DRAFT TECH MEMO #3: TRANSPORTATION SYSTEM CONDITIONS – CURRENT AND FUTURE

Date:	August 5, 2021 — Project #: 23021.028
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Project:	US 199 Corridor Plan
Subject:	Draft Tech Memo #3: Transportation System Conditions – Current and Future

Introduction

Kittelson & Associates, Inc. (Kittelson) prepared this memorandum to present evaluation results for the current and future transportation conditions for the US 199 Corridor Plan (project). The evaluation focused on the project limits between the California border and the Applegate River, excluding the segment through Cave Junction (study corridor). The goal of evaluating the current and future conditions is to understand corridor needs that will guide and prioritize corridor strategies and solutions. Consistent with the scope of work, the evaluation included updating technical analyses completed for the 2020 Josephine County Transportation System Plan (TSP) and incorporating additional study corridor-specific safety analyses.

The study corridor needs established in this memorandum will serve as the basis for conducting the alternatives analysis during the next phase of this project.

Context Zones

For 35 miles, the US 199 study corridor passes through various environments such as forested lands and small rural towns; these changing environments are referred to as ‘context zones.’ Context zones for a corridor like US 199 generally reflect natural areas, transition areas, unincorporated communities, and special areas. These context zones are conceptualized in Figure 1. Understanding the context zones within the study corridor may present the opportunity to implement systemic transportation solutions or context zone-specific strategies where they are appropriate. For example, a set of solutions may be appropriate in transition areas but not in natural areas.

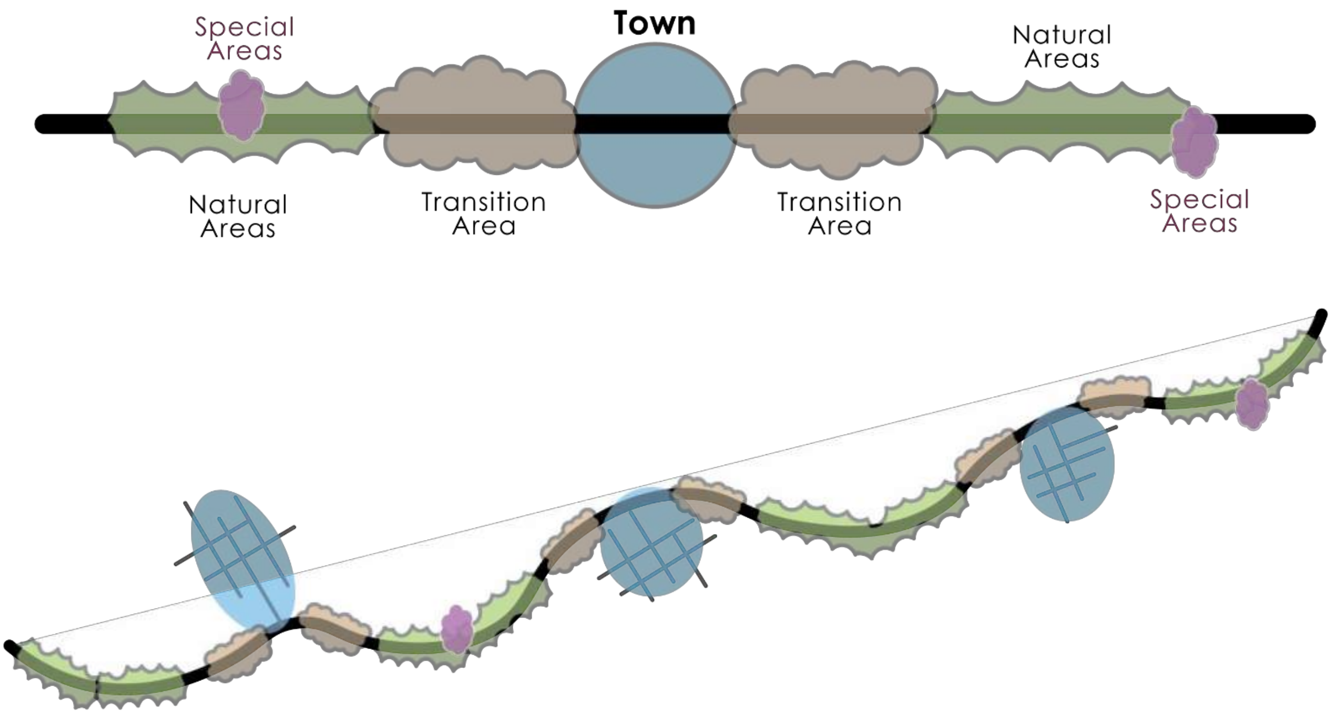


Figure 1: General Context Zones

Traffic Operations Analysis

This section demonstrates how the two study intersections and the study corridor operate now and in the future based on existing and projected traffic volumes.

In general, the study segments operate acceptably under existing (2018) and future (2040) conditions.

Study Intersection Traffic Operations

The two study intersections specifically called out in the scope of work (US 199/OR 260 and US 199/Lakeshore Drive) operate acceptably under existing (2018) and future (2040) conditions. Although they meet corresponding performance targets, the side-street delay exceeds 18 seconds at both intersections. Side-street delay is largely determined by US 199 through volume, which is relatively consistent during the PM peak hour. High side-street delay likely occurs at many locations along the corridor. A detailed summary of the study intersection traffic operations results is provided in Attachment A.

Segment Traffic Operations

Kittelson completed a segment traffic analysis to assess US 199 segment operations. This analysis uses the Federal Highway Administration (FHWA) Capacity Calculation Method for Highway Performance

Monitoring System[1] to determine the approximate level of service (LOS) for segments. Based on ODOT's traffic volumes and estimated growth rates, the US 199 corridor operates acceptably today as a rural two-lane highway and is expected to continue to operate acceptably in the future (2040). A detailed summary of the segment traffic operations results is provided in Attachment A.

Crash Analysis

The purpose of this safety analysis is to review the current conditions of the US 199 corridor to identify the existing crash trends and understand factors contributing to crashes. The team evaluated historical crash data for general crash patterns and completed screenings using two performance measures – described in detail below – to identify priority locations to evaluate. Finally, the team assessed the roadway features against the most common severe crash types to understand roadway features associated with higher risk of crashes.

Kittelson assessed official crash data from ODOT and, separately, reviewed fatal and severe crashes as of late June 2021.

For the crash analyses, the project team evaluated reported crashes from 2014 through 2018 and preliminary data including fatal and severe injury only crashes from 2019 for Milepoint 6.92 just west of the City of Grants Pass to Milepoint 41.7, the Oregon-California border, excluding Cave Junction. ODOT's reported data includes crashes that resulted in an injury or those that result in property damage over $2,500. The crash data identifies crashes based on the most severe injury associated with the crash:

- Fatal;
- Injury A (severe, life changing injury);
- Injury B (moderate injury);
- Injury C (minor injury or complaint of pain); or
- Property Damage Only (PDO).

ODOT data shows there were 417 reported crashes from 2014 to 2019. Of these, there were 41 total fatal and severe injury crashes.

Table 1 presents the number of crashes by severity, and Chart 1 provides the number of crashes by severity per year. As shown, there is a general increase in the number of crashes occurring per year from 2014 to 2018. Although the number of PDO, Injury B, and Injury C crashes are yet not available for 2019, the highest number of combined fatal and severe (Injury A) injury crashes for the study timeframe occurred in 2019.

[1] hpms_cap.pdf (dot.gov)

Table 1: Number of Reported Crashes by Severity

	Fatal	Injury A	Injury B	Injury C	PDO	Total Fatal/Injury A	Total Crashes
2014 to 2018 Reported Crashes	15	26	110	103	163	41	417
2019 Preliminary Crashes[1]	4	9	-	-	-	13	N/A

[1]2019 preliminary data only includes fatal and severe injury crashes

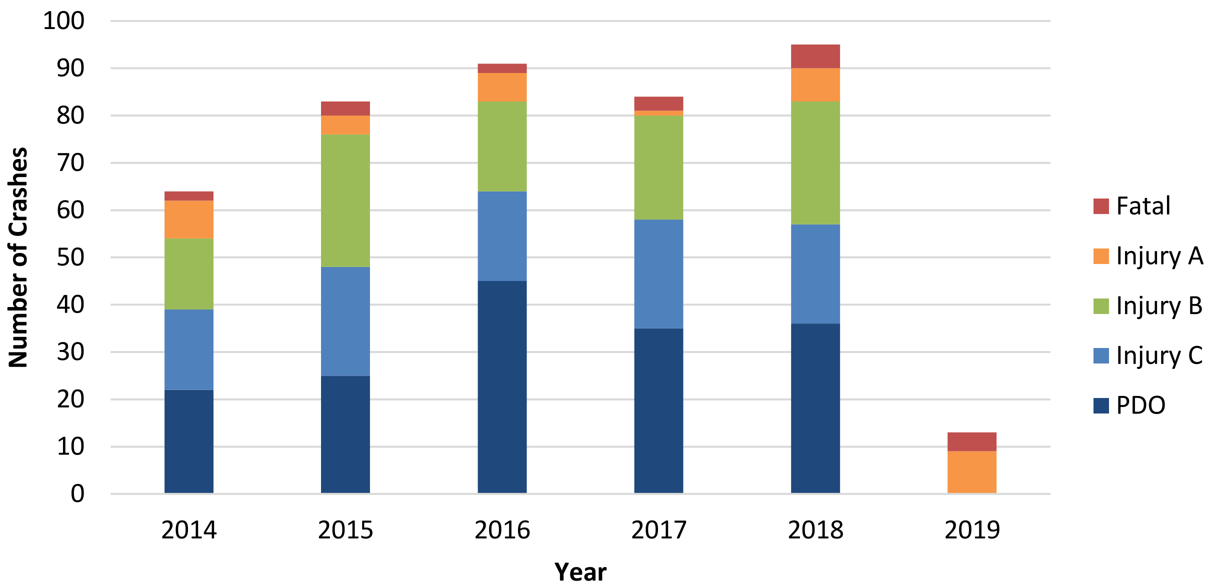


Chart 1: Reported Crash Severity by Year

KEY CRASH ANALYSIS FINDINGS:

- The most common collision types are fixed-object, rear-end, and turning movement crashes.
- The most common fatal and severe collision types are fixed-object, head-on, and turning movement crashes.
- Approximately 15 percent of fatal/severe crashes involved excessive speed. Observed speeds indicate vehicles generally travel five to 10 miles per hour (mph) faster than the posted speed limit.
- Crashes involving alcohol or drugs were more likely to result in a fatal or severe injury compared to those where alcohol or drugs were not involved.

Fixed-object, head-on, and turning movement crashes were the most common fatal and severe collision types.

Five of the seven pedestrian or bicyclist crashes resulted in fatal or severe injury.

75% of fatal/severe crashes involved at least one local driver.

- Seven pedestrian or bicyclist crashes were reported and five resulted in fatal or severe injury, accounting for 9 percent of all fatal and severe injury crashes.
- Seventy-five (75) percent of fatal/severe crashes involved at least one local driver (defined as a driver within 25 miles of home).
- Key locations identified with high crash frequency, severe crash frequency, and/or crash rate included:
  - The intersection with OR 260 (Riverbanks Road);
  - The curves just south of Milepoint 15 had a high number of reported crashes;
  - Curves near Hayes Hill Summit (Milepoint 16)
  - Milepoint 16.5, south of Hayes Hill Summit
  - Curve at Milepoint 21.85
  - US 199/Draper Valley Road, northern end (Milepoint 18)
  - US 199/Illinois River Road in Selma
  - US 199/Wild Park Lane and area just north of this intersection (Milepoint 21.9)
- Several roadway features were associated with fatal and severe crash patterns. These roadway features often overlap, with many features located on one segment, and included:
  - Tight curves
  - Passing lanes and the transitions in/out of passing lanes, particularly those that are located near tight curves
  - Intersections that lack turn-lanes
  - Intersections with limited sight distance
  - Locations with narrow shoulder widths, particularly those located near curves

2020 and 2021 Fatal Crash Summary

According to news articles, there were eight fatalities on US 199 in 2020, and there have been four fatalities in 2021 as of late June 2021.

In addition to 2014 to 2019 reported crashes, Kittelson reviewed fatal crashes that occurred in 2020 and 2021, for which official ODOT crash data is not yet available. Because official reports are not yet available, these crashes are not included in the analyses. According to news articles, there were eight fatalities on the highway in 2020, and there have been four fatalities in 2021 as of late June.

General Crash Characteristics

Kittelson reviewed the reported crash characteristics to identify patterns that may provide information about potential contributing characteristics (behavioral and roadway). The key findings are presented in this section; additional characteristics are summarized in Attachment B for reference.

This section presents the key findings from this analysis focused on:

- Collision Types

- Speed
- Impaired Driving (Alcohol or Drugs Involved)
- Pedestrians and Bicyclists
- Driver Residence

Crash Cause and Collision Type

Chart 2 presents the crashes by severity and collision type for all crashes, and Chart 3 presents the crashes by severity and collision type for severe injury and fatal crashes.

The most common collision types are fixed-object (40 percent), rear-end (23 percent), and turning movement crashes (12 percent), meaning that over 75 percent of all crashes fall into one of those three crash types. The most common fatal and severe collision types are fixed-object (28 percent), head-on (19 percent), and turning movement crashes (19 percent). Head-on crashes account for a small percentage (four percent) of the overall number of crashes on the corridor but a high percentage of fatal/severe crashes. When head-on crashes occur, they are more likely to result in severe injuries or fatalities.

75% of all reported crashes were fixed-object (40%), rear-end (23%), and turning movement crashes (12%).

