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TECHNICAL MEMORANDUM

Warm Springs Commercial Corridor Safety Plan

DRAFT Existing Conditions Memorandum

Date:	November 17, 2016	Project #: 19780
To:	Lonny Macy, Confederated Tribes of Warm Springs	
From:	Ashleigh Griffin, AICP, and Brian L. Ray, PE	
cc:	Michael Duncan, ODOT	

This memorandum documents the existing conditions identified within the Warm Springs Commercial Corridor study area. The memorandum is organized as follows:

STUDY PURPOSE

The Warm Springs Commercial Corridor Safety Plan is intended to develop a set of goals, objectives, and strategies that improve safety on and around the Warm Springs Commercial Corridor. The Plan will identify, prioritize, and refine safe and efficient infrastructure for all modes of transportation.

The Plan focuses on an approximately three mile section of US 26 from the intersection at Paiute Avenue (BIA 3) to the southeastern boundary of the reservation at the Deschutes Crossing (milepost 105.20) and nearby streets, as illustrated in Figure 1.

The community of Warm Springs, including the downtown area, is located within the project study area along US 26. US 26 is a major east-west connection for the local community and also serves high volumes of through traffic as a major connection between Central Oregon and the Portland area. The local Confederated Tribes of Warm springs (CTWS) community relies heavily on US 26 for daily trips. The community has expressed concern about safety issues both along the US 26 corridor and in nearby core areas of the community. This Plan focuses on identify and documenting safety issues as well as developing priorities for treatments.

Figure 1. Study Area

DEMOGRAPHICS

According to the 2014 Transportation Plan, the total Tribal Enrollment in 2010 was 4,760. Of these, 1,402 (29.5 percent) people were under the age of 16, and 113 (2.4 percent) were age 65 and over. The majority of the population (68.1 percent) was between the ages of 16 and 64 in 2010.

In 2010, the total workforce for the reservation included 2,999 employees, with an 8 percent unemployment rate. The major employers in the reservation included the Kah-Nee-Ta Resort and the Indian Head Casino. Twenty-one percent of the population was reported to have earnings below the poverty level.

As of 2003 (the most current data available at the time of the 2014 Transportation Plan report), there were a total of 1,037 occupied homes in Warm Springs, primarily located in the Warm Springs community area. According to the 2014 Transportation Plan, approximately 300 homes were planned for construction as of 2014. The majority of these are planned near the study area, south of Quail Trail Road. As of 2016, some of these have been completed.

LAND USE

The existing zoning within the study area is shown in Figure 2. As the figure illustrates, the study area includes several commercial clusters located along the US 26 corridor. The commercial areas (red areas) on the western end of the study area are located within the "Campus Area." This area has been the subject of multiple planning efforts and is intended for redevelopment in the future. The commercial area in the center of the study area includes the Indian Head Casino which is a major employment center for the community. The commercial area on the east end of the study area includes a restaurant adjacent to the Deschutes River but also includes vacant land available for development along the long narrow stretch east of Tenino Road.

The purple area indicates Industrial Zoning. The purple area in the study area represents the former lumber mill site which closed in 2016. The future use of this site is unknown at this time.

The Public/Community areas, shown by blue in the figure, include the local school, Museum at Warm Springs, Community Center, Tribal Administration building, and other supporting services.

As shown in the figure, there is a large concentration of community services and destinations within the study area, located throughout the US 26 corridor. The residential areas (shown by orange and yellow in this figure) are heavily concentrated south of the core areas. There has been recent residential growth south of the Quail Trail area, and future residential development is identified for areas near Chukar Road and Tenino Road.

The study area includes important corridors used by community members traveling between residential areas and employment/service locations. Workers traveling to the casino areas or the former mill site for work frequently walk along US 26 to access these locations.

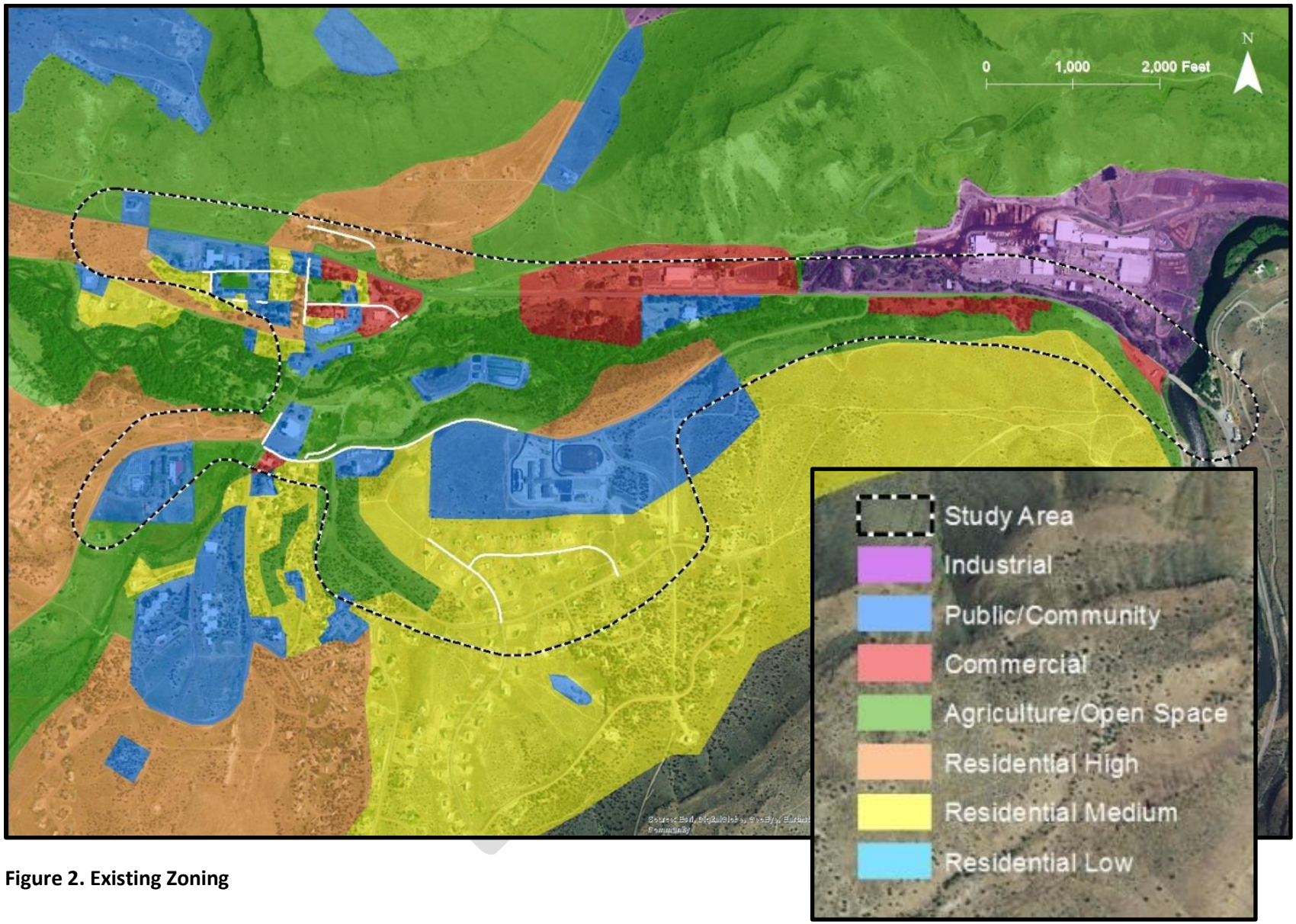

Figure 2. Existing Zoning

ROADWAY AND TRAFFIC CONDITIONS

KAI reviewed the roadway conditions within the study area to inventory and document how the system operates under existing conditions. This section provides an overview of roadway conditions and traffic conditions for roadways within the study area.

