US 191 Corridor Study

Four Corners to Beaver Creek

APPENDIX 2:

Existing and Projected Conditions Report

US 191 Corridor Study
Four Corners to Beaver Creek

Existing and Projected Conditions

Technical Memorandum

February 4, 2020

Prepared for:
Montana Department of Transportation

MONTANA MDT DEPARTMENT OF TRANSPORTATION

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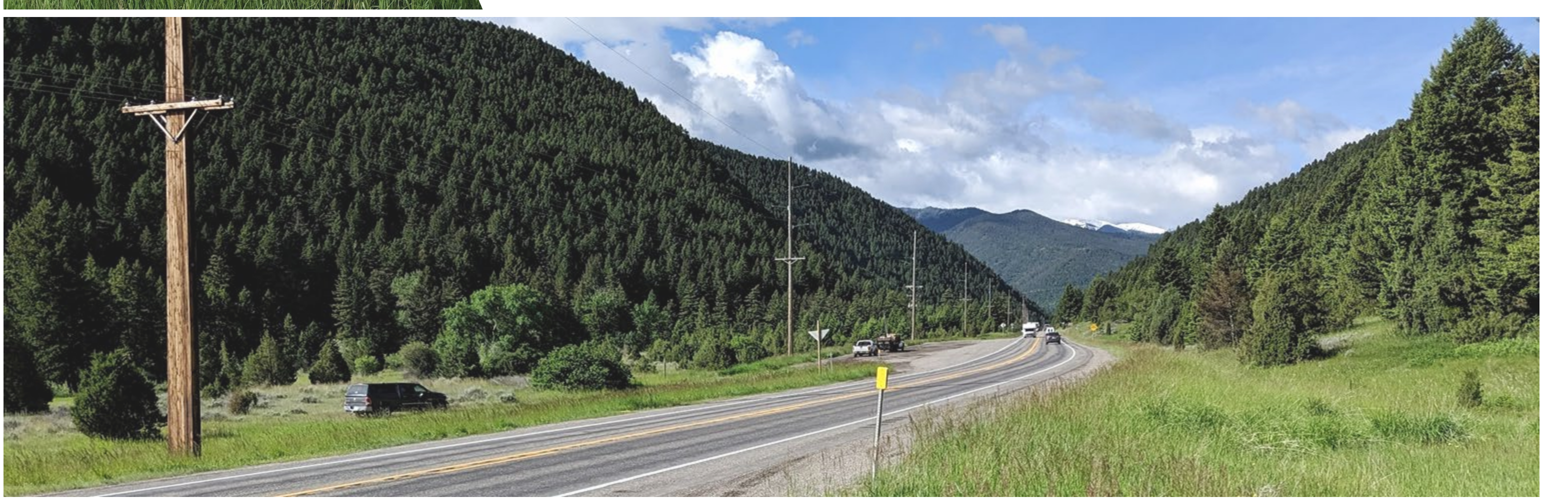

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Existing and Projected Conditions

1.0. INTRODUCTION AND BACKGROUND

The Montana Department of Transportation (MDT) is completing a corridor planning study for US Highway 191 (US 191) between Four Corners and Beaver Creek Road south of Big Sky Canyon Village. The purpose of the *US Highway 191 Corridor Study* is to develop a comprehensive long-range plan for managing the corridor and to identify feasible options to address identified needs. The study is a collaborative process between MDT, the Federal Highway Administration (FHWA), local jurisdictions, resource agencies, and the public.

The intent of this *Existing and Projected Conditions Technical Memorandum* is to evaluate study area existing and projected conditions and to identify transportation and environmental areas of concern for the study corridor. The analyses performed includes a planning-level examination of the corridor based on traffic conditions, future projections, safety, roadway geometrics, field observations, geographical information systems (GIS), and input from local agencies and stakeholders.

1.1. Study Area

The study area for the *US Highway 191 Corridor Study* is located in Gallatin County, Montana between the developed areas of Four Corners and Big Sky. The study corridor includes US Highway 191 (US 191) between the intersection with Huffine Lane/Norris Road/Jackrabbit Lane in Four Corners (Reference Post [RP] 81.9) and the intersection with Beaver Creek Road (RP 45.3) near Ophir School. The study area is shown in **Figure 1.1**.