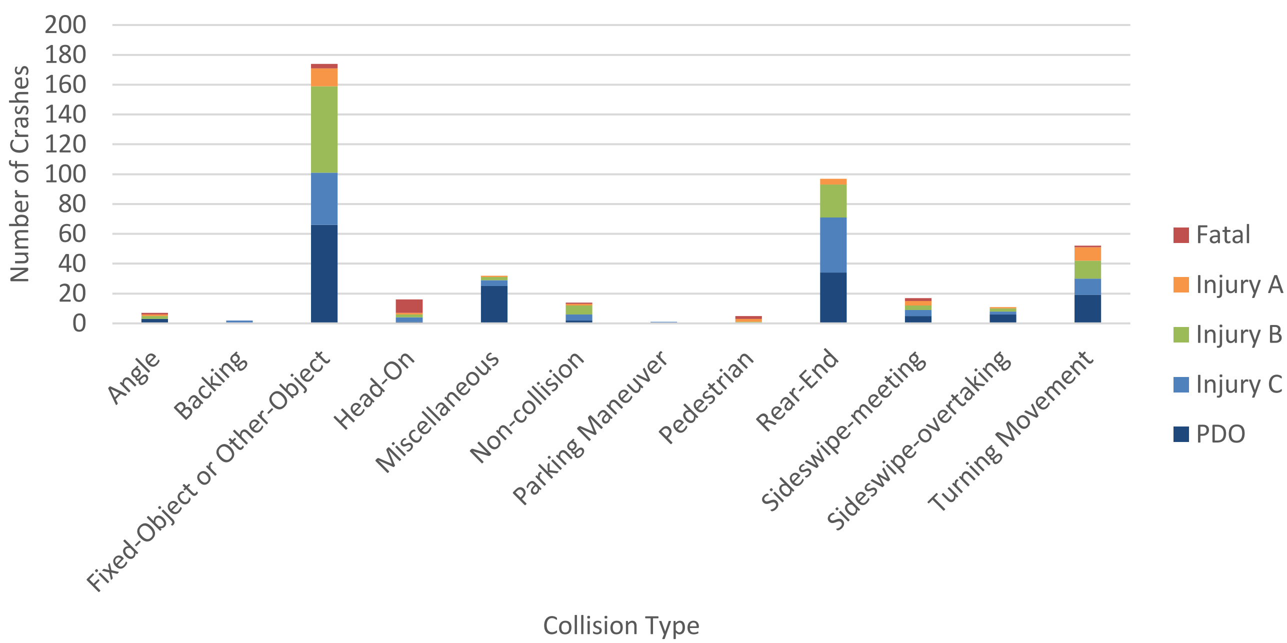


Chart 2: Collision Type by Severity for All Crashes

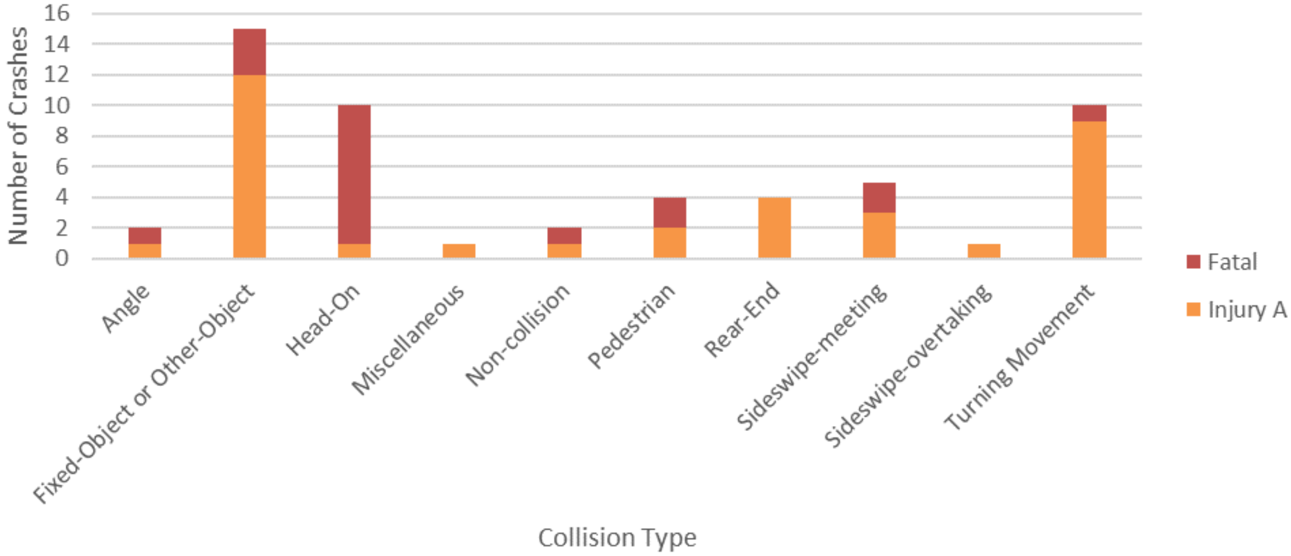


Chart 3: Collision Type by Severity for Fatal and Severe Injury Crashes

As shown in Table 2, the most common fatal and severe injury crash causes included improper driving, not yielding right-of-way, and driving left of center on two-way road.

Table 2: Crash Causes				
Type of Cause	Fatal + Injury A Crashes	Total Crashes	Percent of Fatal + Injury A Crashes	Percent of Total Crashes
Careless Driving	5	30	6.7%	5.8%
Defective steering mechanism	0	5	0.0%	1.0%
Did not yield right-of-way	12	40	16.0%	7.7%
Disregarded other traffic control device	1	1	1.3%	0.2%
Driver drowsy / fatigued / sleepy	2	42	2.7%	8.1%
Driving in excess of posted speed	4	5	5.3%	1.0%
Drove left of center on two-way road	11	22	14.7%	4.2%
Followed too closely	1	70	1.3%	13.5%
Improper change of traffic lanes	0	6	0.0%	1.2%
Improper overtaking	5	12	6.7%	2.3%
Inadequate or no brakes	0	2	0.0%	0.4%
Inattention	4	27	5.3%	5.2%
Made improper turn	4	24	5.3%	4.6%
Mechanical defect	1	3	1.3%	0.6%
Non-Motorist clothing not visible	1	2	1.3%	0.4%
Non-Motorist illegally in roadway	3	4	4.0%	0.8%
Other (not improper driving)	1	34	1.3%	6.6%
Other improper driving	13	77	17.3%	14.9%
Passed stop sign or red flasher	0	5	0.0%	1.0%
Phantom / non-contact vehicle	2	14	2.7%	2.7%
Reckless Driving	1	17	1.3%	3.3%
Speed too fast for conditions (not exceeding limit)	4	70	5.3%	13.5%
Tire failure	0	4	0.0%	0.8%
Vehicle improperly parked	0	1	0.0%	0.2%
Vehicle lost load or load shifted	0	1	0.0%	0.2%

Excessive Speed

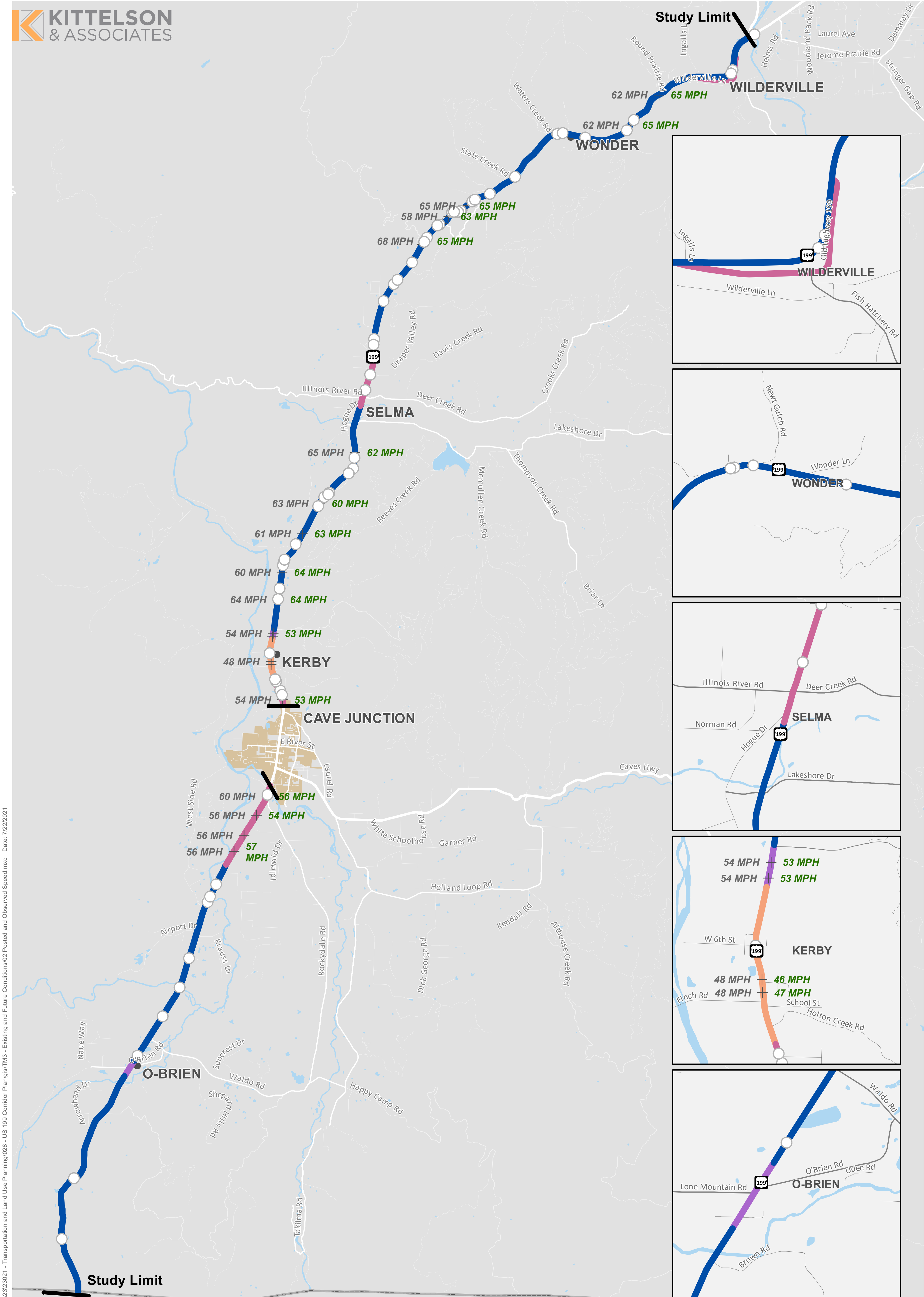
Speed studies indicate that many motorists are driving at speeds higher than the posted speed limit. Figure 2 provides the posted speed limits and observed 85th percentile speeds where data was available along the corridor. The 85th percentile speed is higher than the speed limit for most study locations along the corridor, often five to ten miles per hour (mph) above the posted speed.

Table 3 presents the percent of crashes tagged for excessive speed, which may involve driving over the posted speed or speed too fast for conditions, for each severity level. In total, 18 percent of all crashes and 15 percent of fatal and severe crashes were tagged for excessive speed. The data is based on crash reports and may under estimate speed-involved crashes. The crashes tagged for speed are also shown in Figure 2.

Excessive speed contributed to 18% of all reported crashes and 15% of fatal and severe crashes.

Table 3: Excessive Speed Involved Crashes

	Fatal + Injury A Crashes	Total Crashes	Percent of Fatal + Injury A Crashes	Percent of Total Crashes
Not Tagged for Excessive Speed	46	354	85.2%	82.3%
Tagged for Excessive Speed	8	76	14.8%	17.7%
Total	**54**	**430**	**100%**	**100%**



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

Posted Speed Limit

- 40 MPH
- 45 MPH
- 50 MPH
- 55 MPH

+ Observed 85th Percentile Speeds

○ Speed Involved Crashes

Figure 2

Posted and Observed Speeds and Speed Involved Crashes
U.S. Route199, Josephine County, Oregon

Alcohol Or Drug Involved Crashes

Table 4 presents the percent of drug or alcohol involved crashes by severity. Over 35 percent of fatal and severe crashes involved alcohol or drugs, which is almost three times that of overall crashes involving alcohol or drugs. Over 32 percent of crashes involving alcohol or drugs resulted in a fatal or severe injury, compared to nine percent of crashes not involving alcohol or drugs.

Over 35% of fatal and severe crashes involved alcohol or drugs.

Table 4: Alcohol or Drug Involved Crashes

	Fatal + Injury A Crashes	Total Crashes	Percent of Fatal + Injury A Crashes	Percent of Total Crashes
Alcohol or Drugs Not Involved	35	372	64.8%	86.5%
Alcohol or Drugs Involved	19	58	35.2%	13.5%
Total	**54**	**430**	**100%**	**100%**

Pedestrian and Bicyclist Crashes

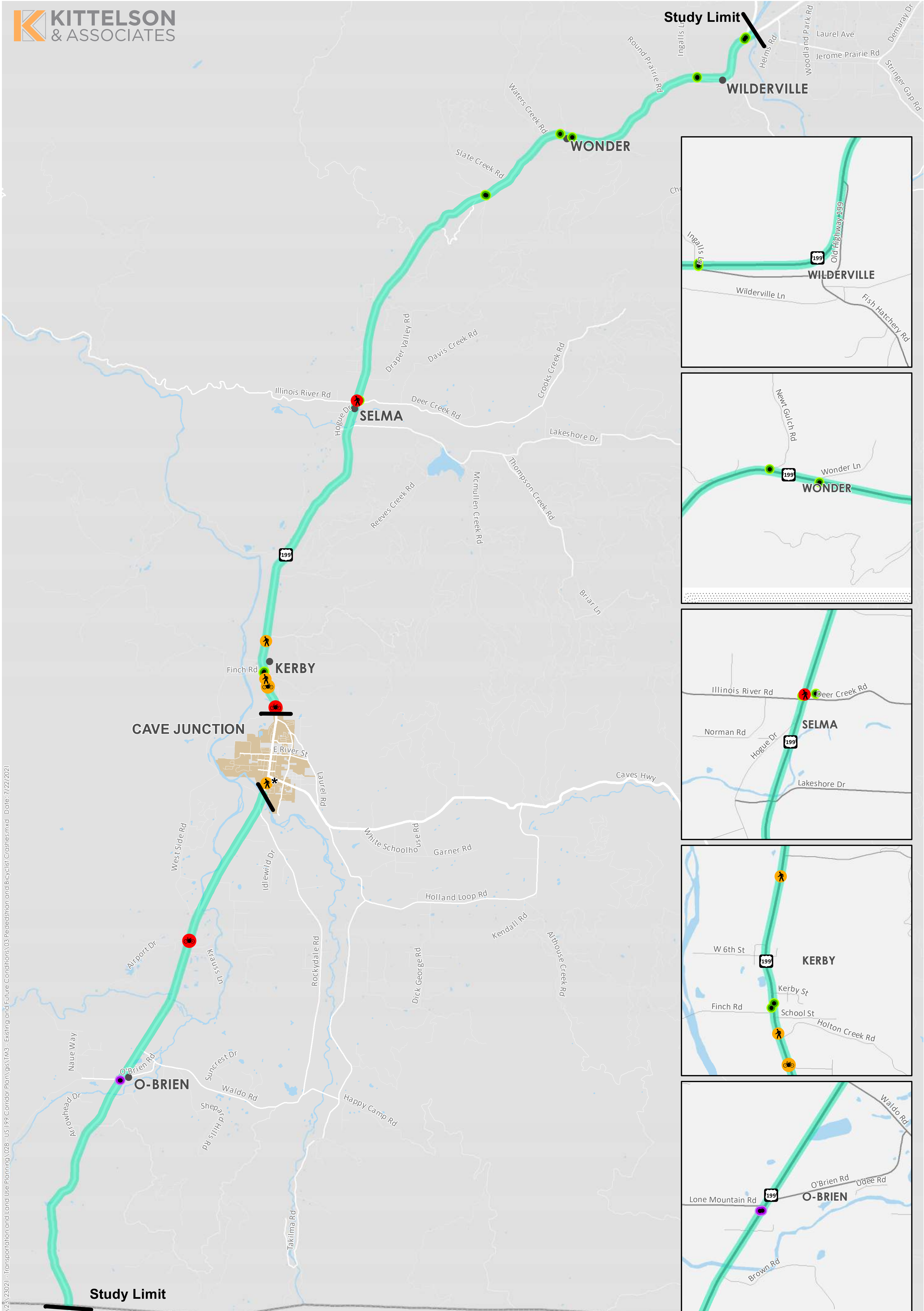
Table 5 presents the number of pedestrian and bicyclist crashes by severity. There were five reported pedestrian crashes and two reported bicyclist crashes. One of the pedestrian crashes involved two pedestrians, one of which was killed and the other of which was severely injured. All reported pedestrian and bicyclist crashes resulted in an injury, and 80 percent of the pedestrian crashes and 50 percent of the bicyclist crashes resulted in a fatal or severe injury. Although pedestrian and bicyclist crashes account for less than two percent of overall crashes on the corridor, they represent over nine percent of fatal and severe crashes in the corridor.