US 26 Corridor Roadway Characteristics

US 26 is a statewide highway that provides a major connection between Central Oregon and the Portland area. It is a two-lane Rural Principal Arterial within the study area with turn lanes provided at the major intersections. There are no sidewalks or bicycle lanes provided within the study corridor. The posted speed limit throughout the study corridor is 45 miles per hour (mph). However, the speed limit increases to 55 mph immediately beyond the study area boundaries.

US 26 Corridor Traffic Characteristics

ODOT traffic volumes indicate an annual average daily traffic (AADT) volume of 4,700 vehicles per day (veh/day) on US 26 west of Paiute Avenue and an AADT of 6,900 veh/day east of Paiute Avenue. The truck percentages vary from 29.5% west of Paiute Avenue to 15.1% east of Paiute Avenue. ODOT's projected volumes for the corridor show the segment between Paiute Avenue and Hollywood Boulevard with higher general projections than other sections of the corridor, likely due to local traffic traveling north-south through Warm Springs and connecting to BIA 3.

Traffic counts were collected as part of the Indian Head Casino Traffic Monitoring Report. These volumes were collected between a Thursday and Sunday in August 2015 and therefore reflect peak season traffic volumes. These counts revealed traffic volumes substantially higher than the AADT for the corridor. The ADT on Sunday was 12,712 on US 26, and the ADT recorded on Friday was 13,145 for US 26.

Traffic volumes were obtained from the 2014 Transportation Plan for the major intersection approaches when possible. This data is summarized below.

- BIA 3: 5,900 veh/day (based on 2009 data from the 2014 TP)
- Hollywood Boulevard: 6,637 veh/day
- Casino/Museum Driveway: 1,400 veh/day (obtained from the Casino Traffic Monitoring Study)
- Jackson Trail Road: 317 veh/day

Pedestrian counts were conducted at the intersection of US 26/Casino/Museum driveway during the study. The number of pedestrians recorded as the intersection is summarized in

Table 1. Observed Pedestrian Crossing Volumes at US 26/Casino/Museum Driveway

Count Day (8/7/15 to 8/9/15)	Pedestrian Crossings of US 26	Total Pedestrian Volume (All Approaches)
Thursday	7	10
Friday	4	11
Saturday	6	18
Sunday	5	9

Off Highway Roadway Characteristics

Table 2 provides a summary of the major roads within the study area that are located off of the Highway 26 route. The roads are generally lower speed roads that serve as access to local destinations or residences. However, some of the roads, particularly Hollywood Boulevard, carry high traffic volumes as they form important connections through the community.

Table 2. Roadway Characteristics of Non-Highway Roads

Road Name	Limits	Number of Lanes	Posted Speed Limit	Bike Lanes	Sidewalks	Traffic Volumes (from 2014 TP)
Paiute Avenue	US 26 to Warm Springs Street	2	15 mph	No	Both Sides (except one side from US 26 to Wasco Street)	--
Warm Springs Street	Hollywood Boulevard to Paiute Avenue	2	15 mph	No	Both Sides	--
Hollywood Boulevard	Tenino Road to US 26	2	30 mph	No	Shared-use Path on one side (Tenino Road to Warm Springs Street)	6,637 veh/day
Tenino Road	US 26 to Hollywood Boulevard	2	25 mph (20 mph in school zone)	No	Sidewalk on one side (School to Hollywood Boulevard)	4,018 veh/day (from 2009 data)
Quail Trail	Chukar Road to Tenino Road	2	25 mph	No	None	2,877 veh/day
Chukar Road	Tenino Road to Quail Trail		Not posted	No	Shared-use Path	--

Figure 3 shows the location of existing sidewalks and shared-use paths within the study area. Several key gaps exist within the network. The two most noticeable gaps are the east-west connection for pedestrians and the pedestrian connections around the new school to new residential areas to the south.