The study corridor provides access to many popular recreational areas.

US 191 connects the greater Bozeman and Belgrade areas to West Yellowstone and Yellowstone National Park. Within the study area, the highway serves the unincorporated communities of Four Corners, Gallatin Gateway, and Big Sky. The area is highly used by recreationists for hiking, backpacking, camping, rock climbing, rafting, fishing, hunting, skiing, and more. The corridor generally parallels the Gallatin River and provides direct access to the Custer Gallatin National Forest and indirect access to the Beaverhead-Deerlodge National Forest. In addition to providing access to public lands for many recreational visitors and commercial operations, the corridor also serves numerous individual residences, rural subdivisions, and commercial enterprises.

The use of lands accessed by US 191 has historically provided substantial tourism traffic and economic subsistence for the rural communities along the corridor. The corridor is also used by commercial truck drivers and other heavy vehicle traffic. In recent years, the study area has experienced substantial growth which has put considerable strain on existing infrastructure resulting in increased traffic, reduced travel times, and safety concerns. A number of planning efforts and construction projects along US 191 and associated roads have occurred in recent years to help address these concerns. Making improvements to the corridor have been complicated due to physical, financial, and environmental constraints, however.

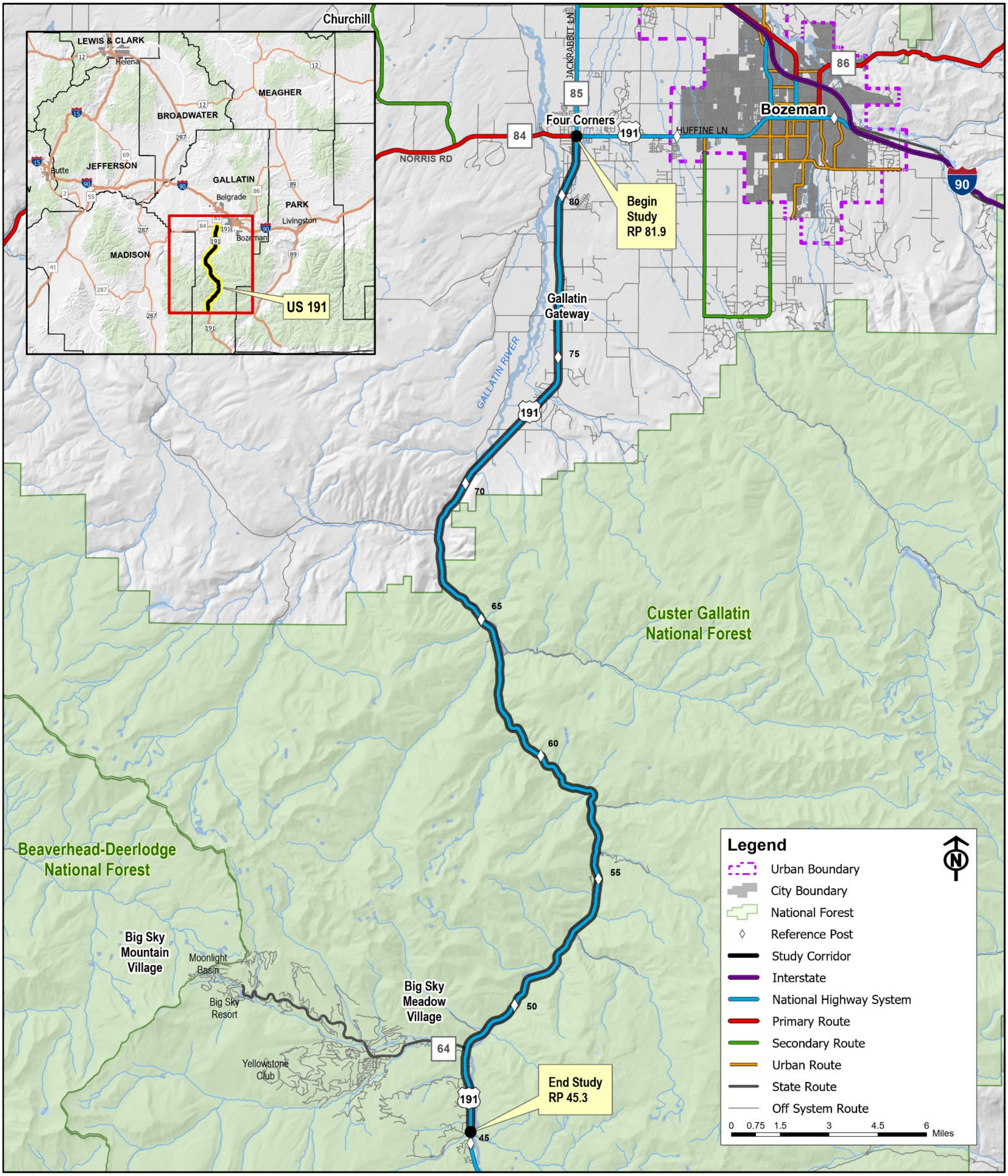


Figure 1.1: Study Area

1.2. Existing Plans and Regulations

Many local plans and regulations exist related to transportation and land use within the study area. Land use policy and development regulation on private lands are governed by Gallatin County. The Four Corners, North Gallatin Canyon, and Gallatin Canyon/Big Sky zoning districts regulate zoning and development within specified areas. Within the National Forest boundary, land use policy and regulations are dictated by the Forest Plan. Other planning documents also exist related to transportation for specific areas or spot locations. The following sections provide a summary of existing relevant planning documents and regulations within the study area.

1.2.1. Gallatin County Planning Framework