Pedestrian and bicyclist crashes account for less than two percent of overall crashes but represent over 9% of fatal and severe crashes.

Many of these crashes occurred in towns or transition zones to towns, particularly Kerby and the transition area adjacent to Cave Junction. Figure 3 provides the locations of the crashes along the corridor.

Table 5: Pedestrian and Bicycle Crashes by Severity

	Fatal	Injury A	Injury B	Injury C	PDO	Total
Total Pedestrian Crashes	2	2	1	0	0	5
Total Bicyclists Crashes	1	0	1	0	0	2
Total	**3**	**2**	**2**	**0**	**0**	**7**



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

- Fatal Crash Ped Involved
- Fatal Crash Bike Involved
- Injury Crash Bike Involved
- Injury Crash Ped Involved

Transit Stops

- Josephine Community Transit
- SouthWest POINT
- Study Corridor

*Pedestrian crash in unincorporated Josephine County

0 2.1 Miles

Figure 3

Pedestrian and Bicyclist Crashes
U.S. Route199, Josephine County, Oregon

Resident and Non-Resident Crashes

Crashes in the study corridor involve a mix of local residents and non-residents. Understanding whether a driver involved in a crash is local to the area or is a visitor helps inform outreach and education efforts. Based on ODOT crash reports, local residents are defined as those living in Oregon and within 25 miles of the site of the crash. Fifty-two percent of crashes involved at least one local resident, and 67 percent of crashes involved at least one non-local resident. When considering fatal and severe crashes only, 75 percent of crashes involved at least one local resident. For all crashes that involved at least one local resident, eighteen percent resulted in a fatal or severe injury. Table 6 presents the crashes by local resident status.

Local residents were involved with 52% of reported crashes and 75% fatal and severe crashes.

Table 6: Crashes by Local Resident Status

	Fatal + Injury A Crashes	Total Crashes
Local Resident(s) Only	25 (46.3%)	139 (32.3%)
One Local Resident	16 (29.6%	83 (19.3%)
No Local Residents	13 (24.1%)	208 (48.4%)
Total	**54 (100%)**	**430 (100%)**

Crashes by Location

Although crashes are fairly distributed along the corridor, there are several locations with greater number of crashes compared to the rest of the corridor. As shown on Chart 4, two locations along the corridor had greater than 10 crashes:

- 11 crashes were reported near the US 199/OR 260 (Riverbanks Road) intersection (around MP 7.09), including four severe injury crashes, as shown in Chart 5. This location is a three-legged intersection with stop control on the minor street. Many of the crashes involved left turns onto or off of the minor street.
- 11 crashes were reported at the horizontal and vertical curve near MP 15.00: 6 were fixed-object crashes and 7 crashes occurred on non-dry road surface conditions.

As shown in Chart 5, several locations also exhibited multiple fatal or severe injury crashes:

- 2 severe injury crashes were reported near the intersection with Old Redwood Highway/Hayes Hill Road (around MP 16);
- 2 severe injury crashes were reported just south of the intersection with Briggs Valley Road (around MP 16.5); and
- 1 fatal and 1 severe injury crash were reported along the curve around MP 21.85.

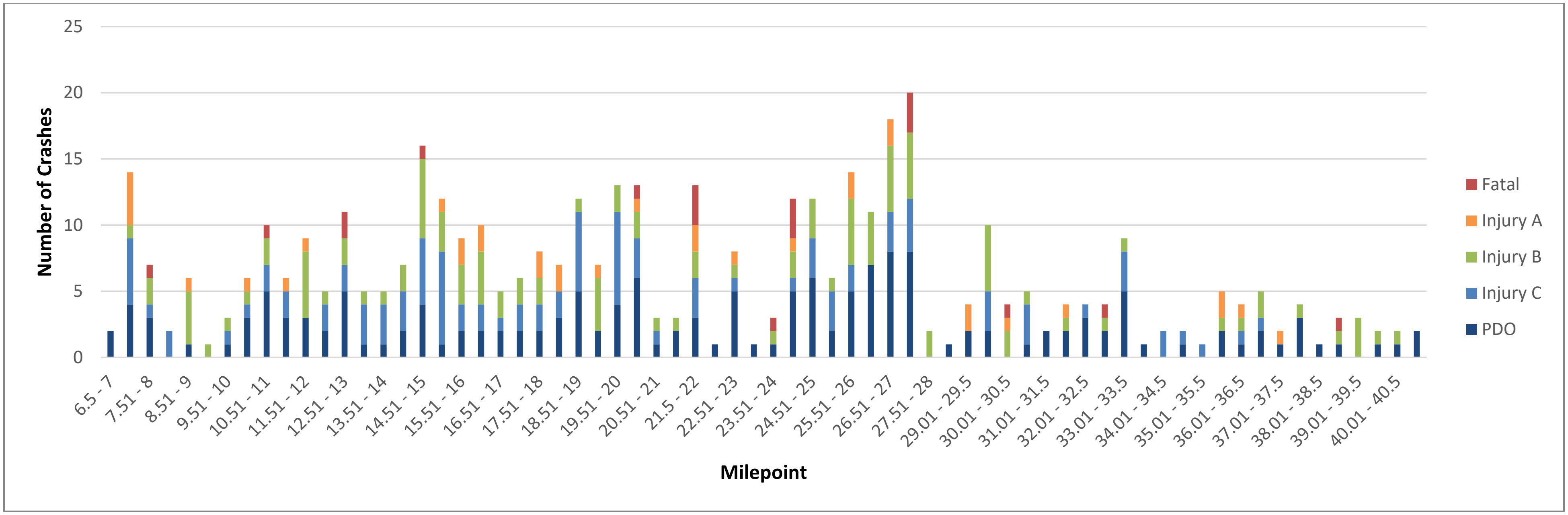


Chart 4: Crashes by Milepoint

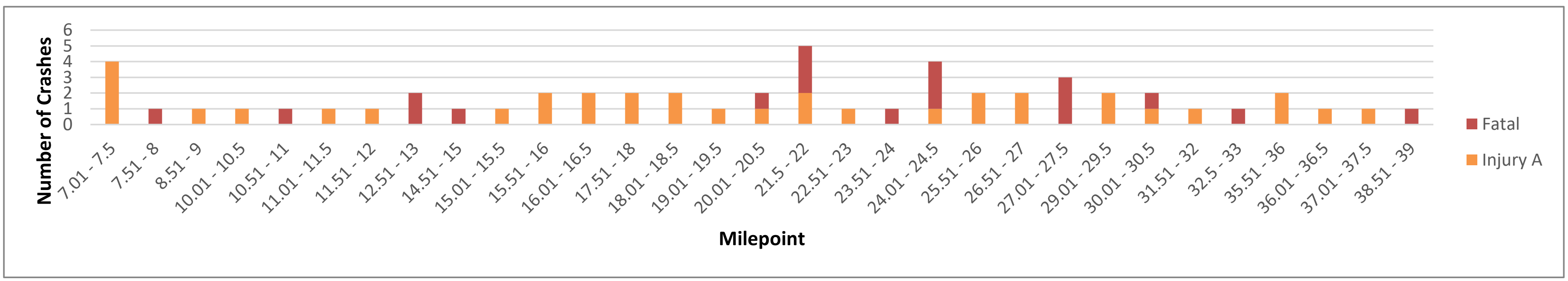


Chart 5: Fatal and Severe Injury Crashes by Milepoint

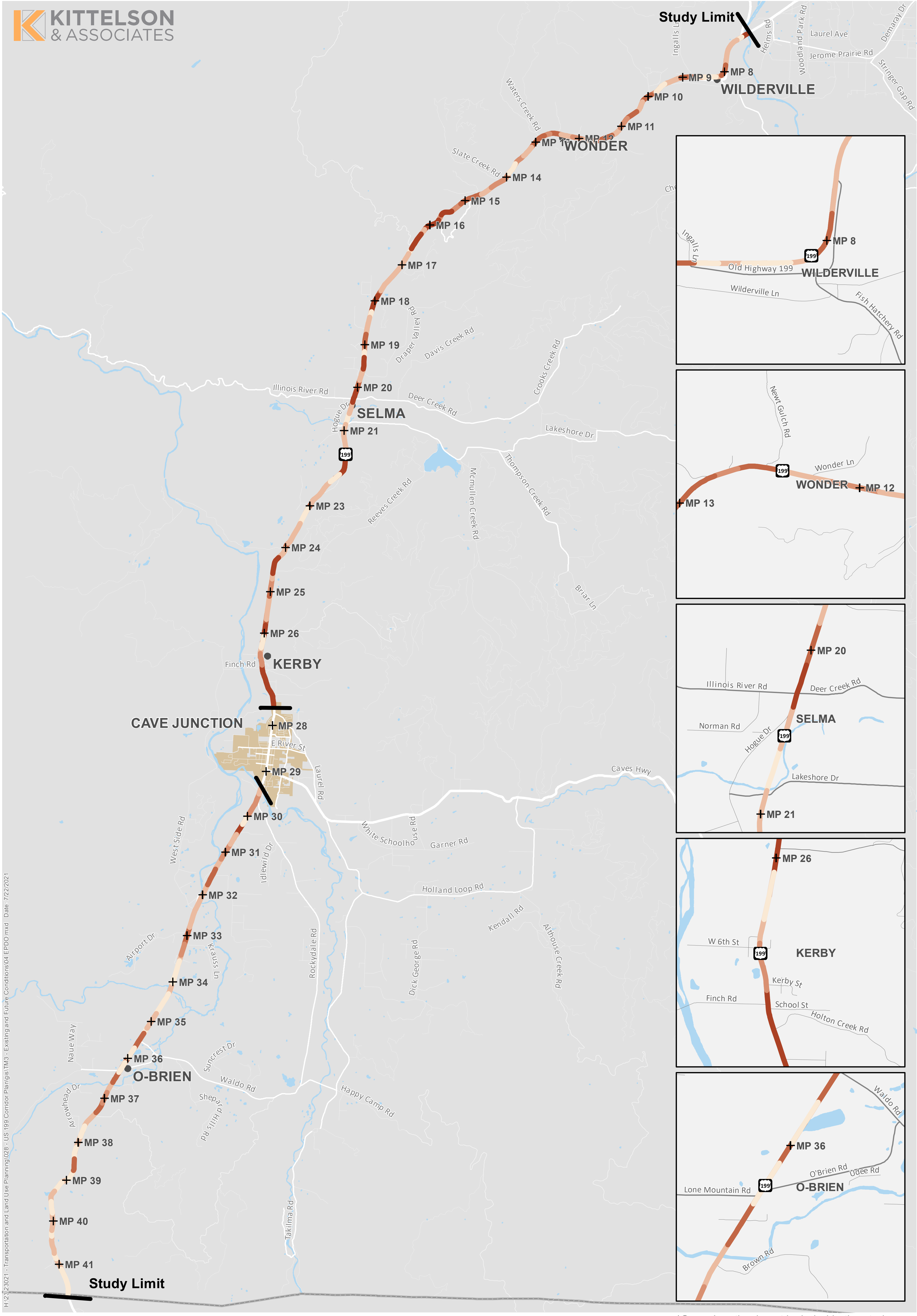
Corridor Screening by Performance Measures

Kittelson performed two screenings of the corridor using performance measures from the *Highway Safety Manual* to identify priority locations. The two performance measures used were Equivalent Property Damage Only (EPDO) scores and Crash Rates. The following sections provide the results of those screenings.

Equivalent Property Damage Only (EPDO) Analysis

An EPDO analysis assigns each location a score based on the crash frequency and severity at that location. More severe crashes are given higher weights than less severe crashes. More details about EPDO screening methodology are included in Attachment B. The EPDO analysis results shown in Figure 4 reveal the northern section of corridor, north of Cave Junction, generally has higher EPDO scores than the section of corridor south of Cave Junction. Other locations with higher EPDO scores include tight curves, locations near passing lanes, and transition zones in/out of towns, particularly Kerby, Cave Junction, Selma, and O'Brien.

The corridor section north of Cave Junction has higher EPDO scores than the southern section.



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

EPDO Results + Milepost

- Lowest 20%
- Fourth 20%
- Middle 20%
- Second 20%
- Top 20%

0 3 Miles

Figure 4

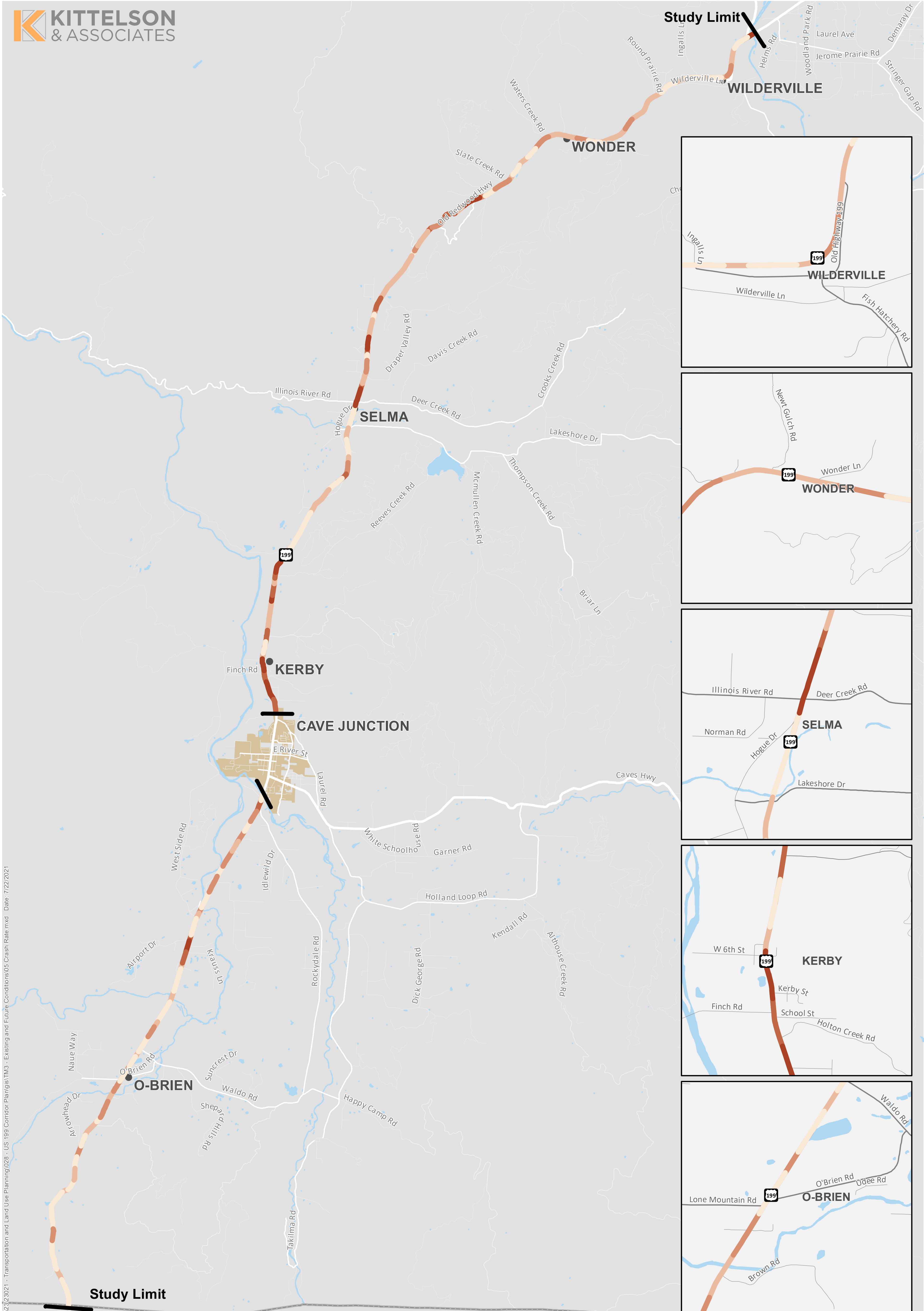
Equivalent Property Damage Only (EPDO) Analysis Results
U.S. Route 199, Josephine County, Oregon

Crash Rate Analysis

The crash rate analysis normalizes the number of crashes based on exposure to traffic (the traffic volume). By considering the crash rate, the team can identify areas with a higher number of crashes in comparison to the number of users. The detailed methodology for the crash rate analysis is presented in Attachment B.