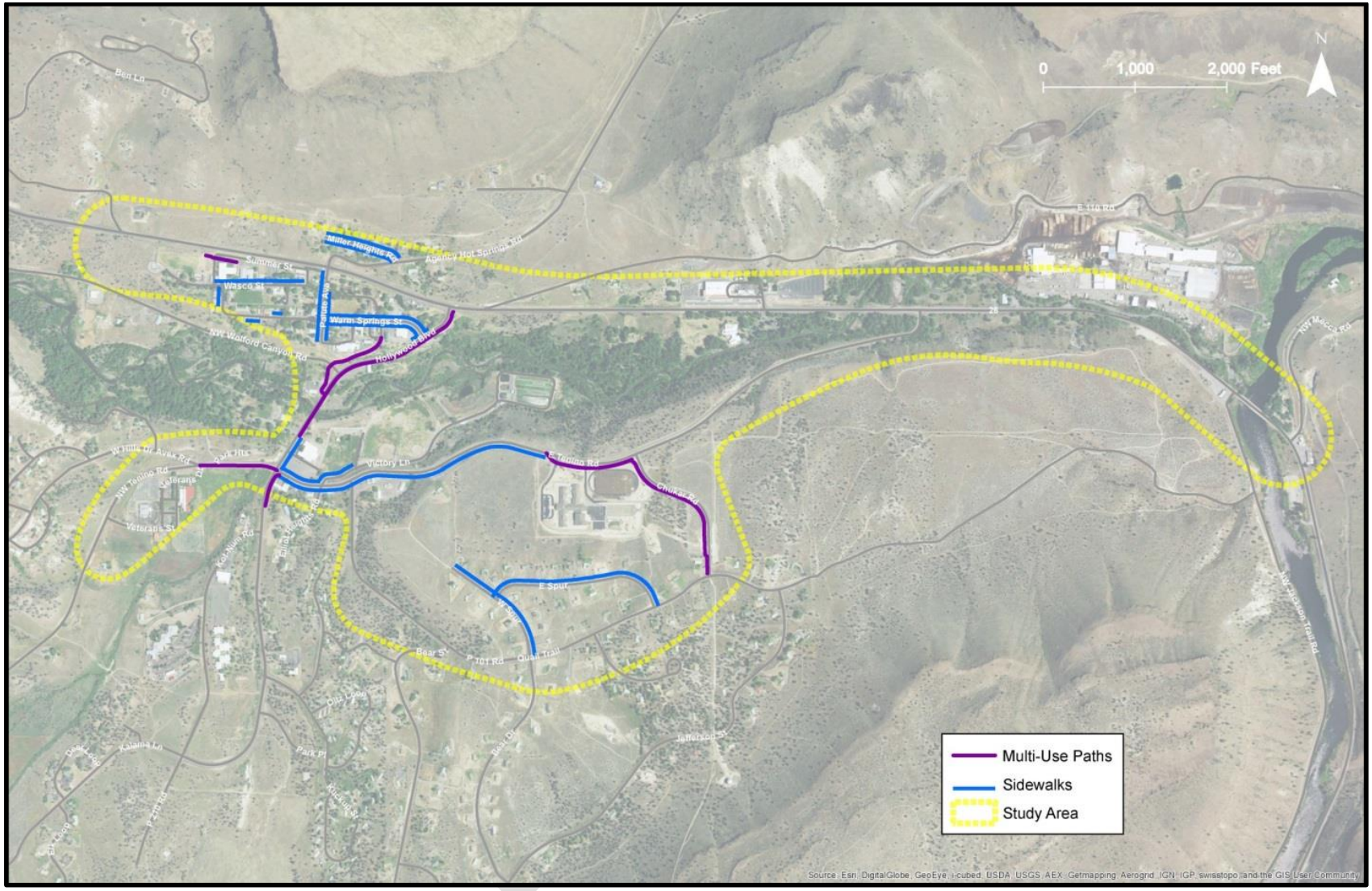

Figure 3. Existing Sidewalk Locations

DESCRIPTIVE CRASH STATISTICS

KAI obtained reported crash data for the study area for the years 2010 through 2014 from ODOT's crash database. Crash data for statistics was limited to crashes within the study area, but crashes mapped included those just beyond the study area. The additional data was included in maps because the proposed treatments may extend beyond the study boundaries for recommendations in transition areas.

Data for the year 2015 was also obtained and reviewed. However, the 2015 data was not complete in ODOT's database as of October 2016. Therefore, the crashes from 2015 were excluded from the summaries in this section to provide a consistent analysis across different years. The data that was available for 2015 indicated two additional crashes within the study area. These are further described below:

- One crash was reported at 3:00 pm on a Thursday in April. This crash occurred near the gas station access on US 26. The crash was a rear-end crash involving vehicles traveling northbound. The crash did not result in any injuries. No crash causes were reported.
- One crash was reported at 7:00 pm (during dusk) on a Saturday in May. This crash also occurred near the gas station access on US 26 and was reported as a turning movement crash. It involved one vehicle traveling westbound and one vehicle traveling eastbound. "Did not yield right-of-way" was reported as a contributing cause to the crash. The crash resulted in a minor injury.

There were 24 reported crashes within the study area boundaries between 2010 and 2014. Four of these crashes occurred in the Warm Springs area, off of US 26. The remaining 20 crashes occurred along US 26. This section organizes the crash statistics description into three sub-sections:

- US 26 Corridor Wide Trends
- Off-Highway Location Trends
- Location Specific Trends and Patterns

Throughout this section, crashes are discussed based on the injury severity of the crash. This is based on the most severe injury associated with the crash and may be coded according to the following categories.

- Fatal
- Injury A (Severe Injury)
- Injury B (Moderate Injury)
- Injury C (Minor Injury)
- PDO (Property Damage Only)

US 26 Corridor Wide Trends

Crash frequency and severity for the US 26 corridor, including crashes at intersections and along segments, are shown in the following exhibits. Of the 20 reported crashes in the corridor, 13 were property damage only (PDO) and 7 involved at least one injury. No fatal crashes occurred within the study corridor, but one fatal crash was reported on the east end of the corridor, approximately one half mile east of the study corridor. The fatal crash was a sideswipe meeting crash that occurred during dark light conditions when a vehicle crossed the centerline. Driving in excess of posted speeds was reported as a contributing factor. As shown in Figure 4, the number of crashes averaged slightly over three crashes per year, with the exception of 2013 when the number of reported crashes increased to seven. However, the majority of the crashes in 2013 were PDO crashes.

Figure 5 shows the number of reported crashes by month. The number of crashes exhibits a spike during July and August, which are peak summer travel months when US 26 traffic is high. Figure 6 illustrates the number of crashes by day of the week. The highest number of crashes was reported on Thursday and Friday. The number of reported crashes on Sunday is lower than other days, although the Indian Head Casino Traffic Monitoring Report found that Friday and Sunday experienced the highest traffic volumes.

Crash reports indicated that alcohol and drugs were not a factor in the reported crashes on US 26 within the study timeframe.

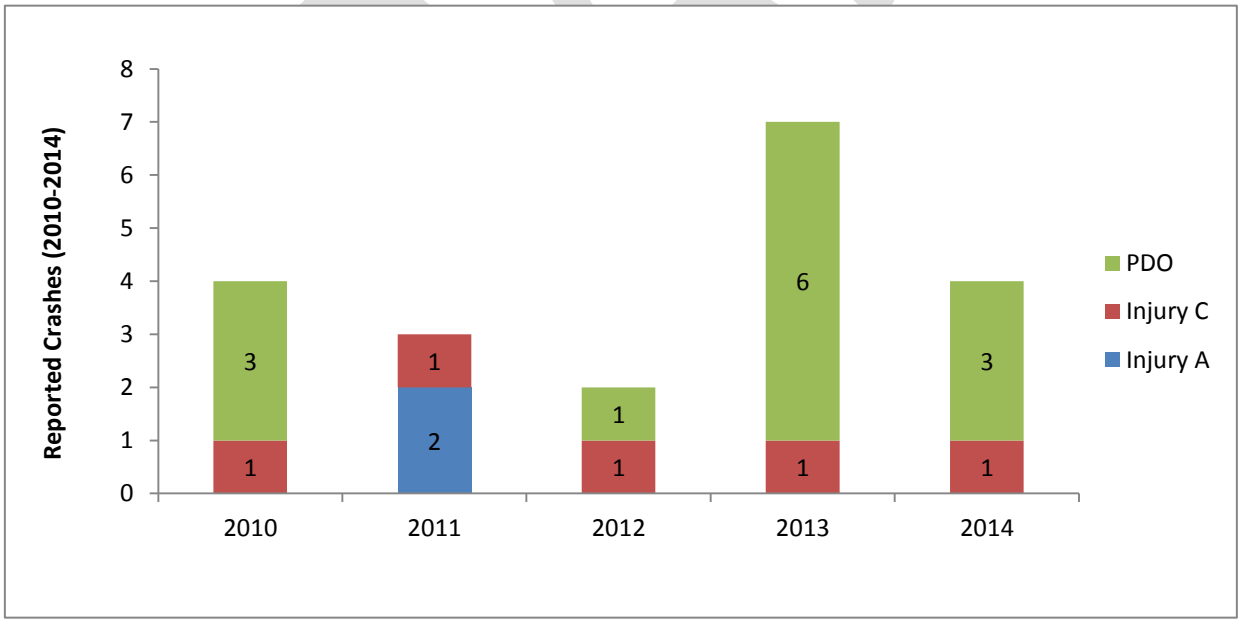

Figure 4. Number of Reported Crashes in US 26 Study Corridor (2010-2014)