The *Gallatin County Growth Policy*[1] generally guides future growth and land development within the county. The most recent adopted version of the growth policy was developed in 2015 as a limited update to the 2003 growth policy. Efforts are currently underway to complete an update to the current growth policy. The document is intended to be used to guide decisions relative to land use and the provision of public facilities and services, as well as the conservation and protection of environmentally sensitive lands. Several goals and policies that reflect community desires with respect to local land use decisions are identified in the growth policy. The growth policy is supported by several other planning documents. The following plans have been adopted under the growth policy and are relevant to the current planning process:

Gallatin Triangle Planning Study (2014)

The *Gallatin Triangle Planning Study*[2] addresses the "triangle" area of the Gallatin Valley, which generally includes the area between Bozeman, Belgrade, and the unincorporated area of Four Corners. The study identifies and provides recommendations to Gallatin County and the communities regarding coordination of planning activities for infrastructure, land use, and public services. It is intended that the analysis and recommendations of the study be used by elected officials, planning boards, and citizens interested in the future of Gallatin County to understand existing conditions of cooperation, opportunities to improve coordination of services, and the value of regional cooperation. A variety of scenarios are provided for the triangle area to predict the impacts of future growth. No recommendations specific to the US 191 study corridor are presented in the plan. Efforts are currently underway to develop a Community Plan for the triangle area.

Gallatin Gateway Community Plan (2011)

The *Gallatin Gateway Community Plan*[3] was originally adopted in 2009 and was revised in 2011. The plan recognizes US 191 as a major transportation route bisecting Gallatin Gateway. The plan acknowledges that as the community grows, necessary improvements should be made to the highway to ensure maximum safety. Gallatin Gateway envisions cooperation with Gallatin County and MDT to ensure that US 191 receives necessary improvements to safely handle increasingly higher traffic volumes while maintaining the character and improving the aesthetics of the corridor. The plan addresses land use and commercial development within the corridor and identifies several improvements as potentially necessary including a traffic signal at the intersection with Mill Street, reduced speed zones, enhanced signage, installation of turn lanes, and expanded pedestrian and bicycle facilities.