The results of this analysis present similar trends to the EPDO analysis. However, this analysis reveals that crash rates in several segments south of Cave Junction are in the top 20 percent of segments in the study area due to the lower traffic volumes, as shown in Figure 5. Similar to the EPDO results, the screening shows that tighter curves, especially those near Old Redwood Highway, segments near passing lanes, towns, and transition zones have higher crash rates. Given that these locations are identified through both the EPDO and crash rate screening, segments with these characteristics are likely to continue experiencing a high number of crashes and high number of more severe crashes.

Higher crash rates occur at locations with tighter curves, segments near passing lanes, transitions to towns, and towns.



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

Crash Rate

- Lowest 20%
- Fourth 205
- Middle 20%
- Second 20%
- Top 20%

0 3 Miles

Figure 5

Crash Rate Analysis Results
U.S. Route 199, Josephine County, Oregon

Roadway Characteristics and Safety Performance

The team evaluated the three most common crash types among fatal and severe injury crashes (fixed-object, head-on, and turning movement crashes) against the corridor's roadway characteristics to identify potential contributing factors. Through this analysis, the team identified several roadway characteristics associated with fatal and severe crashes, including:

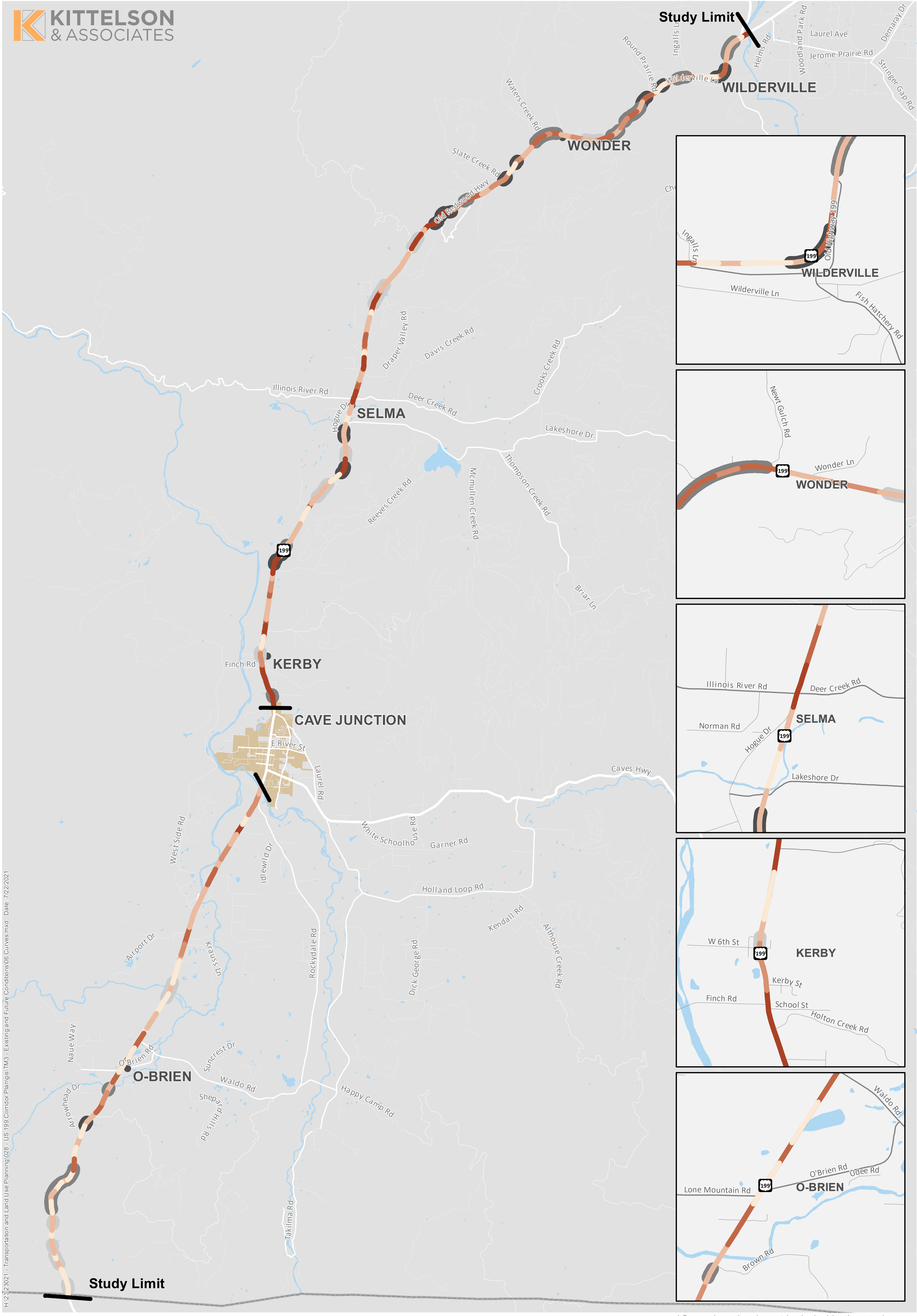
- Tight curves
- Passing lanes and the transition in/out of them
- Narrow roadway shoulder widths
- Intersections and access points

Curves

This corridor traverses through sections of mountains and hills and has many sections of horizontal and vertical curves. Key locations in the study corridor, including Hayes Hill to Wonder and Wilderville as well as Sisses Gap (Hogue Drive to Reeves Creek Road), have tight horizontal curves. The project team used a geospatial tool to estimate and visualize curve radii throughout the corridor. Figure 6 presents curve radii and EPDO scores along the corridor. By overlaying this with EPDO screening results, the team made the following observations:

- Many of the locations with tighter curve radii have higher numbers and severity of crashes, compared to curves with larger radii.
- Crashes were reported at entrances and exits of curves, and many of these crashes involve a motorist that has exited their lane (predominantly fixed object crashes).
- Segments of short, tight curves after a long straight roadway segment display patterns of higher crash frequency. Drivers may be able to pick up speed on the straight segments.

KITTELSON & ASSOCIATES



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

Curve Radius

- Tightest 33% Curve Radius
- Middle 33% Curve Radius
- Largest 33% Curve Radius

EPDO Results

- Lowest 20%
- Fourth 20%
- Middle 20%
- Second 20%
- Top 20%

0 3 Miles

Figure 6

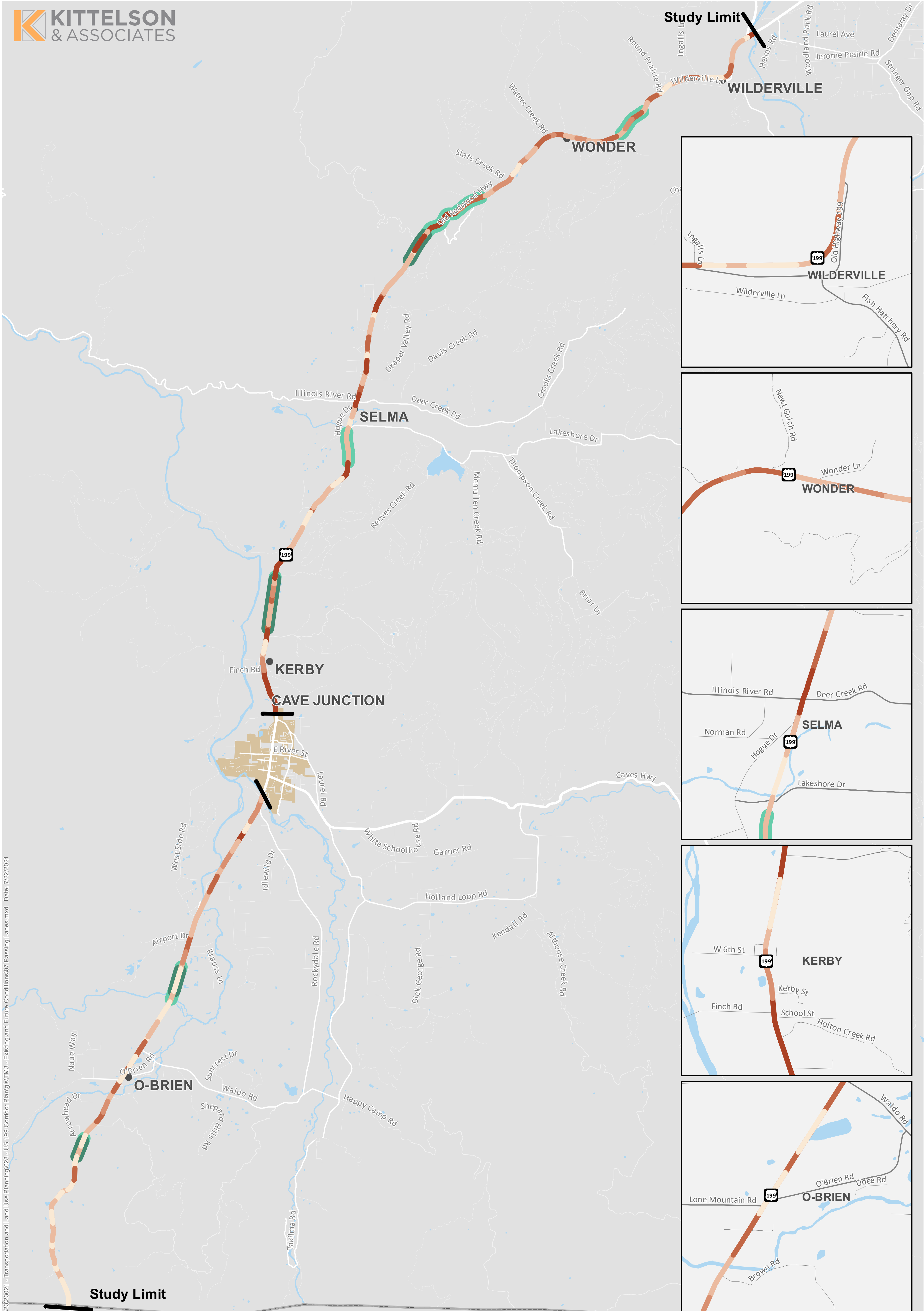
Curve Radius and EPDO Results
U.S. Route 199, Josephine County, Oregon

Passing Lanes

US 199 is a two-lane roadway with sections of 3-lanes and 4-lanes where passing lanes are located. Figure 7 presents the number of lanes and EPDO results for the corridor. As shown on the figure, several of the passing lanes or transitions in/out of passing lanes overlap with high EPDO scores, indicating severe crashes. In addition, several of the passing lanes are located within areas of tight curves and on tangent sections adjacent to tight curves.

Many of the head-on crashes occurred at or near the beginning or ending of a passing lane.

Head-on crashes made up 18.5 percent of all fatal and severe injury crashes, and many of the head-on crashes occurred at or near the beginning or end of passing lanes, as shown in Figure 8.