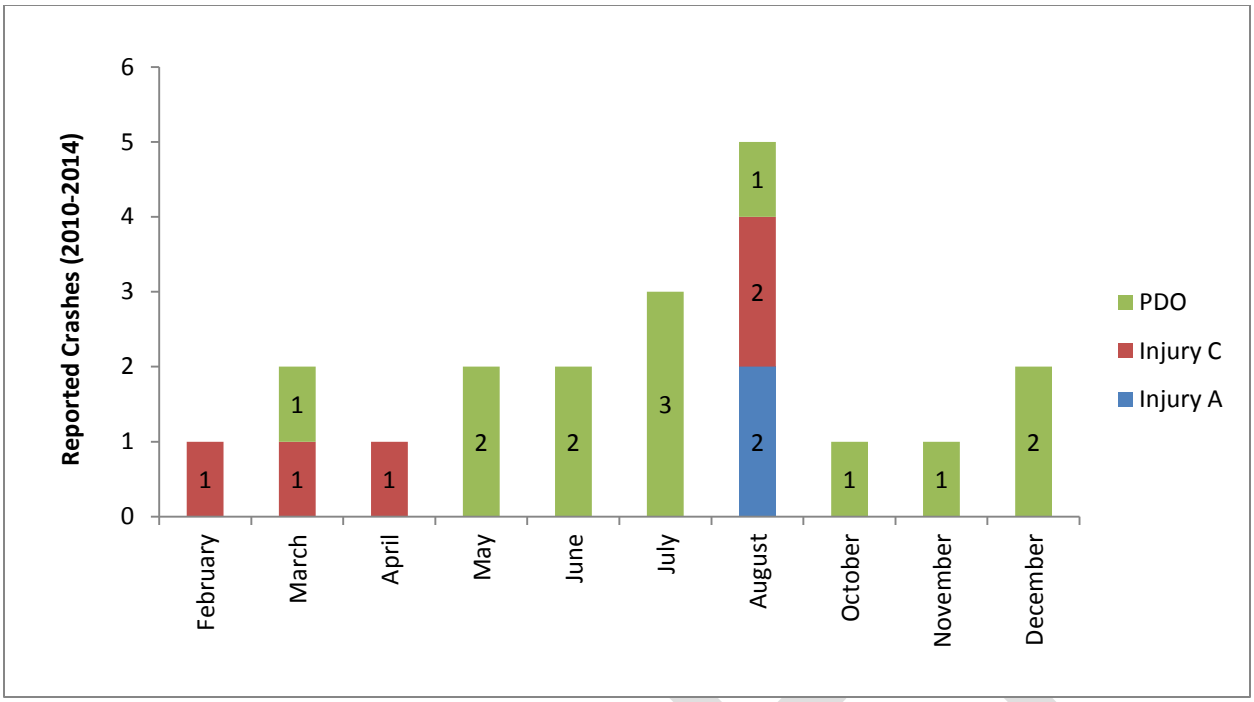

Figure 5. Number of Reported Crashes in US 26 Study Corridor by Month (2010-2014)

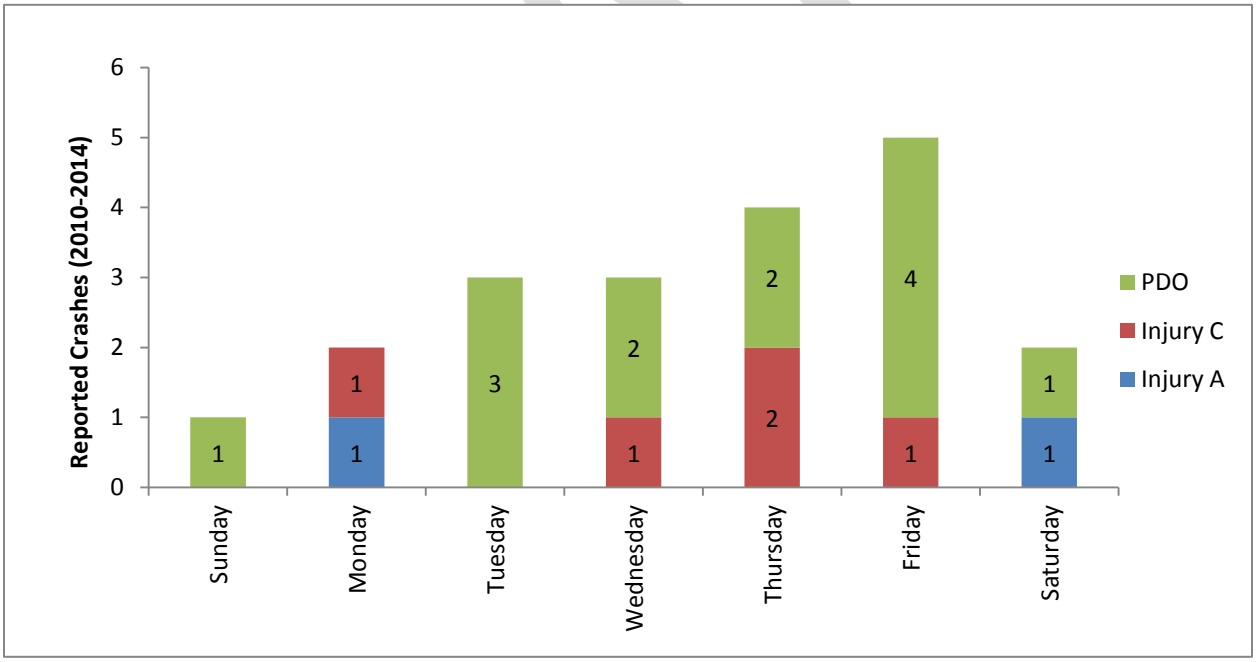

Figure 6. Number of Reported Crashes in US 26 Study Corridor by Day of Week (2010-2014)

Figure 7 illustrates the number of reported crashes and injury severity by crash type. The majority of crashes that occurred within the study corridor on US 26 were rear-end crashes. Several turning movement and angle crashes were also reported. Six of out seven injury crashes in the corridor were rear-end crashes.