Gallatin County Park and Trails Comprehensive Plan (2010)

The Gallatin County Board of Park Commissioners, the Gallatin County Planning Board, and the County Commission all adopted resolutions creating the "Gallatin County Interconnect" – a joint planning effort to consolidate updates to the county's 2001 *Trails Plan* and 1989 *Recreation Plan* into a single master plan known as the *Gallatin County Park and Trails Comprehensive Plan*[4]*.* The goals and polices of the plan support economic growth and development through the stimulation of tourism and the provision of quality of life amenities. Ideally, the development of parks and trails should also minimize impacts on agriculture by providing adequate access to recreation in appropriate areas, while at the same time protecting unique natural and scenic resources.

A past route priority was a paved boulevard trail on the east side of US 191 from the Gallatin Gateway Underpass (RP 76.3) to the intersection with Huffine Lane in Four Corners. Since the adoption of the 2001 *Trails Plan*, a 9-foot wide paved trail from the Gallatin Gateway underpass to Zachariah Lane has been constructed to help implement this trail priority. Approximately four miles remain to complete the trail connection into Four Corners. Continued public use has created a warn path adjacent to the shoulder on the west side of US 191, informally connecting Gallatin Gateway to Four Corners.

Several other priority facilities and routes were identified for the Gallatin Gateway area including improvements to recreational access and safety improvements for pedestrians. Pertinent to the study corridor, the plan recommends improved safety and signage at Zachariah Lane, Gooch Hill Road, Cottonwood Road, and the Little Bear Subdivision. A safe crossing of US 191 at Little Bear Road is also recommended.

Four Corners Community Plan (2006)

The *Four Corners Community Plan*[5] supports new development within the Four Corners planning area compatible with the existing neighborhood and environment. The plan seeks to manage growth to maintain the small-town character of the area. With respect to transportation infrastructure, the plan identifies several strategies to support a comprehensive transportation system including extending separated pedestrian and bicycle facilities, mitigating excessive traffic speeds, improving local traffic flows, supporting opportunities to separate local traffic from through traffic, and providing adequate parking for commercial, public transportation, and carpooling purposes. Project specific recommendations are not included in the plan.

Gallatin Canyon/Big Sky Plan (1996)

The *Gallatin Canyon/Big Sky Plan*[6] combines and updates the work contained in the *Big Sky Master Plan* and *Gallatin Canyon Study*, both completed in 1972. The plan addresses the area generally bounded by Karst Ranch (RP 56) and Rainbow Road (RP 43). The area spans Gallatin County to both the east and west. Information about existing and future land uses, population and demographics, infrastructure, and the physical environment are discussed. The plan also defines a set of comprehensive goals and strategies which present a vision for the future of the zoning district and reflect the needs and desires of the community. Specific to US 191, the plan provides strategies which including supporting lower speed limits, no passing zones, and increased traffic monitoring on the highway. The land use/zoning map in the document has since been updated and is discussed further in **Section 1.2.4**.

1.2.2. National Forest Planning Framework

The *Custer Gallatin National Forest Plan Revision*[7] guides all natural resource management activities and establishes management standards for the Custer Gallatin National Forest. The plan provides for the social, economic, ecological sustainability, and multiple uses of the Custer Gallatin National Forest lands and resources. It describes resource management practices, levels of resource production and management, and the availability and suitability of lands for resource management within the forest. Travel management on specific roads, trails, and motorized areas within the forest is addressed in the *Gallatin National Forest Travel Management Plan*[8]. However, US 191 is not under Forest Service jurisdiction and is therefore not directly included in the travel management plan.

1.2.3. Other Plans and Studies

Several other planning efforts have been conducted in and near the study area. The following sections summarize the past plans and studies with relevance to the current planning efforts.

Big Sky Trails Master Plan (2018)

The *Big Sky Master Trails Plan*[9] serves as a guide for the development of an interconnected trail system aimed at enhancing recreation and transportation opportunities for Big Sky residents and visitors. The plan recommends several trail connections including three in the vicinity of the study corridor. Connector trails were recommended from the Meadow Village Trail System to the US 191/MT 64 intersection and from the US 191/MT 64 intersection to Dudley Creek. A trail connecting Town Center to US 191 near Ophir School and Lone Peak High School is recommended. A trail along either the east or west bank of the Gallatin River between Porcupine Creek and the US 191/MT 64 intersection to provide fishing accesses is also recommended.