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

Number of Lanes

- Three Lanes
- Four Lanes

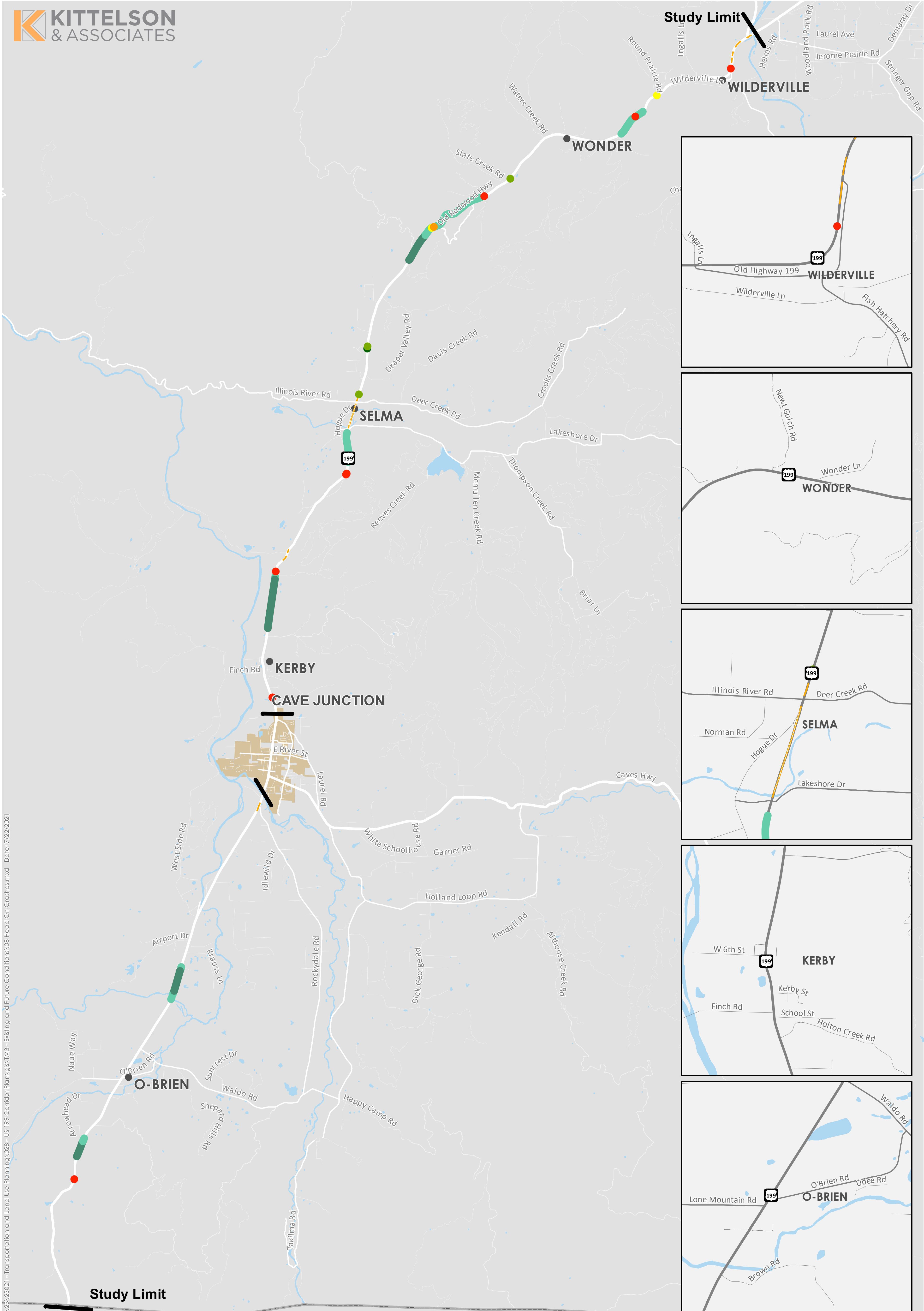
EPDO Results

- Lowest 20%
- Fourth 20%
- Middle 20%
- Second 20%
- Top 20%

0 3 Miles

Figure 7

Passing Lanes and EPDO Results
U.S. Route 199, Josephine County, Oregon



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

Head-On Crashes

- PDO
- Injury C
- Injury B
- Injury A
- Fatal

Medians

- Painted Median
- Painted Center Turn Lane

Number of Lanes

- Three Lanes
- Four Lanes

0 2.1 Miles

Figure 8

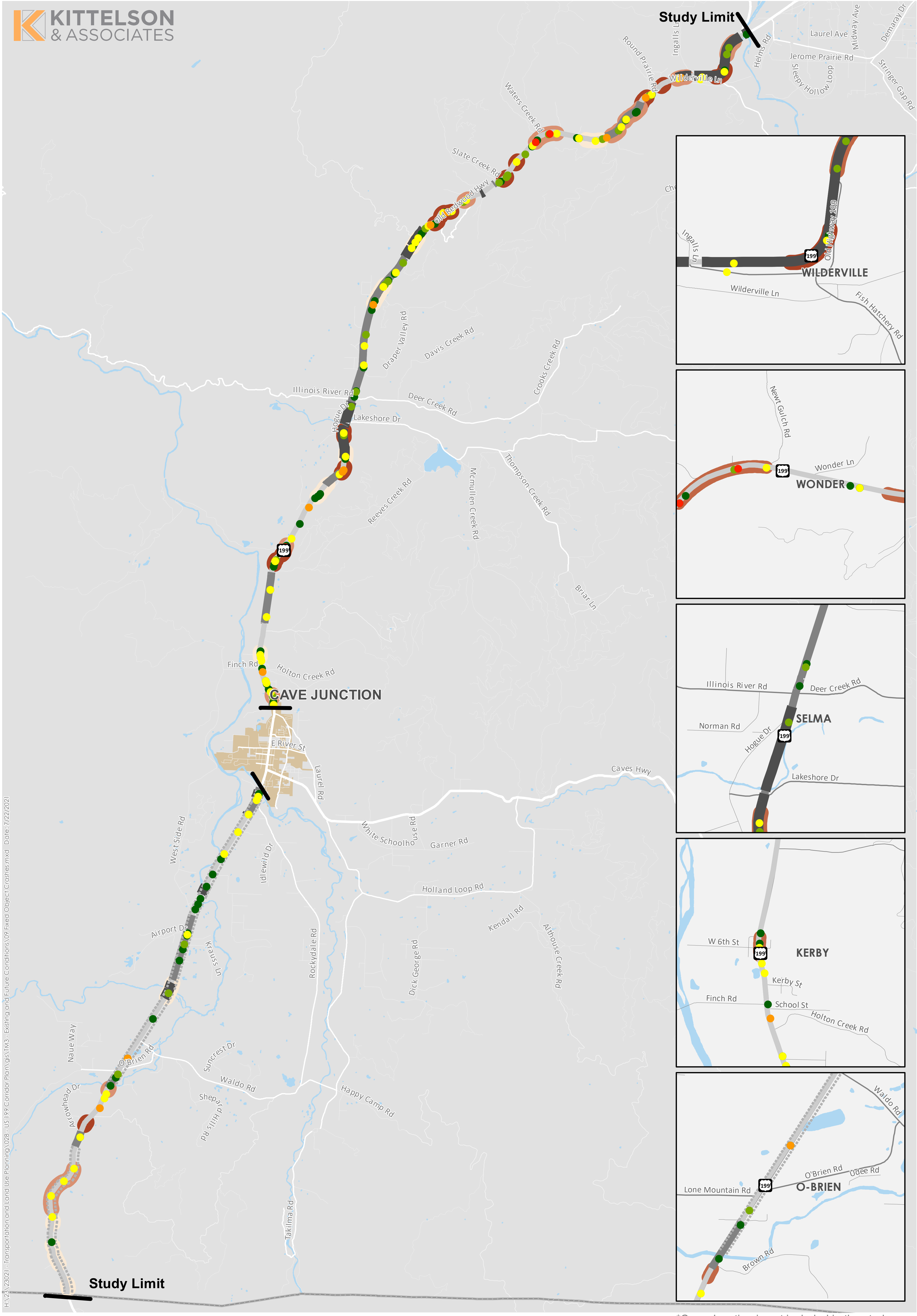
Head-On Crashes and Passing Lanes
U.S. Route199, Josephine County, Oregon

Roadway Shoulder Widths

Fixed object crashes were the most common collision type reported within the corridor. Fixed object crashes occur when a motorist departs their lane and strikes an object. The team evaluated fixed object crashes against roadway shoulder widths to understand potential correlations between the shoulder width and presence of fixed object crashes.

Figure 9 presents the fixed object crashes by severity along with shoulder widths and curve radii for the corridor. As shown on the figure, many of the fixed object crashes occurred in sections with two- to four-foot-wide shoulders and tight curves. These are locations with limited recovery area for drivers.

Many of the fixed-object crashes occurred in sections with two to four foot wide shoulders and tight curves.



*Cave Junction is not included in the study area
Data Source: Josephine County, Oregon Department of Transportation

Fixed Object Crashes
- PDO
- Injury C
- Injury B
- Injury A
- Fatal

Curve
- Tightest 33% Curve Radius
- Middle 33% Curve Radius
- Largest 33% Curve Radius

Gravel Shoulder Width
- 2 Ft

Pave Shoulder Width
- 2-4 Ft Shoulder
- 5-6 Ft Shoulder
- > 6 Ft Shoulder

0 — 2.1 Miles

Figure 9

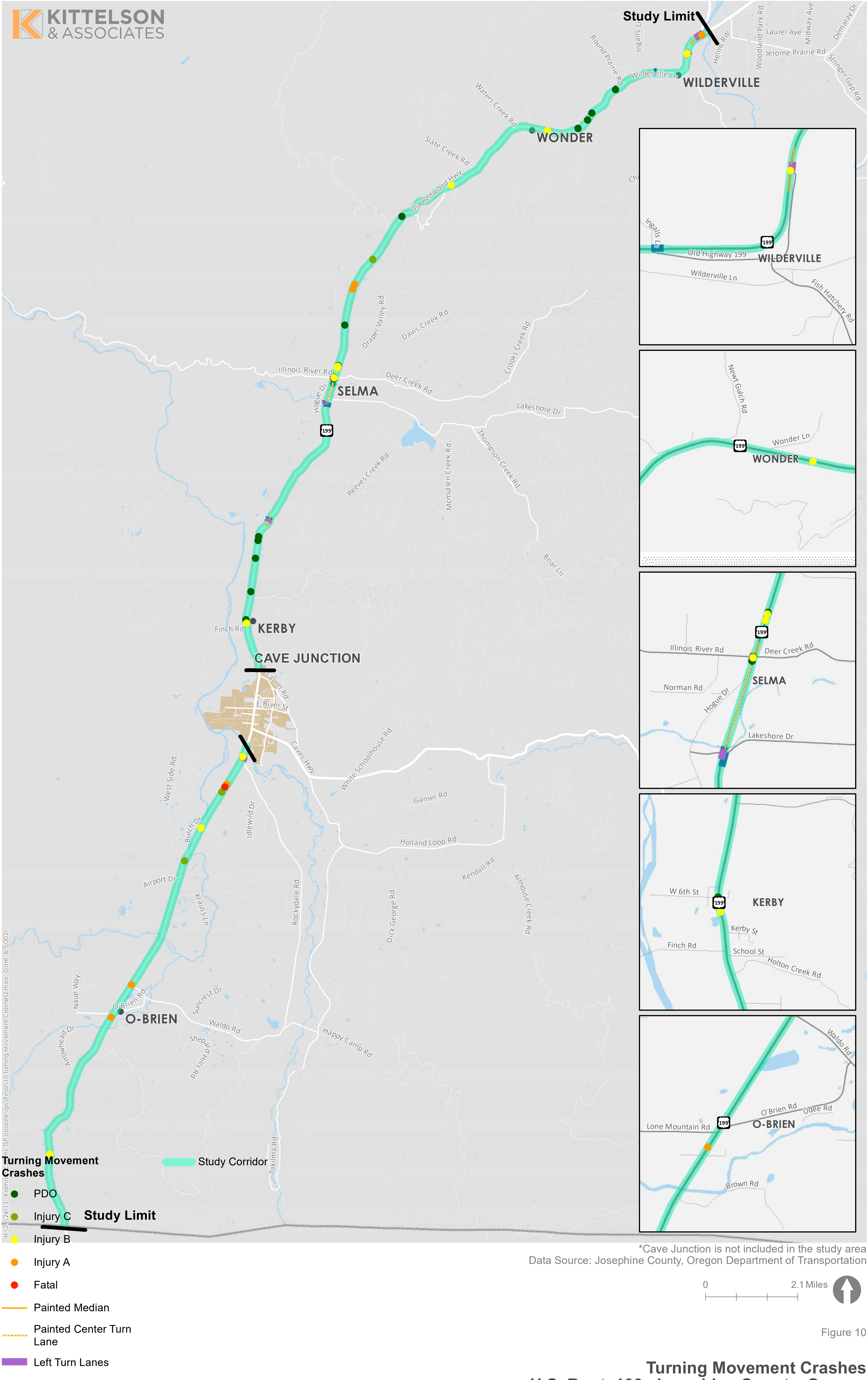
Fixed-Object Crashes by Severity
U.S. Route199, Josephine County, Oregon

Intersections and Access Points

Because turning movement crashes involve a turning vehicle, they often occur at intersections or driveways. The US 199 corridor serves as a Regional Highway and freight route, moving traffic through the area, and it also provides direct access to many properties. The concentration of driveways and intersections is highest in urban areas. However, the posted speed limit is higher in rural areas where driveways may be unexpected.

Figure 10 shows the locations of turning movement crashes along with locations of medians and turn lanes along the corridor. Many of the turning movement crashes are located at intersections or driveways without a dedicated turn lane. In addition, many of the turning movement crashes are located at driveways or minor intersections along the corridor.

Many of the turning movement crashes are located at driveways or minor intersections along the corridor.



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

Figure 10

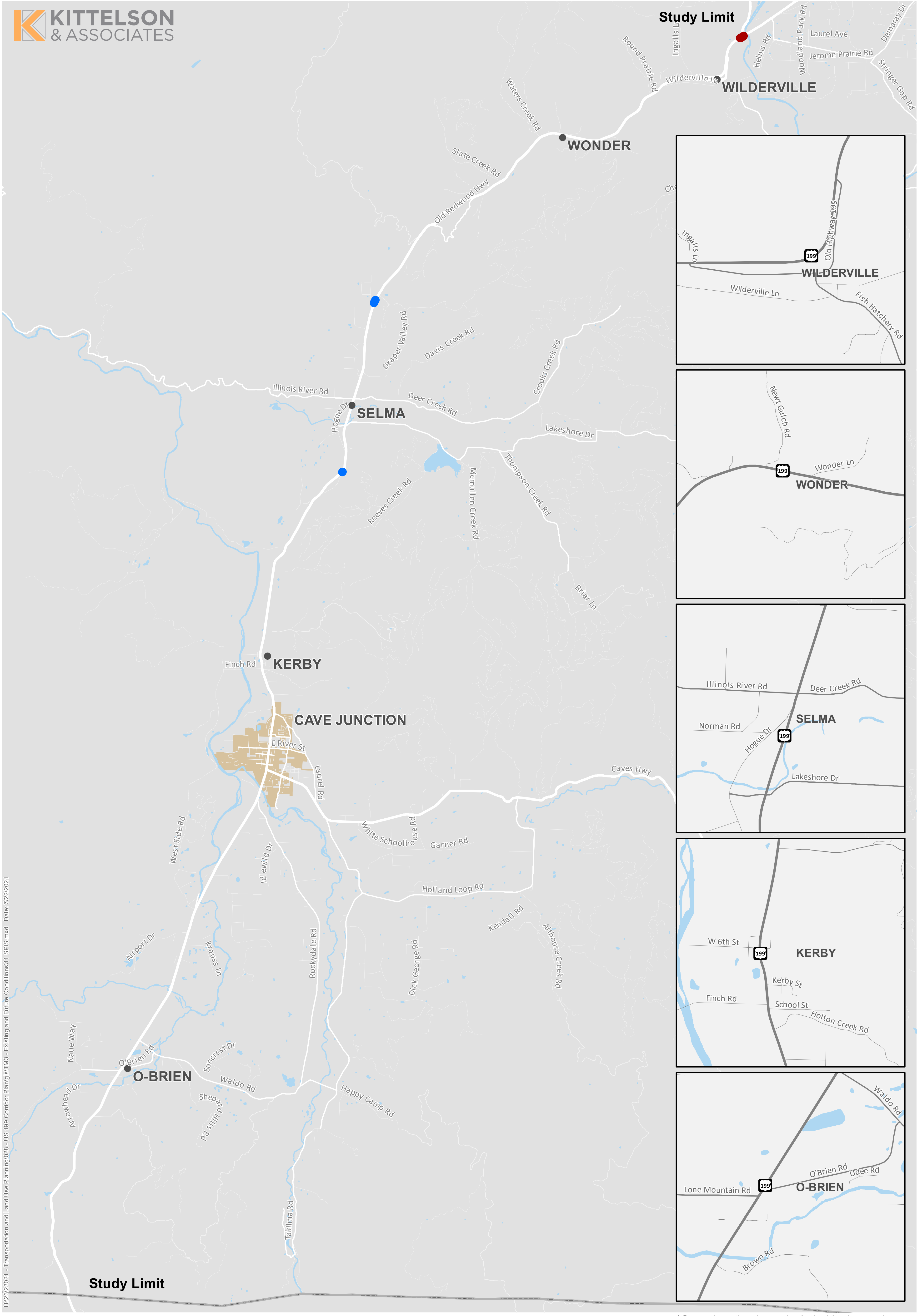
Turning Movement Crashes
U.S. Route199, Josephine County, Oregon

Safety Priority Index System

The ODOT Statewide Priority Index System (SPIS) identifies sites along state highways with safety issues. The SPIS is a network screening developed by ODOT for identifying locations on state highways through consideration of crash frequency, crash severity, and traffic volume. Kittelson identified which locations along the study corridor were reported within ODOT's Top 5% and Top 10% SPIS locations in three most recent SPIS cycles (2017-2019).