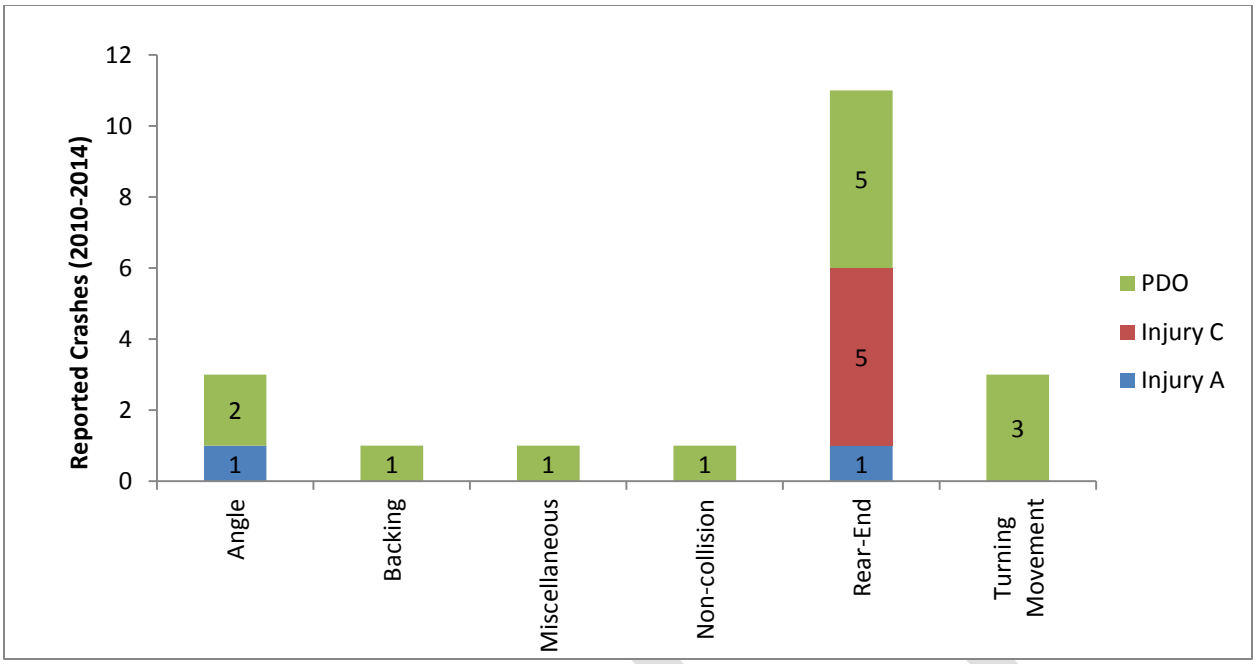

Figure 7. Number of Reported Crashes in US 26 Corridor by Collision Type (2010-2014)

Figure 8 illustrates the road condition at the time of reported crashes. The majority of crashes occurred during dry road conditions. Four crashes occurred on snow or ice. Six out of the seven reported injury crashes occurred during dry conditions.

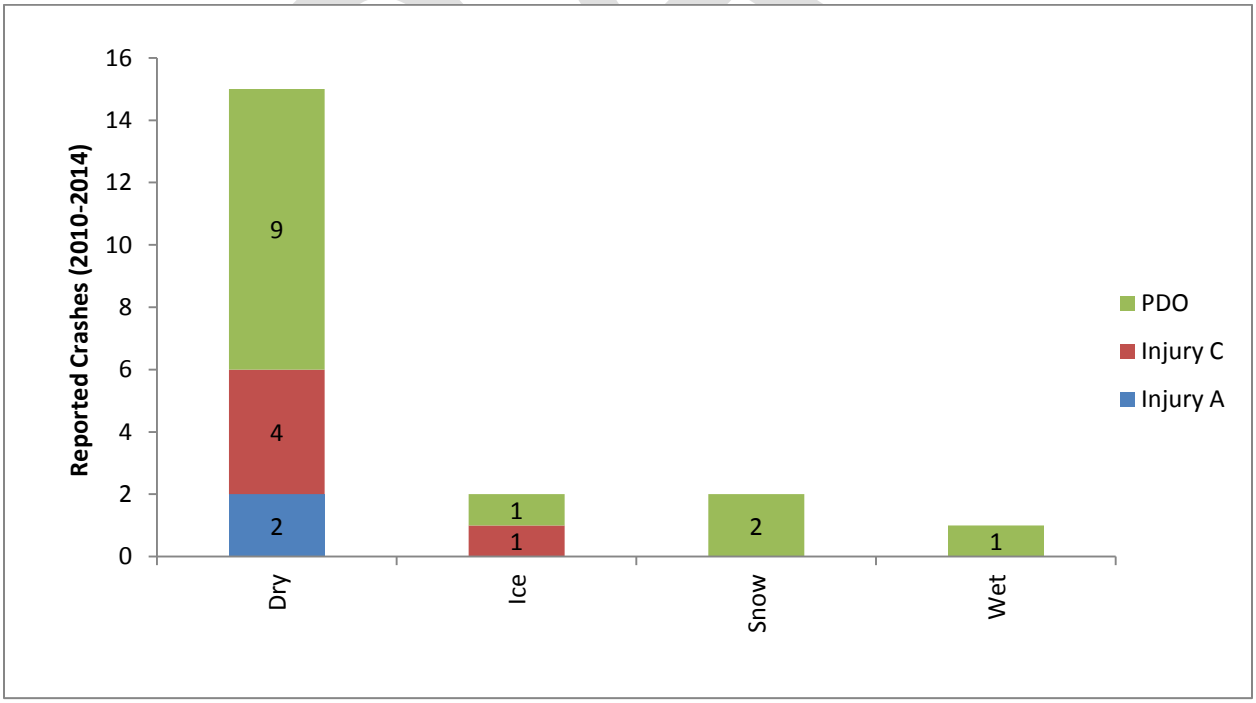

Figure 8. Number of Reported Crashes in US 26 Corridor by Road Condition (2010-2014)

Figure 9 illustrates that the majority of crashes occurred during daylight conditions. Four reported crashes occurred during dark light conditions, and one crash occurred at dusk. The majority of injury crashes also occurred during daylight conditions.

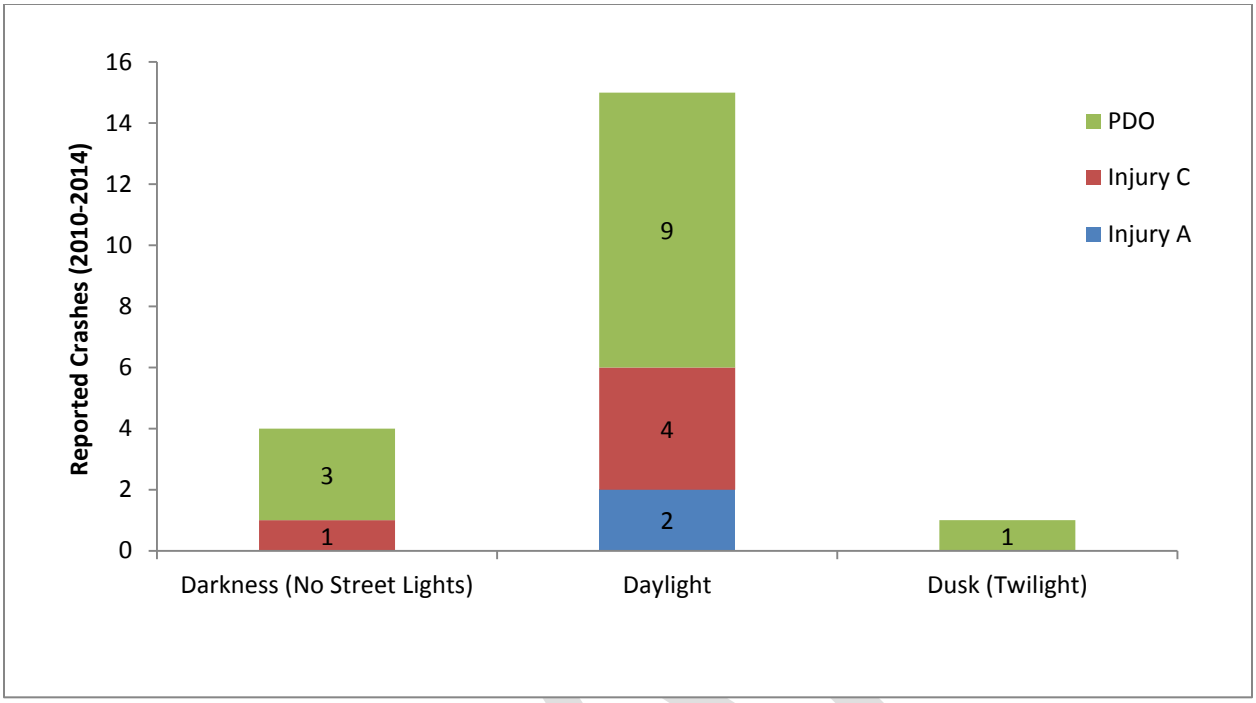

Figure 9. Number of Reported Crashes in US 26 Corridor by Light Condition (2010-2014)

Crash Location and Frequency

Consistent with guidance from the HSM, KAI organized the corridor into 11 sites based on roadway characteristics such as horizontal alignment, roadside conditions, shoulder widths, and frequency of intersections. The sites included 6 segments and 5 intersections. Crashes were associated with each intersection and roadway segment based on their physical location, crash type, and contributing factors.