Big Sky Spur Left-turn Signal Review (2017)

MDT completed a left-turn signal review[10] in 2017 for the intersection of US 191 and MT 64 (RP 48). The review investigated inadequate signal phasing at the intersection to determine if a right-turn overlap in the southbound direction would improve intersection operations. The northbound left-tun lane was reported to not have adequate time for the queue to clear. Based on the results of the study, MDT recommended installation of protected/permissive left-turn phasing in the northbound direction. The study recommended a right-turn overlap phase in the eastbound direction but did not recommend the right turn overlap in the southbound direction. Installation of countdown pedestrian signals for the crossing on MT 64 as well as ADA modifications were also recommended in the study.

Big Sky Transportation Study (2017)

The *Big Sky Transportation Study*[11] addresses the growing demand on the community's roads and the rest of the transportation system supporting it. The transportation study is primarily focused on the MT 64 corridor between US 191 and Big Sky. Although MT 64 is owned and maintained by MDT, it is an off-system route and therefore has maintenance funds but no dedicated source for highway improvements. This, coupled with recent growth, presents a unique situation wherein the community does not have a dedicated source of funding for transportation improvements on one of its main roads.

Of particular concern to the *US 191 Corridor Study* is the proposed improvements at the US 191/MT 64 intersection. The study recommends that the signal timing be adjusted to include northbound dedicated left-turn phasing, installation of lane designation signs, and installation of southbound shoulder hatching on US 191. Also recommended is relocation of the Conoco and Chamber of Commerce accesses to the west side of the property to reduce turning movement conflicts and make room for installation of left-turn lanes on the MT 64 leg of the US 191/MT 64 intersection. These improvements are pending from a $10.3 million TIGER grant awarded to Gallatin County on behalf of Big Sky. The TIGER grant will also enable the Big Sky Transportation District to buy four motor coaches and six vans for the Skyline Bus, which provides service between Bozeman and Big Sky.

Appendix A of the Transportation Study details the input received from community meetings hosted as part of the public participation process. Comments regarding US 191 from RP 49 to 42.9 consist of concerns regarding speeds and set speed limits, the US 191/MT 64 intersection, distracted driving, and wildlife crossings. Additionally, many comments were made regarding the turnouts on US 191 between Gallatin Gateway and Big Sky including drivers not using turnouts, no advanced warning signing for turnouts, turnouts being too small, and people using turnouts for fishing access. Other comments made at public meetings were made regarding the amount of truck traffic using US 191 as a through route and concerns about hazardous materials being transported on US 191.

Four Corners MCS Scale Site Traffic Study (2015)

In 2015 MDT developed the *Four Corners MCS Scale Site Traffic Study*[12] which evaluated the operations of the MDT Motor Carries Services (MCS) Scale site at Four Corners. The site has two access points and accommodates bidirectional circulation within the site (i.e both northbound and southbound trucks can access the site). Concerns regarding safety, intersection and corridor operations, scale site congestion, and driver confusion were mentioned and evaluated in the study. The preferred alternative recommends that the northern access accommodate ingress movements and the southern access be used for egress movements only so that all internal traffic would be one-way, thereby eliminating head-on conflicts within the site. Construction of a slip ramp for southbound truck ingress movements would allow faster highway exit speeds and also provide additional off-road storage for the scale lane queues. Minor modifications to the southern access geometry are also recommended to allow trucks a better entry angle to US 191, improving the line of sight for trucks drivers and reducing out of lane encroachment. These improvements are recommended to be completed in the interim, with future relocation of the scale site being necessary for accommodating future traffic volumes.