Figure 11 presents the locations along the study corridor that are within top 5% and top 10% SPIS sites:

- Milepoint 7.1 (US 199/OR 260),
- Milepoint 18 (US 199/Circle W Drive),
- Milepoint 20.18 (US 199/Illinois River Road in Selma), and
- Milepoint 21.9 (just north of the intersection of US 199/Wild Park Lane).



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation, Oregon Department of Transportation

- 95-100 Percentile SPIS Site
- 90-95 Percentile SPIS Site

0 3 Miles

Figure 11

Safety Priority Index System (SPIS) Sites
U.S. Route 199, Josephine County, Oregon

Multi-Modal Analysis

The multi-modal analysis identifies existing and future needs of people walking and biking within the study corridor based on both safety risk and quality of service of current facilities.

Statewide Bicycle and Pedestrian Safety Risk Assessment

The statewide bicycle and pedestrian safety risk assessment focuses on the safety of people walking, rolling, and biking in the study corridor and their risk of being involved in crashes. The State of Oregon identifies these seven factors to assess safety risk of rural roadways, and all seven apply to the study corridor:

- Roadway Classification
- Number of Lanes
- Posted Speed
- Zoning
- Proximity to Schools
- Proximity to Transit Stops
- Population over Age 64

The corridor has a number of characteristics that create safety risks for pedestrians and bicyclists.

Characteristics of the study corridor that create the greatest safety risks to pedestrians are its high-order functional classification, posted speeds, and periodic four-lane sections; the greatest safety risk to bicyclists is also the study corridor's high-order functional classification.

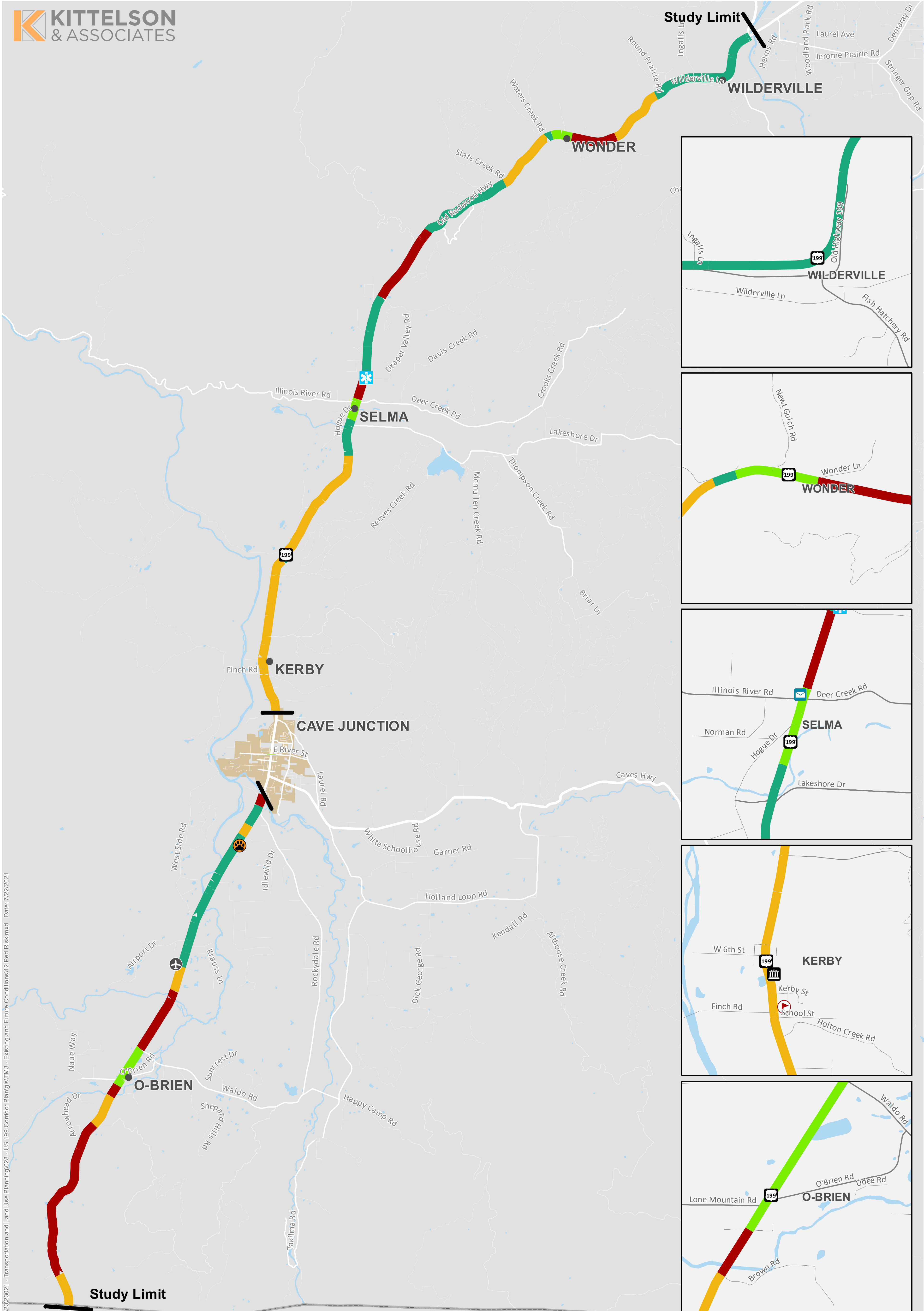
Figure 12 and Figure 13 show the varying levels of safety risk for pedestrians and bicyclists in the study corridor. Pedestrians experience the highest safety risk near the following locations due to their respective corridor characteristics:

- Wonder: roadway classification, speed limit, zoning, and proximity to transit stops
- South of Hayes Hill summit: roadway classification, number of lanes, speed limit, and zoning
- North of Selma: roadway classification, speed limit, zoning, and proximity to transit stops
- North of O'Brien: roadway classification, number of lanes, speed limit, and zoning
- South of O'Brien to the California Border: roadway classification, number of lanes, speed limit, and zoning

For bicyclists, safety risk is relatively high and consistent throughout the study corridor because of its high-order classification, posted speed, and population over age 64. The highest safety risk is present in Kerby due to these reasons, as well as proximity to schools and transit stops.

The highest bicyclist safety risk is in Kerby.

More detail from the Statewide Bicycle and Pedestrian Safety Risk Assessment is provided in Attachment C.



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

State Ped Risk Factor Score

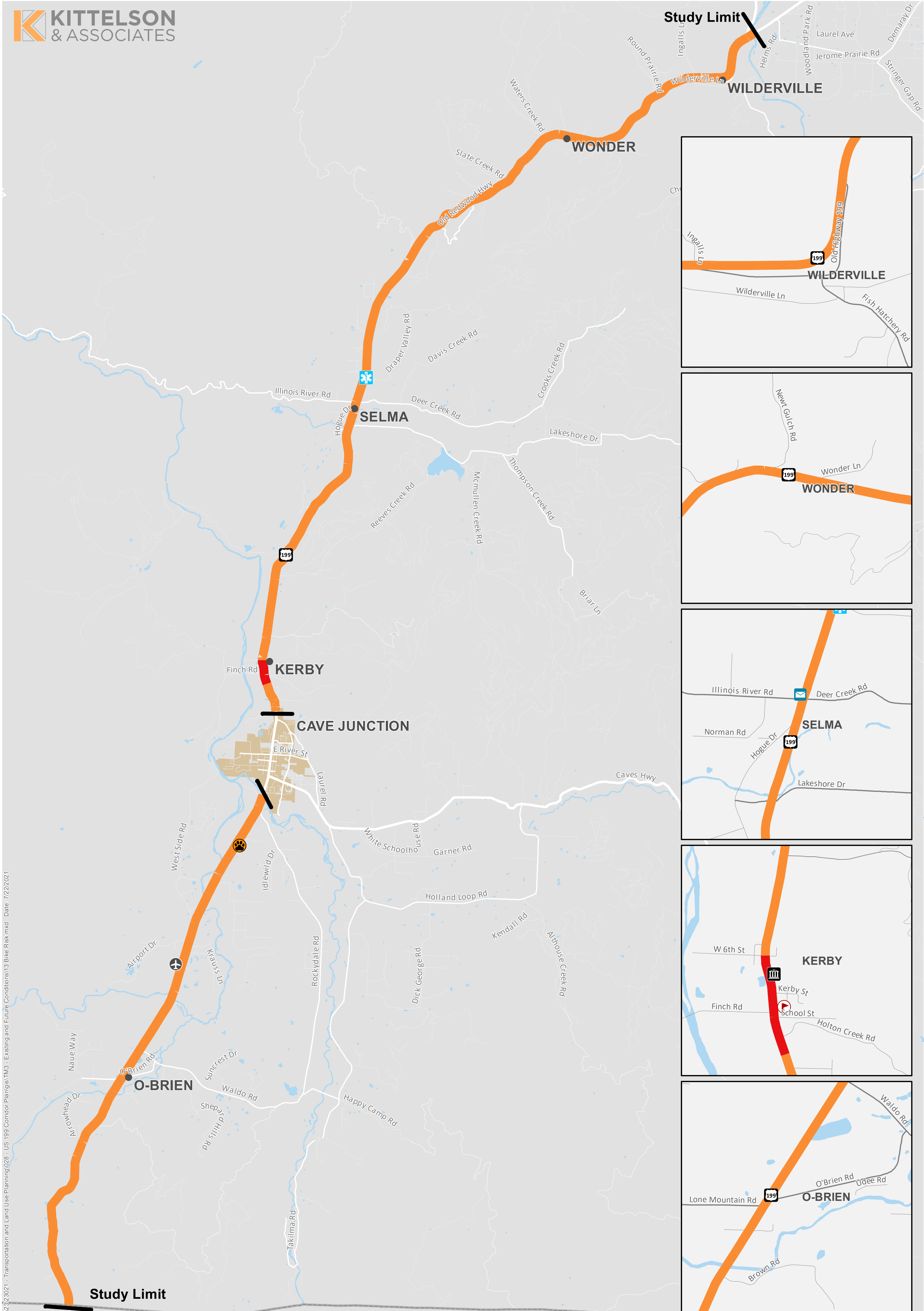
- Top 20%
- Second 20%
- Third 20%
- Fourth 20%
- Lowest 20%

- Airport
- Community College
- Great Cats World Park
- Hospital
- Library
- Medical Clinic
- Museum
- Post Office

0 3 Miles

Figure 12

Pedestrian Risk Scoring
U.S. Route199, Josephine County, Oregon



*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

Bike Risk Factor Score

- Top 20%
- Second 20%
- Third 20%
- Fourth 20%
- Lowest 20%

- Airport
- Community College
- Great Cats World Park
- Hospital
- Library
- Medical Clinic
- Museum
- Post Office

0 3 Miles

Figure 13

Bicycle Risk Scoring
U.S. Route199, Josephine County, Oregon

Quality of Service

Quality of service in the multi-modal analysis pertains to the study corridor's level of comfort and available facilities for people walking, rolling, and biking. The quality of service evaluation focuses on stress levels for bicyclists within the study corridor as well as on facilities that serve people walking and taking transit. More detail from the Quality of Service evaluation is provided in Attachment C.

Bicycle Level of Traffic Stress

Bicycle facilities along the study corridor were evaluated using ODOT's Bicycle Level of Traffic Stress (BLTS) methodology to identify locations with highest stress for cyclists. BLTS determines four levels of traffic stress that a bicyclist can experience on rural roadways based on these factors:

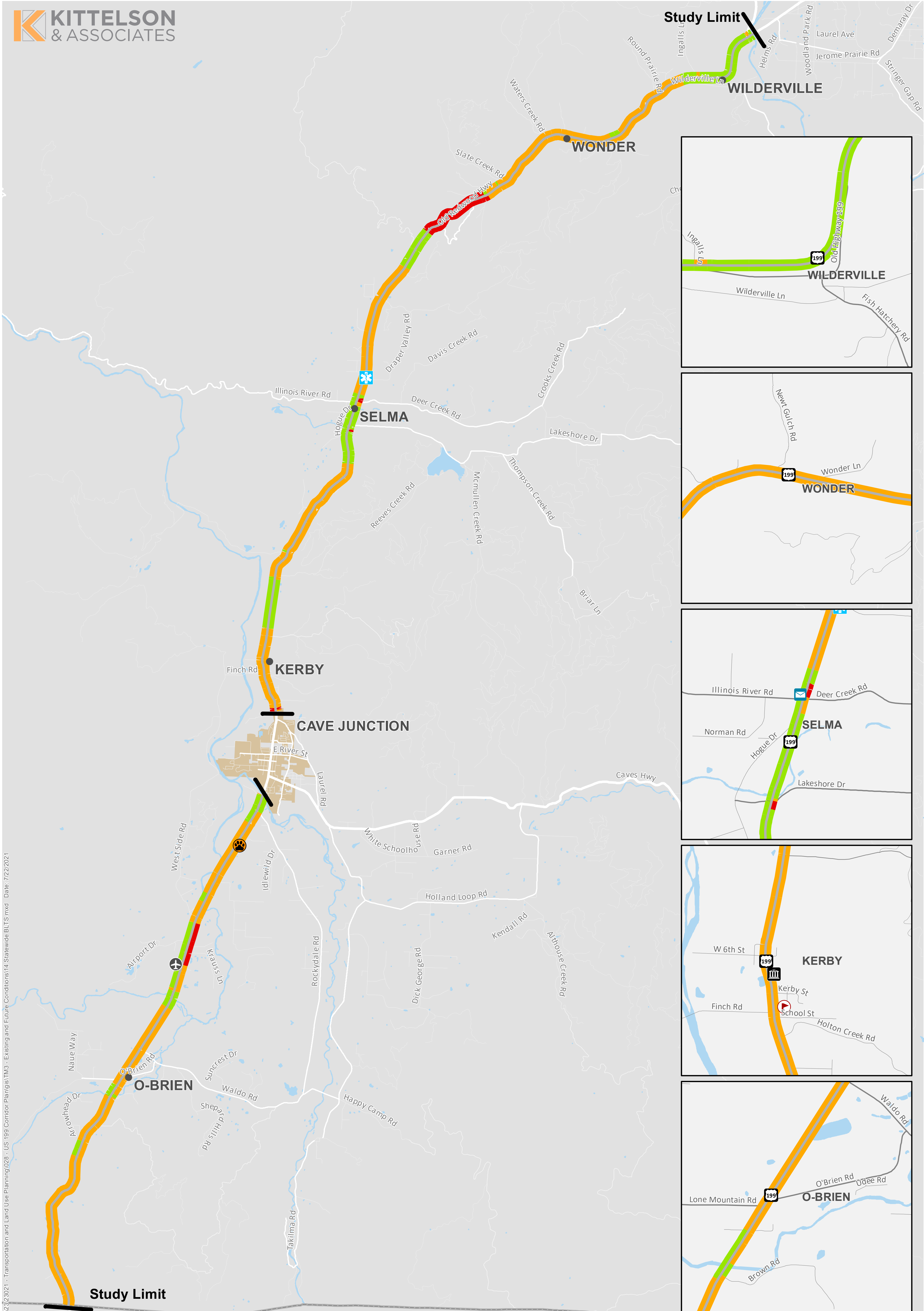
- Roadway speed
- Daily vehicle volume
- Paved shoulder widths

A BLTS 1 rating reflects little traffic stress (suitable for all cyclists, including children) and a BLTS 4 rating represents high traffic stress (perceived as unsafe by most adults).