Using Part C – Chapter 10 of the HSM as well as roadway, crash, and volume data, KAI calculated the expected annual number of crashes for each intersection and roadway segment. The expected annual number of crashes is the long-term yearly average number of crashes anticipated to occur on the segment or at the intersection based on each location's physical characteristics, previous crash frequency, and current traffic volumes. Oregon specific calibration factors were used in the analysis to reflect crash experiences in the state of Oregon.

The expected annual number of crashes per site were calculated and are summarized below to provide a relative sense of which sites along the study corridor are anticipated to have higher long-term average crash frequency. Table 3 summarizes the sites, the total number of reported crashes, and expected annual number of crashes.

Table 3. US 26 Corridor Sections and Crash Frequency

Location	Description	Length (miles)	Reported Crash Frequency per Year	Predicted Crash Frequency per Year	Expected Crash Frequency per Year
US 26 - 1	Ben Lane to Paiute Avenue	0.43	0.2	4.15	1.41
US26/Paiute	4-leg, minor street stop-controlled intersection	--	1.6	0.08	0.11
US 26 - 2	Paiute Avenue to Hollywood Boulevard	0.27	0.4	0.59	0.52
US26/Hollywood	3-leg, minor street stop-controlled intersection	--	0.4	0.3	0.26
US 26 - 3	Hollywood Boulevard to Casino/Museum	0.64	1.2	1.87	1.6
US26/Museum	4-leg, minor street stop-controlled intersection	--	0	0.28	0.26
US 26 - 4	Casino/Museum to Tenino Road	0.32	0.2	3.49	1.12
US26/Tenino	3-leg, minor street stop-controlled intersection	--	0	0.19	0.18
US 26 - 5	Tenino Road to Jackson Trail	0.70	0.6	2.28	1.55
US26/Jackson Trail	3-leg, minor street stop-controlled intersection	--	0	0.25	0.22
US 26 - 6	Jackson Trail to East Boundary	0.42	0.8	1.15	1.01

Crash Location and Severity

Figure 10 maps the reported crashes by location and severity. As shown in the figure, the PDO and Injury C (minor injury) crashes are located throughout the study area. The more severe injury crashes (Injury B and Injury A) occurred near the intersection of US 26/Hollywood Boulevard.

Crash Location and Collision Type

Figure 11 maps the reported crashes by location and collision type. The turning movement crashes occurred most frequently at the intersections of US 26 with Paiute Avenue and Hollywood Boulevard. However, the rear-end crashes occurred throughout the entire US 26 corridor.

Crash Location and Contributing Cause

As shown in Figure 12, the most commonly reported cause was following too closely. This was reported as a cause for crashes throughout the corridor. Failure to yield right-of-way was also a common factor for some of the intersection crashes.

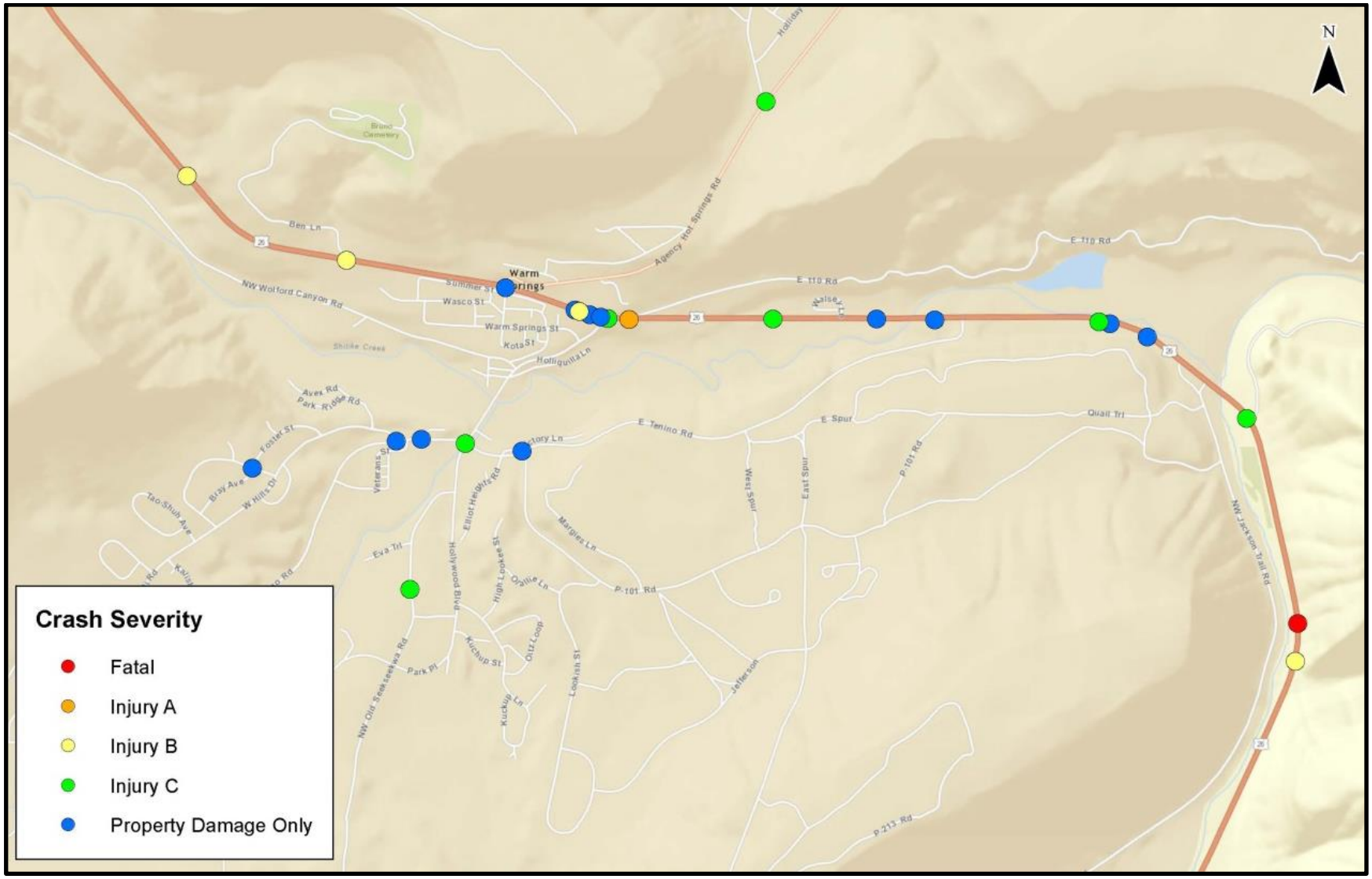

Figure 10. Reported Crashes Severity (2010-2014)

