 interchange and Tom McCall Road and SW George Millican Road intersections.
- OR 370 is the O'Neil highway (ODOT Highway Number 370) and is classified as a district highway and not a freight route. The posted speed limit in the study area is 55 mph.
- OR 380 is the Paulina highway (ODOT Highway Number 380) and is classified as a district highway and not a freight route. The posted speed limit in the study area is 35 mph.

All study intersections are within the urban growth boundary. The mobility targets are shown in

[2] 1999 Oregon Highway Plan including amendments November 1999 through January 2023, Oregon Department of Transportation, January 2023.

[3] Highway Design Manual, Oregon Department of Transportation, 2023.

Table 2.

Table 2. Intersection Mobility Targets

Intersection ID	Intersection	Jurisdiction	Control[1]	Existing and Future No Build Mobility Target[2]	Future Build Mobility Target[3]
1	N Main St & NE 10th St	City of Prineville	Signalized	LOS E or better v/c ratio < 0.90	LOS E or better v/c ratio < 0.90
2	N Main St & NW 9th St	City of Prineville	TWSC	LOS E or better, v/c ratio < 1.0	LOS E or better, v/c ratio < 1.0
3	N Main St & N 4th St	City of Prineville	TWSC	LOS E or better, v/c ratio < 1.0	LOS E or better, v/c ratio < 1.0
4	US 26 & NW 9th St	ODOT	TWSC	v/c < 0.90	v/c < 0.75
5	NW Harwood Ave & NW 3rd St/US 26	ODOT	Signalized	v/c < 0.90	v/c < 0.75
6	NW Deer St & NW 3rd St/US 26	ODOT	Signalized	v/c < 0.90	v/c < 0.75
7	N Main St & 3rd St/US 26	ODOT	Signalized	v/c < 0.90	v/c < 0.75
8	NE Elm St & NE 3rd St/US 26	ODOT	Signalized	v/c < 0.90	v/c < 0.75
9	NE Combs Flat Rd/OR 380 & NE 3rd St/US 26	ODOT	Signalized	v/c < 0.90	v/c < 0.75
10	NE Laughlin Rd & NE 3rd St/US 26	ODOT	TWSC	v/c < 0.80	v/c < 0.70
11	NW Meadows Lakes Dr & NW 2nd St	City of Prineville	TWSC	LOS E or better, v/c ratio < 1.0	LOS E or better, v/c ratio < 1.0
12	NW Deer St & NW 2nd St	City of Prineville	TWSC	LOS E or better, v/c ratio < 1.0	LOS E or better, v/c ratio < 1.0
13	N Main St & N 2nd St	City of Prineville	TWSC	LOS E or better, v/c ratio < 1.0	LOS E or better, v/c ratio < 1.0
14	S Main St & SE Lynn Blvd	City of Prineville	TWSC	LOS E or better, v/c ratio < 1.0	LOS E or better, v/c ratio < 1.0
15	NE Combs Flat Rd/OR 380 & SE Lynn Blvd	ODOT	TWSC	v/c < 0.85	v/c < 0.75
16	WB OR 126 & WB US 26	ODOT	Ramp	v/c < 0.85	v/c < 0.70
17	EB OR 126 & EB US 26	ODOT	Ramp	v/c < 0.85	v/c < 0.70
18	WB OF 126 & EB US 26	ODOT	Ramp	v/c < 0.85	v/c < 0.70
19	OR 126 & O'Neil Highway/OR 370	ODOT	TWSC	v/c < 0.80	v/c < 0.65
20	OR 126 & S Rimrock Rd	ODOT	TWSC	v/c < 0.80	v/c < 0.65
21	SW Tom McCall Rd & OR 126	ODOT	Roundabout	v/c < 0.85	v/c < 0.70
22	SW George Millican Rd & OR 126	ODOT	TWSC	v/c < 0.85	v/c < 0.70
23	N Main St & N 7th St	City of Prineville	TWSC	LOS E or better, v/c ratio < 1.0	LOS E or better, v/c ratio < 1.0

[1]TWSC = two-way stop control

Two-Lane Highway Capacity Analysis

Tube counts were collected at five locations, as shown in Figure 1 and Table 1. At these five locations, McTrans Highway Capacity Software (HCS) 7, which is based on HCM 6th Edition methodologies, will be used to determine the roadway LOS.

Multimodal Analysis

The project team will analyze transit, bicycle, and pedestrian operations in the study area using the level of traffic stress (LTS) for bicycles and pedestrians and the qualitative multimodal assessment (QMA) for transit as outlined in Chapter 14 of the APM for arterial and collector streets. LTS will be evaluated on arterial and collector streets

only. The assessment will also include identification of key origins and destinations (e.g., schools) for cycling and pedestrian trips and a discussion of the quality and comfort of routes between origins and destinations. Analysis will identify safety concerns and barriers such as system gaps or challenging topography.

Transit analysis will use available data and information from Cascades East Transit and other local providers as appropriate.

Crash Analysis

Collision trends will be identified by analyzing the most recent five years of available crash data (2017-2021) for roadways within the City of Prineville. Analysis will include calculation of critical crash rates and excess proportion of specific crash types at all study intersections, as outlined in Chapter 4 of the APM. Intersection crash rates will be compared to critical crash rates based on the method outlined in Part B of the Highway Safety Manual[4]. If a critical crash rate cannot be calculated due to limited data, the published 90th percentile rates in Table 4-1 of the APM will be used. Project-area K-factors from the available AADT will be used to convert short duration counts to daily traffic approach volumes. The crash rates will be compared to the 2020 Crash Rate Table II in the State Highway Crash Rate Book to identify locations and intersections with more crashes than other similar facilities in Oregon. Top 10% ODOT Safety Priority Index System (SPIS) sites from 2019, 2020, and 2021 will also be identified for further review.

The collision analysis will be used to identify crash patterns and suggest potential countermeasures at locations that exceed the published intersection or segment crash rates, the calculated critical crash rate, or SPIS sites. Crash modification factors (CMFs) will be identified for each countermeasure to provide an estimate of the potential change in crash frequency based on CMFs from the Highway Safety Manual, the ODOT All Roads Transportation Safety (ARTS) Crash Reduction Factor List, or the Federal Highway Administration' (FHWA) Crash Modification Factors Clearinghouse. When using the FHWA CMF Clearinghouse, it is recommended to select CMFs with a rating of three stars or better.

[4] Highway Safety Manual 1st Edition, American Association of State Highway and Transportation Officials (AASHTO), 2010.