Figure 14 illustrates the BLTS ratings throughout the study corridor. Observations include:

- No segments of the study corridor have a BLTS 1 rating (i.e., not suitable for all cyclists, especially children).
- Much of the study corridor is rated BLTS 3 (i.e., moderate stress/suitable for most observant adult cyclists) with sections of BLTS 2 (i.e., little traffic stress/suitable for teen and adult cyclists with adequate bike handling skills) and BLTS 4.
- Locations of highest stress for bicyclists (BLTS 4) include:
    - Hayes Hill
    - Two short sections in Selma
    - A section just north of Cave Junction
    - The section north of the Illinois Valley Airport.

These ratings also reflect the study corridor's future conditions, which are not expected to improve as traffic volumes increase and if no transportation improvements occur that relate to the three criteria above.



BLTS 2	Airport	Library
BLTS 3	Community College	Medical Clinic
BLTS 4	Great Cats World Park	Museum
Study Corridor	Hospital	Post Office

*Cave Junction is not included in the study area

Data Source: Josephine County, Oregon Department of Transportation

0 3 Miles

Figure 14

Bicycle Level of Traffic Stress
U.S. Route199, Josephine County, Oregon

Qualitative Multimodal Assessment

ODOT's Qualitative Multimodal Assessment (QMA) methodology evaluates multimodal facilities and services for people walking and taking transit in rural environments to identify areas where improvements might be needed for these users. The QMA applies subjective ratings (e.g., Excellent, Good, Fair, Poor) to the study corridor based on its facilities and services.

Pedestrian Assessment

The following six criteria are used to assess the quality of facilities for people walking and rolling. Kittelson applied the criteria relevant to the study corridor; the last three listed are not relevant given the study corridor's primarily rural context:

- Outside travel lane width
- Bicycle lane/shoulder width
- Number of travel lanes
- Posted speed
- Traffic volumes
- Presence of buffers (landscaped or other)
- Sidewalk/path presence and width
- Lighting

The pedestrian multimodal facilities and services for people walking and taking transit is rated Fair to Poor.

Under existing conditions, the study corridor generally demonstrates these characteristics and results in the following pedestrian QMA ratings:

- **Applegate River to Cave Junction UGB: *Poor***
  - 12-foot outside lane widths
  - 4-foot shoulder widths
  - 2 travel lanes (except when passing lanes are present)
  - 55 mile-per-hour (mph) posted speed
  - Greater than 7,000 ADT
- **Cave Junction UGB to California Border: *Fair***
  - 12-foot outside lane widths
  - 4-foot shoulder widths
  - 2 travel lanes (except when passing lanes are present)
  - 55 mph posted speed
  - 2,000 to 7,000 ADT

The study corridor is divided into two sections due to the difference in traffic volumes north and south of Cave Junction. These ratings also reflect the study corridor's future conditions, which are not expected to improve as traffic volumes increase and if no transportation improvements occur that relate to the criteria listed above.

Transit Assessment

The following four criteria are used to assess the quality of facilities and services for people taking transit. Kittelson applied all of them for this evaluation:

- Frequency and on-time reliability
- Schedule speed/travel times
- Transit stop amenities
- Connecting pedestrian/bicycle network

The transit facilities and services along the corridor are rated Fair.

Route 50 for Josephine Community Transit (JCT) provides the following services and facilities to the study corridor:

- Peak hour morning, mid-day, and evening loop service between Grants Pass, Cave Junction, and destinations in between.
- Three loops during the AM peak and two loops during mid-day and the PM peak.
- AM and PM peak loops run one-hour headways while the mid-day loops run longer than one-hour headways.
- Bus stops are located in Wonder, Selma, and Kerby. No stops are marked with bus stop signs.

Southwest POINT provides mid-day loop service between Brookings and Cave Junction. There is one eastbound bus and one westbound bus, both stopping in O'Brien at a stop with a marked sign but no other amenities.

Based on these services and facilities, the transit QMA rating for the entire study corridor is *Fair*. This rating also reflects the study corridor's future conditions if no transit facility and service improvements occur that reflect the criteria listed above. Transit facility improvements, as they relate to this project, could include transit stop amenities and pedestrian and bicycle connections to transit stops.

Summary of Needs

This section summarizes the transportation needs in the study corridor established throughout this memorandum as well as in Tech Memo #2 (Baseline Inventories) and input from the Project Management Team. These needs serve as the basis that the Alternatives Analysis will further explore and address in the next phase of this project. Study corridor needs include:

General Corridor-Wide Findings and Needs:

- Drivers experience high delay when attempting to turn onto US 199 from a side street or driveway.
- The corridor lacks dedicated facilities (wide shoulders, shared-use paths, and/or sidewalks) for people walking and biking in unincorporated communities.
- There are no marked or enhanced pedestrian crossings of US 199 in unincorporated communities.
- Transit stops lack signage, other amenities, and connections for people walking or biking.
- Crash analyses revealed the following general findings:

  - The most common collision types are fixed-object, rear-end, and turning movement crashes.
  - The most common fatal and severe collision types are fixed-object, head-on, and turning movement crashes.
  - Approximately 15 percent of fatal/severe crashes involved excessive speed. Observed speeds indicate vehicles generally travel five to 10 miles per hour (mph) faster than the posted speed limit.
  - Alcohol or drug involved crashes were more likely to result in a fatal or severe injury compared to those not involving alcohol or drugs.
  - Five of the seven pedestrian or bicyclist crashes resulted in fatal or severe injury. Pedestrian and bicyclist crashes accounted for nine percent of all fatal and severe injury crashes.
  - Seventy-five (75) percent of fatal/severe crashes involved at least one local driver (defined as a driver within 25 miles of home).

- A higher incidence of severe crashes is associated with:
  - Tight curves
  - Within and at the beginning/end of passing lanes
  - In locations with narrow shoulder widths
  - At intersections and access points without turn lanes and/or with limited sight distance

Context Zones Identified through Safety Analyses:

- Transition areas into unincorporated communities
  - Kerby, Selma, and Cave Junction transition zones had high crash rates
  - These areas have more frequent driveways and transitioning speeds
  - Pedestrian and bike crashes reported in these areas
- Unincorporated communities
  - Kerby, Selma, O'Brien, and Wonder have greater need for pedestrian and bicyclist facilities, crossings, and transit connections based on the multimodal analysis presented in this memorandum and the inventory (e.g., demographics, bicycle and pedestrian facilities, public transportation, etc.) conducted for Tech Memo #2.
- Curves
  - Multiple features present at the northern end of corridor: tight curves, narrow shoulders, passing lanes, intersections with limited sight distance and limited turn lane options. Specific locations identified for further review include:
    - Curves near Milepoint 15 to 16 (intersections of Old Redwood Highway/Hayes Hill Road): high number of reported crashes
    - Curve at Milepoint 21.85 (near Wild Park Lane)
- Passing lanes
  - Transitions in and out of passing lanes (higher crash frequency)

  - Intersections and access points within passing lanes (sight distance and turn lane needs)

Specific Locations Identified for Further Analyses and Alternatives:

- US 199/OR 260 (Riverbanks Road): High crash frequency and SPIS site
- US 199/Circle W Drive (Milepoint 18): SPIS Site
- US 199/Illinois River Road in Selma: SPIS Site
- Area just north of US 199/Wild Park Lane: SPIS Site
  - Sight distance concerns at Wild Park Lane
- Milepoint 16.5, just south of the intersection with Briggs Valley Road
- US 199/Kerby Mainline Road
  - Lack of turn lanes for an intersection that serves the landfill; sight distance concerns due to vegetation
- US 199/Hayes Hill Road
  - Lack of turn lanes

Locations with Observed Concerns:

Members of the Project Management Team (PMT) live and work along the corridor and are familiar with the highway and its operations. The PMT shared observations about various corridor locations based on their experiences. These locations were identified at the February 17, 2021 kick-off meeting or a subsequent PMT meeting. Kittelson will assess these locations during the Site Visit:

- Elliott Creek Road: Concern about lack of turn lanes and vehicles passing in this area. Two reported crashes (PDO).
- Waters Creek Road: Intersection has a skew and is located on a vertical curve. One reported crash (Injury C).
- Slate Creek Road: Skewed intersection. Six reported crashes included two Injury B, three Injury C, and 1 PDO.
- Draper Valley Road: Sight distance constraints turning from Draper Valley Road onto US 199. Congestion is common in this area. Two reported crashes including one Injury B and one Injury C.
- Reeve’s Creek Road: Two crashes (one Injury B and one PDO).
- Both sides (300 to 400 feet on each side) of Holton Creek Road in Kerby: Congestion is common in this area; many driveways.
- Evaluation of passing opportunities: Do the location of passing opportunities provide adequate room for a vehicle to pass?

ATTACHMENT A – TRAFFIC OPERATIONS ANALYSIS

STUDY INTERSECTIONS

The intersection traffic operations for the study corridor summarizes the existing and future analyses results presented in the Josephine County TSP Update for the two study intersections. These intersections possess the following characteristics:

- (1) US 199 / OR 260: located near the beginning project limits, this is a three-leg, two-way stop-controlled intersection where OR 260 is the controlled approach. The intersection provides dedicated left- and right-turn lanes from US 199 onto OR 260. During peak hour operations, trucks account for approximately six percent of the traffic volumes on US 199.
- (2) US 199 / Lakeshore Drive: located in Selma, this is a four-leg, two-way stop-controlled intersection where the Lakeshore Drive approaches are controlled. The intersection provides dedicated left- and right-turn lanes from US 199 onto Lakeshore Drive. During peak hour operations, trucks account for approximately nine percent of the traffic volumes on US 199.

The results of the existing and future traffic operations analyses completed by the TSP for these intersections are summarized in Table 7.

Table 7: Existing and Future Traffic Conditions - Weekday PM Peak Hour [1]

Intersection	Existing (2018) Conditions				Future (2040) Conditions				Mobility Target
	CM	LOS	Del	V/C	CM	LOS	Del	V/C	
US 199 / OR 260	SB	D	26.1	0.31	SB	D	26.0	0.32	0.75
US 199 / Lakeshore Drive	WB	C	18.9	0.28	WB	C	18.9	0.27	0.75

[1]CM = Critical Movement; LOS = Level of Service; Del = Delay; V/C = Volume-to-Capacity; SB = Southbound; WB = Westbound

As shown, both intersections will have sufficient capacity for the anticipated traffic growth by the year 2040 and meet their mobility targets.

Peak hour truck percentages were measured at the US 199/OR 260 intersection as approximately four percent of southbound through traffic on US 199 and seven percent of northbound through traffic. Peak hour truck percentages were measured at the US 199/Lakeshore Drive intersection as approximately nine percent of southbound and northbound through traffic on US 199.

SEGMENTS

The segment traffic operations are additional analyses to what was completed for the Josephine County TSP. The segment-based traffic operations analysis summarized in this section referenced the Federal Highway Administration (FHWA) Capacity Calculation Method for Highway Performance Monitoring System[2] to determine the approximate LOS for segments along the US 199 study corridor. The analysis methodology followed these steps:

1. For study corridor segments posted at 45 MPH or higher, Kittelson compared current and forecast traffic volumes with the volume thresholds defined in Table 17 of the FHWA reference. The volume-to-capacity ratios for current and future traffic conditions were also calculated using recorded traffic volumes and the LOS D service volume from Table 17. As such:
    a. US 199 is considered to have rolling terrain;
    b. Truck percentages were obtained from ODOT's TransGIS online tool;
    c. Current traffic volumes were obtained from ODOT's 2019 State Highway Traffic Volumes; and
    d. Forecast traffic volumes were developed using the current traffic volumes and growth rates determined from ODOT's Future Volume Tables.
2. For study corridor segments posted below 45 MPH, Kittelson compared current and forecast traffic volumes with the volume thresholds defined in Table 16 of the FHWA reference. The volume-to-capacity ratios for current and future traffic conditions were also calculated using recorded traffic volumes and the LOS E service volume from Table 16. As such:
    a. The land use is considered rural;
    b. US 199 is designated as a Principal Arterial;
    c. Current traffic volumes were obtained from ODOT's 2019 State Highway Traffic Volumes; and
    d. Forecast traffic volumes were developed using the current traffic volumes and growth rates determined from ODOT's Future Volume Tables;

The analysis results are summarized in Table 8 and Table 9. As shown, the study corridor operates sufficiently as a rural two-lane highway for motorists under existing and future.

[2] hpms_cap.pdf (dot.gov)

Table 8: Rural Two-Lane Segment Traffic Conditions [1]										
MP	Posted Speed	Truck %	2019 AADT	Annual Growth Rate	2040 AADT	LOS B Service Volume	LOS C Service Volume	LOS D Service Volume	2019 V/C	2040 V/C
6.97	55	19.18	10400	0.05%	10500				0.43	0.43
7.14	55	19.18	7400	0.06%	7500				0.31	0.31
8.81	55	19.18	8300	0.17%	8600	13,900	19,000	24,200	0.34	0.36
16.10	55	19.18	7400	0.06%	7500				0.31	0.31
17.87	55	19.18	7400	0.06%	7500				0.31	0.31
19.60	45	19.18	7800	0.06%	7900				0.56	0.57
20.08	45	19.18	8000	0.12%	8203	3,200	8,100	13,900	0.58	0.59
20.24	45	19.18	8100	0.06%	8200				0.58	0.59
20.37	55	19.18	7800	0.06%	7900				0.32	0.33
20.81	55	19.18	7300	0.07%	7400	13,900	19,000	24,200	0.30	0.31
21.44	55	19.18	7500	0.06%	7600				0.31	0.31
29.65	45	19.18	5400	0.09%	5500	3,200	8,100	13,900	0.39	0.40
32.34	55	19.18	4500	0.11%	4600	13,900	19,000	24,200	0.19	0.19
36.22	50	19.18	4800	0.10%	4896	8,100	13,900	19,000	0.25	0.26
36.71	55	19.18	3700	0.38%	3992	13,900	19,000	24,200	0.15	0.16
41.32	55	16.99	3500	0.64%	3973				0.14	0.16

[1]Table 17 of FHWA Reference

Table 9: Stop Sign-Controlled Segment Traffic Conditions [1]									
MP	2019 AADT	Annual Growth Rate	2040 AADT	LOS B Service Volume	LOS C Service Volume	LOS D Service Volume	LOS E Service Volume	2019 V/C	2040 V/C
26.32	8000	0.06%	8100	7,600	11,100	12,400	13,600	0.59	0.60
26.81	8600	0.06%	8700					0.63	0.64

[1]Table 16 of FHWA Reference

ATTACHMENT B – CRASH ANALYSIS

General Crash Characteristics

This section provides additional crash characteristics to those summarized in the Transportation System Conditions: Current and Future Memorandum.