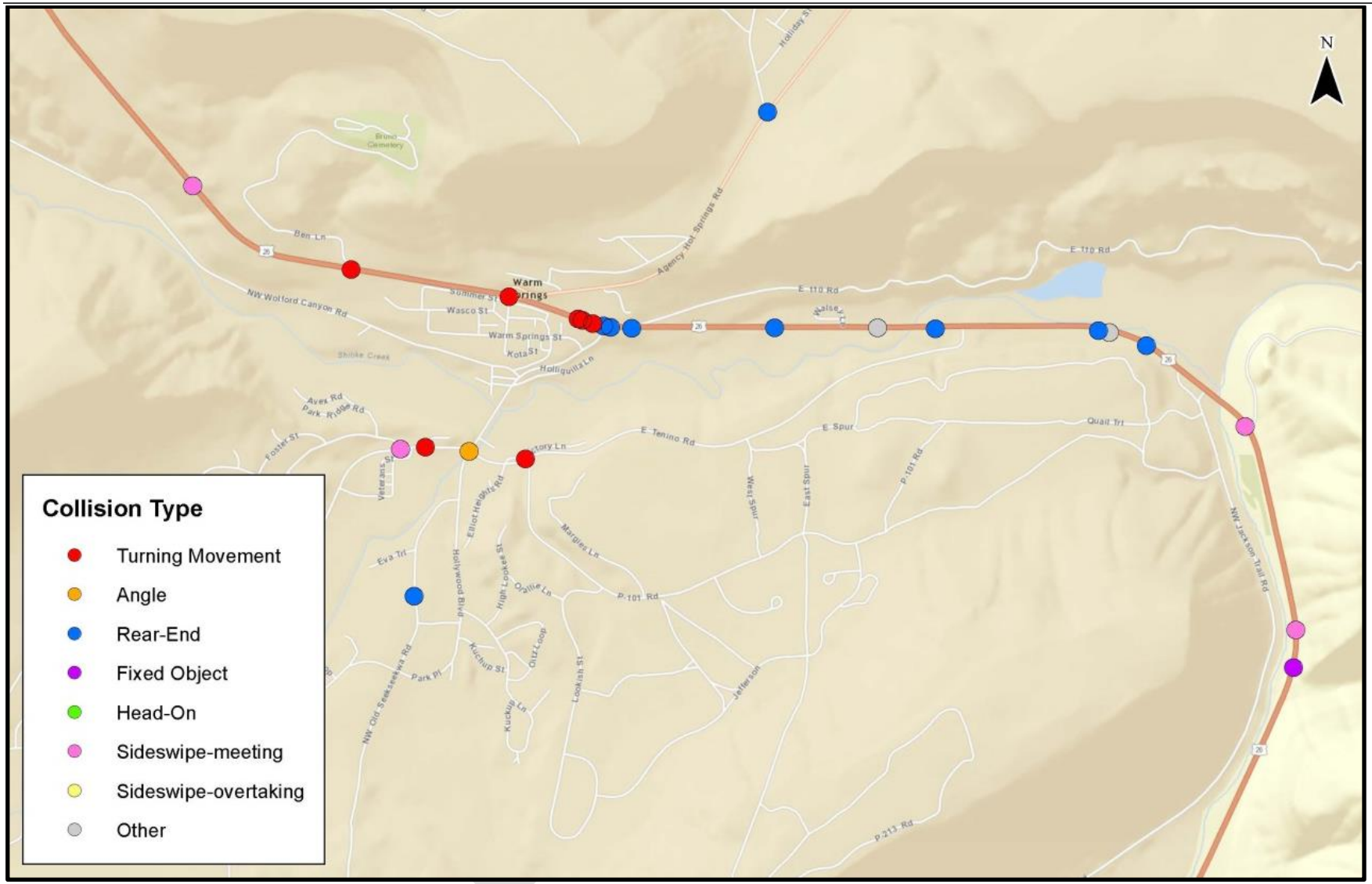

Figure 11. Reported Collision Type (2010-2014)

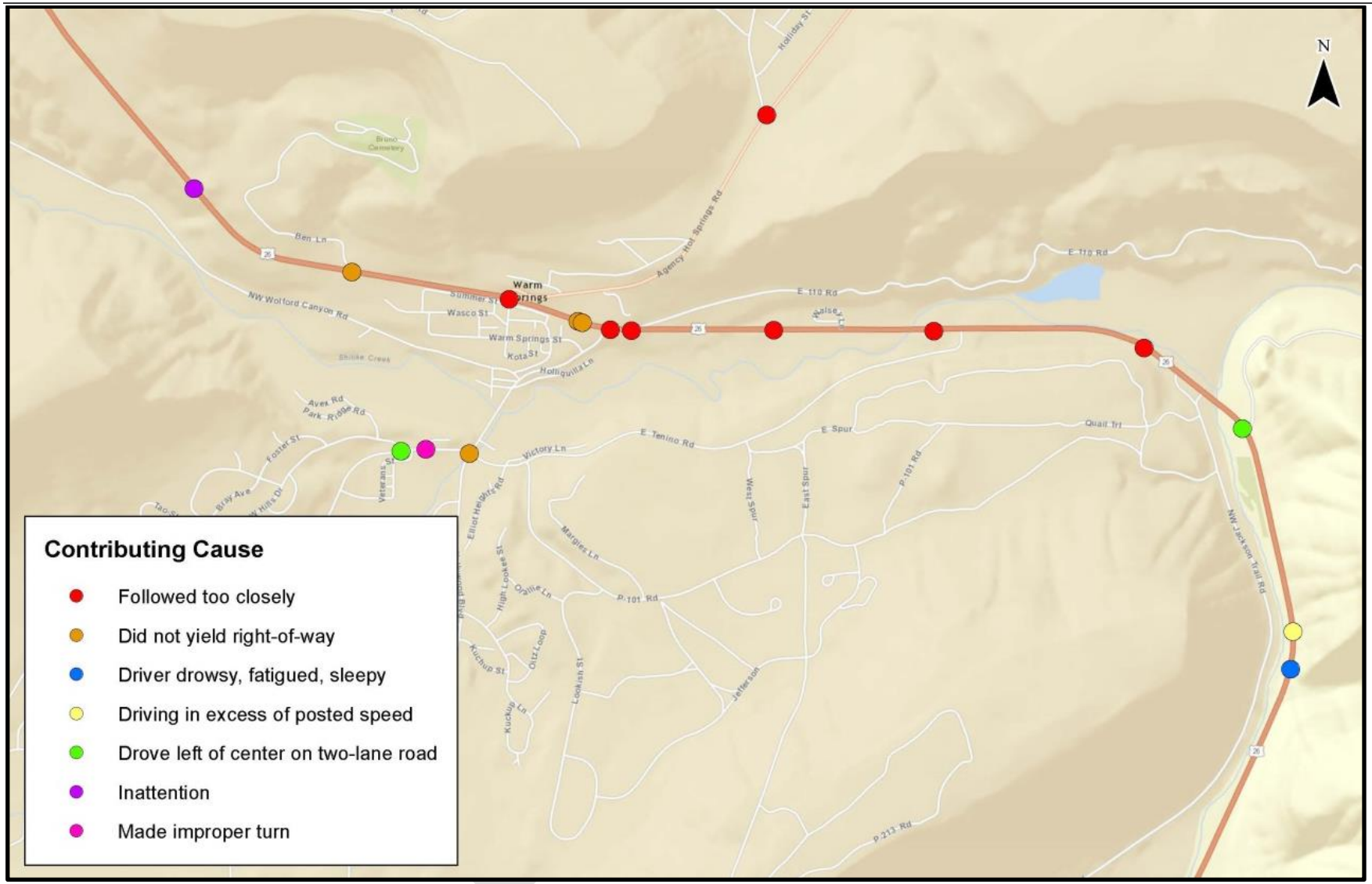

Figure 12. Reported Crashes and Contributing Causes (2010-2014)

Off Highway Location Trends

Reported crashes that occurred off of Highway 26 but within the study area are referred to as "Off Highway" crashes and described in this section. Four crashes were reported during the 2010 – 2014 time period. One crash resulted in a minor injury; the remainder were PDO crashes.

Two crashes occurred on Tenino Road, west of Hollywood Boulevard. One of these was a turning movement crash, and the other was a sideswipe-meeting crash. Both of these crashes were PDO crashes. One occurred during snow conditions. Both occurred during daylight conditions.

One crash was reported at the intersection of Tenino Road/Hollywood Boulevard. This crash resulted in a minor injury. The crash was reported as an angle crash and occurred during dry, dark conditions. According to the crash report, alcohol was involved in this crash.

One crash was reported at the intersection of Tenino Road/Quail Trail. No injuries occurred as a result of this crash. The crash was reported as a turning movement crash, and "speed too fast" for conditions was identified as a contributing factor. The crash occurring during daylight in snowy road conditions.

Crash Location and Frequency

Consistent with the approach used for the US 26 Corridor area, HSM Part C predictive methods were applied to the Off Highway Locations. Due to the relatively low numbers of reported crashes in these areas, the expected crash frequency provides information about locations that may have higher crash risk relative to other locations in the area. A total of six intersections and 9 segments were evaluated. Table 4 summarizes the observed and expected crashes at each location.

Table 4. Off-Highway Segments/Intersections and Crash Frequency

Location	Description	Length (miles)	Reported Crash Frequency per Year	Predicted Crash Frequency per Year	Expected Crash Frequency per Year
Intersections					
Paiute Avenue/Warm Springs Street	4-leg, all-way stop-controlled intersection	--	0	0.1	0.1
Hollywood Boulevard/Warm Springs Street	3-leg, minor street stop-controlled intersection	--	0	0.02	0.02
Tenino Road/Hollywood Boulevard	4-leg all-way stop-controlled intersection	--	0.2	0.05	0.05
Tenino Road/Quail Trail	3-leg, minor street stop-controlled intersection	--	0	0.02	0.02
Tenino Road/Chukar Road	3-leg, minor street stop-controlled intersection	--	0	0.02	0.02
Quail Trail/Chukar Road	3-leg, minor street stop-controlled intersection	--	0	0.03	0.03
Segments					
Paiute Avenue	US 26 to Warm Springs Street	0.10	0	0.03	0.03
Warm Springs Street	Paiute Avenue to Hollywood Boulevard	0.22	0	0.09	0.09
Hollywood Boulevard - 1	Tenino Road to Warm Springs Street	0.09	0	0.01	0.01
Hollywood Boulevard - 2	Warm Springs Street to US 26	0.43	0	0.1	0.09
Tenino Road - 1	Hollywood Boulevard to Quail Trail	0.16	0.2	0.03	0.03
Tenino Road - 2	Quail Trail to Chukar Road	0.61	0	0.1	0.1
Tenino Road - 3	Chukar Road to US 26	0.69	0	0.12	0.11
Chukar Road	Tenino Road to Quail Trail	0.33	0	0.06	0.06
Quail Trail - 1	Tenino Road to Chukar Road	1.02	0	0.2	0.19

Location Specific Trends

KAI selected two individual intersections for closer analysis based on crash frequency, crash severity, and trends noted in the corridor assessment. The specific locations discussed in more detail include US 26/Paiute Avenue and US 26/Hollywood Boulevard.

US 26/Paiute Avenue Intersection

The US 26/Paiute Avenue intersection is a minor street stop-controlled, four-legged intersection. This is the first major intersection eastbound drivers encounter on US 26 within the Warm Springs area. BIA 3 extends north from US 26 at this location, providing connections to employment locations including the Kah-Nee-Ta Resort and therefore carrying relatively high amounts of traffic. Figure 13 shows the existing intersection configuration.

Eight crashes were reported at this intersection during the study period, including one severe injury crash. The remaining seven crashes did not result in an injury. Rear-end crashes and angle crashes were the most common reported crash types, with three crashes each. The severe crash was an angle crash. There was also one turning movement and one backing crash reported. Two reported crashes occurred during snow conditions; the remainder occurred during dry conditions. One crash occurred during dark lighting conditions.

Directionality of the crashes was further reviewed to determine if one direction was overrepresented in the reported crashes. Among the three reported angle crashes, one crash involved southbound and eastbound vehicles, one crash involved northbound and westbound vehicles, and one crash involved southbound and westbound vehicles. Among the rear-end crashes, two crashes involved southbound vehicles and one crash involved westbound vehicles. The turning movement crash involved westbound and eastbound vehicles. The backing crash involved a southbound and northbound vehicle. The two southbound rear-end crashes may be associated with the sharp curve located on the approach to the intersection.

Figure 13. Existing Intersection Configuration of US 26/Paiute Avenue (Source: Google Maps)

US 26/Hollywood Boulevard/Gas Station Intersection Area

The US 26/Hollywood Boulevard is located a short distance from the driveway area to the gas station. Therefore, this location is reviewed together. Four crashes were reported at this location between 2010 and 2014. In addition, the partial 2015 crash data indicates an additional two crashes that occurred near the gas station driveway.

One of the four reported crashes resulted in a severe injury, and one crash resulted in a minor injury. The remaining two crashes did not result in an injury. The four reported crashes occurred during dry, daylight conditions. Two crashes were reported as turning movement crashes, and two were rear-end crashes. The two turning movement crashes involved vehicles traveling eastbound in conflict with vehicles turning from the south. The two rear-end crashes occurred in the westbound direction.

Figure 14. Existing Configuration of the US 26/Hollywood Boulevard Intersection
Source: Google Maps

NEXT STEPS

The information in this memorandum was presented to the Project Advisory Committee (PAC) at the meeting on September 13, 2016. The information in this memorandum will be used to guide the development of the recommended projects, policies, and programs in the Draft Safety Plan.