Kittelson found crashes occur at a similar frequency across all days off the week, with a slightly higher number of severe injury and fatal crashes toward the end of the week or early on the weekends, on Thursdays, Fridays, and Saturdays.

When considering time of day, most crashes occur during higher volume periods on the corridor, with the most crashes occurring during the PM peak between 5:00 – 6:00 PM and the least crashes occurring between 4:00 – 5:00 AM. Chart 6 provides the crashes by severity and day of week, while Chart 7 provides the crashes by severity and time of day.

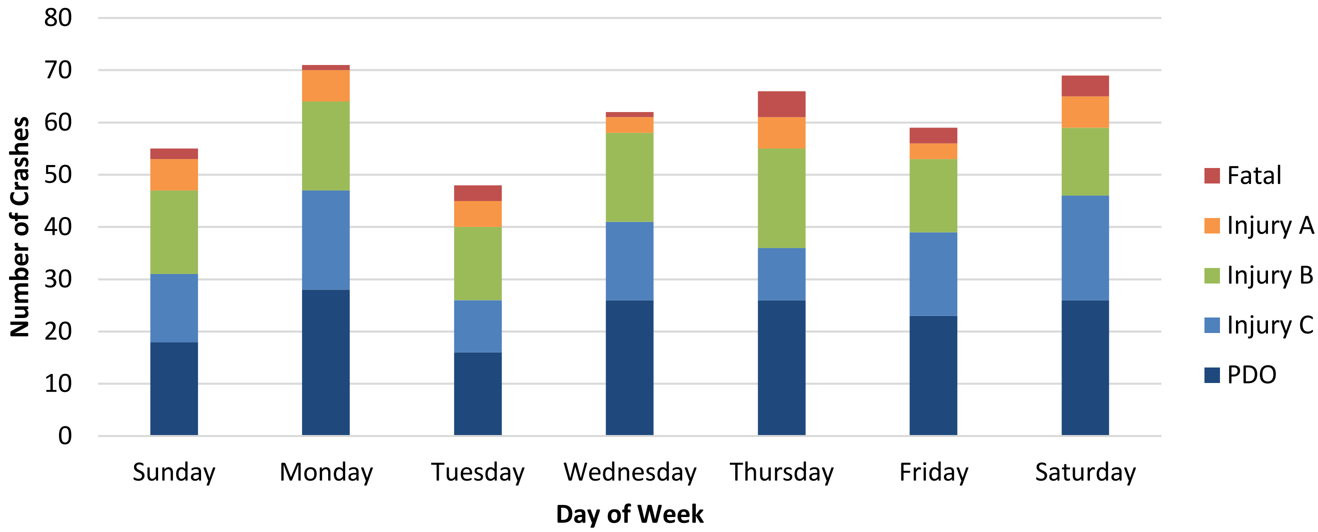


Chart 6: Crash Severity by Day of Week

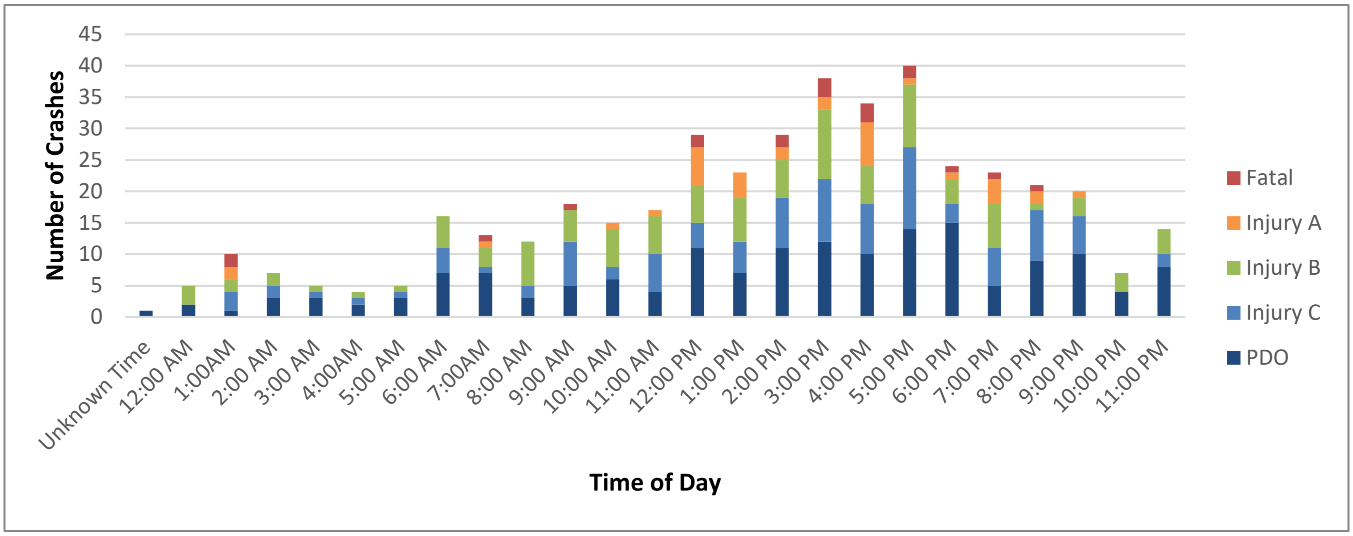


Chart 7: Crash Severity by Time of Day

Kittelson analyzed the road surface conditions and weather conditions for fatal and severe injury crashes along the corridor, as presented in Chart 8 and Chart 9, respectively. Sixty-three percent of fatal and severe injury crashes occurred during clear weather conditions and 80 percent of fatal and severe injury crashes occurred with dry road surface conditions.

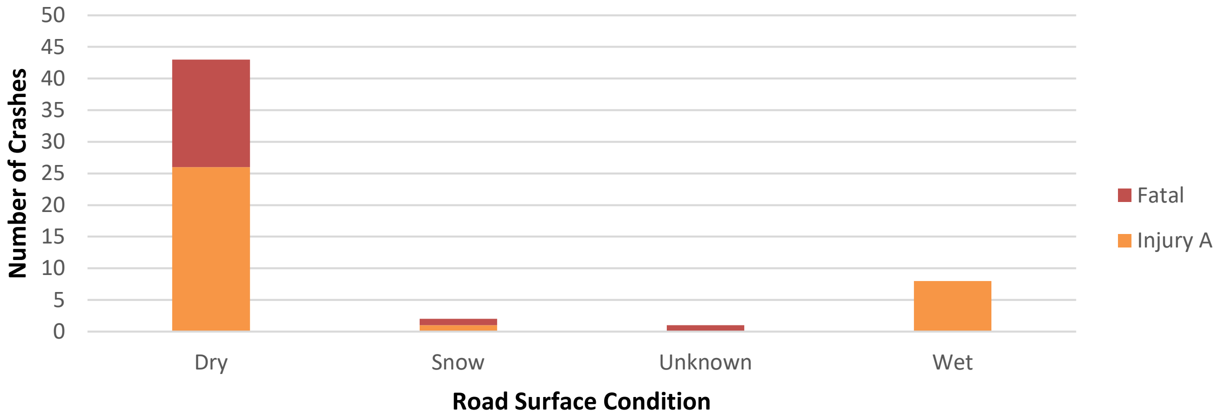


Chart 8: Fatal and Severe Injury Crashes by Road Surface Condition

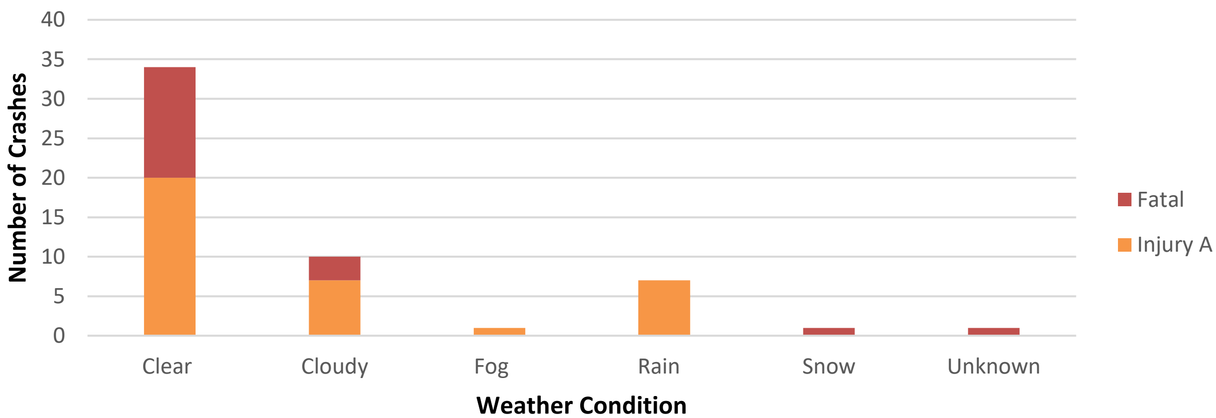


Chart 9: Fatal and Severe Injury Crashes by Weather Condition

Corridor Screening by Performance Measures

Kittelson performed Equivalent Property Damage Only (EPDO) screening and Crash Rate screenings to identify crash trends along the corridor. The following sections provide the methodologies for those screenings.

Equivalent Property Damage Only Analysis

Equivalent Property Damage Only (EPDO) is one of 13 performance measures identified in the Highway Safety Manual. EPDO assigns a weight to an intersection or segment based on the observed crash frequency and severity. For this analysis, Kittelson considered segments of 0.25 miles in length, and performed a sliding window analysis in 0.125 mile increments. The equation used to develop the EPDO score is shown below:

$$EPDO\ Index = W_K K + W_A A + W_B B + W_C C + P$$

where:

W = Weighting Factor

K = # of fatal crashes

A = # of severe injury crashes (Class A)

B = # of moderate injury crashes (Class B)

C = # of minor injury crashes (Class C)

P = # of property damage only crashes (PDO)

The weighting factors used are consistent with those used as part of ODOT's Safety Priority Index System (SPIS), where fatal or severe injury crashes are given a weight of 100, moderate (injury B) and minor injury (injury C) crashes are given a weight of ten, and PDO crashes are given a weight of one.

Crash Rate Analysis

For the crash rate analysis, Kittelson applied an ADT of 7,800 for the section of corridor between Grants Pass and Cave Junction and an ADT of 4,800 for the section between Cave Junction and the California border. These ADTs are generally representative of the ADTs for these corridors, per data provided in ODOT's TransGIS as of June 2021. Crash rate was calculated using the following formula.

$$Crash\ Rate\ per\ Million\ Vehicle\ Miles = \frac{N * 1{,}000{,}000}{L * ADT * Y * 365}$$

where:

N = # of crashes per segment

L = Length of segment (0.25 miles)

ADT = Average Daily Traffic

Y = # of Years of Crash Data

Because the crash rate formula does not take severity into consideration, it identifies segments with a high number of crashes. For this calculation, Kittelson used five full years of crash data; the additional year of fatal and severe injury crashes only (2019) was not used since the data for non-severe injury and PDO crashes is incomplete.

ATTACHMENT C – MULTI-MODAL ANALYSIS

STATEWIDE BICYCLE AND PEDESTRIAN SAFETY RISK ASSESSMENT

The risk factors presented in Table 10 influence safety performance for people walking, rolling, and biking, and they were established by ODOT through analyzing crash, traffic, infrastructure, land-use, and demographic data across the State of Oregon. A weight is assigned to each factor based on its correlation to crash history: factors with higher weights have stronger correlations with severe crashes. If no weight is assigned, there is no correlation between the risk factor and the user type.

Table 10: Pedestrian and Bicyclist Risk Factors by Weight and Rural Context

Risk Factor	Pedestrians	Bicyclists
Principal Arterial	1.46	1.39
Number of Lanes (≥ 4 Lanes)	1.73	-
Posted Speed (≥ 35 mph)	1.63	1.09
Other Zoning	1.45	-
Proximity to Schools (1 Mile)	1.17	1.00
Proximity to Transit Stops (1/4 Mile)	1.00	1.03
High Population over Age 64	-	1.00

The application of risk factors was completed by ODOT on a statewide level, and therefore, highway segments are grouped to show how one segment might compare to others in Oregon. While these groupings highlight general safety needs in the study corridor, they can also help with prioritizing study corridor improvements where safety risk may be higher in some segments than in others.

Other risk factors not included in Table 10 that should be investigated for the study corridor include:

- High turning volumes at intersections
- Lack of lighting
- Exposure (traffic volumes)

QUALITY OF SERVICE

Bicycle Level of Traffic Stress

ODOT's Analysis Procedures Manual (APM) provides a methodology referred to as Bicycle Level of Traffic Stress (BLTS) that helps in evaluating the adequacy of roadways to accommodate bicyclists in various environments. This methodology classifies four levels of traffic stress that a bicyclist can experience on a roadway, ranging from BLTS 1 (little traffic stress) to BLTS 4 (high traffic stress). A roadway that is rated as BLTS 1 generally has low traffic volumes and travel speeds and is suitable for all cyclists, including children. A roadway that is rated BLTS 4 generally has high traffic volumes and travel speeds and is perceived as unsafe by most adults. According to the APM, BLTS 2 is considered a reasonable target for roadways due to its acceptability with the majority of people.

In urban areas, BLTS is determined by characteristics such as speed of the roadway, the number of travel lanes per direction, and the presence and width of on-street bicycle lanes and/or adjacent parking lanes. In rural areas, BLTS is determined by characteristics such as speed of the roadway, daily vehicle volume, and paved shoulder width.

Qualitative Multimodal Assessment

The QMA methodology is based on principles in the Highway Capacity Manual and was used to evaluate pedestrian and transit facilities and services in the study corridor to identify potential connectivity issues.

Pedestrian Assessment

Provided that the study corridor is primarily rural, the pedestrian assessment considered the criteria listed in Table 11.

Table 11: Pedestrian QMA Criteria

Criteria	Excellent	Good	Fair	Poor	Very Poor
Outside Travel Lane Width	>12	12	11	10	<10
Bicycle Lane/ Shoulder Width	>6	6	4	2	<2
Number of Travel Lanes	1	2	3	4	5
Speed	≤25	30	35	40	≥45
ADT	<400	400-1,500	1,500-2,000	2,000-7,000	>7,000

Transit Assessment

Table 12 details the criteria used to determine the transit QMA ratings for the study corridor.

Table 12: Transit QMA Criteria

Criteria	Excellent	Good	Fair	Poor
Frequency and On-Time Reliability	<15-minute headways	15- to 30-minute headways	30- to 60-minute headways	>60-minute headways
Schedule, Speed, and Travel Time	<20% slower than driving	20 to 40% slower than driving	40 to 60& slower than driving	>60% slower than driving
Transit Stop Amenities	Shelter	Bench	Sign with waiting area	No waiting area and/or no sign
Connective to Pedestrian/Bicycle Network	Shoulders, bicycle lanes, or sidewalks and crossing	Shoulders, bicycle lanes, or sidewalks with no crossing	Narrow bicycle lanes, sidewalks, or shoulders with no crossing	No sidewalks, bicycle lanes, shoulder, or crossing