Gallatin Canyon River Access Site Assessment (2015)

The *Gallatin Canyon River Access Site Assessment*[13] examined 40 miles of the Gallatin River between the Yellowstone National Park boundary and Spanish Creek (RP 31.1 to 68.1). The site assessment mapped over 100 access points along the river/corridor used for fishing, floating, and other water recreation. The points identified included user-created "go downs" off US 191; MDT, USFS, and user-created turnouts off US 191; trailheads; parking areas; campgrounds; and USFS river access sites. Local fishing outfitters and rafting companies, along with individuals from the rafting and kayaking communities, provided input on river access site usage. Over 70 of the identified access points are within the *US 191 Corridor Study* area. For each river access site, the usage type, access type, and potential treatments to improve the site were identified.

Bighorn Center Left-Turn Lane Study (2014)

MDT completed a left-turn lane study[14] in 2014 for the Bighorn Center located at RP 48.3. The Bighorn Center is a strip mall located on the west side of US 191 just north of MT 64. The study investigated the need for a northbound left-turn lane on US 191 for the Bighorn Center. The study included consideration of traffic operations, crash history, and field observations. It was determined that a left-turn lane would not address existing operational or safety issues. It was recommended that if a left-turn lane is pursued at this location, that the four-foot shoulder width be maintained on US 191 therefore requiring additional roadway width. A left-turn lane has not been installed at this location since completion of the study.

Gallatin Canyon Safety Improvements (1996 – 2014)

MDT originally initiated a safety improvement project for US 191 in 1996 in response to safety concerns and crash trends. Safety improvements were proposed in three phases. The first phase was completed in 1998 and involved installation of new signs, upgrades to existing signs, continuous snowpole delineation, epoxy striping, installation of new guardrail, and upgrades to meet current guardrail standards.

The second phase, evaluated in the *Gallatin Canyon: Slope Flattening/Widening Environmental Assessment*[15] and accompanying *Finding of No Significant Impact*[16], proposed improvements at 10 locations on US 191 between RP 32 and 70. Improvements included turn lanes, shoulder widening, slope flattening, clear zone improvements, improved sight distance, new and upgraded guardrail, and bridge replacements. The recommended improvements addressed the primary needs to improve safety and reduce roadway deficiencies. These improvements were implemented in 2014.

Safety improvements proposed for the third phase include adding passing lanes in several locations in the canyon. Based on public concerns regarding the potential for increased traffic speeds through the canyon as a result of passing lanes, the third phase of the project is under review and it has not yet been advanced.

1.2.4. Zoning Regulation

Zoning regulation within Gallatin County is dictated by individual community zoning districts. The US 191 Corridor Study area falls within the Four Corners, North Gallatin Canyon, and Gallatin Canyon/Big Sky zoning districts. All of the zoning districts have prepared formal zoning regulations which have been adopted by Gallatin County.[17] The Gallatin Gateway area does not have a designated zoning district, but land uses in the area are assigned and carried out by the *Gallatin Gateway Community Plan*. The zoning and land use in the study area is as follows.

The Four Corners neighborhood zoning jurisdiction includes the part of the study area which begins at the intersection of US 191/Huffine Lane/Norris Road/Jackrabbit Lane (RP 81.9) and continues south for approximately three miles (RP 79). The land immediately adjacent to US 191 is zoned as commercial use. Behind the commercial development, the land is zoned for mixed use, and further from the roadway, rural residential and agricultural land uses.

The Gallatin Gateway neighborhood planning area generally begins at Zachariah Lane and extends south to Little Bear Spur (about RP 78 to 73.5). Adjacent to US 191 from Zachariah Lane to Gooch Hill Road (RP 78 to 77), the area is designated as part of “Highway North” which allows commercial and mixed commercial/industrial land uses. Between Gooch Hill Road and Cottonwood Road (RP 77 to 76) the land adjacent to US 191 is designated as part of the “Core” of town and does not call out specific land use requirements. Land extending from Cottonwood Road south for one mile (RP 76 to 75) is part of the “Southern Highway District” as called out in the Community Plan. This area will allow commercial development along US 191. South, to the end of the planning boundary, the land is already developed and is encompassed within the “Existing Development” general land use category.

The North Gallatin Canyon Zoning District extends from Gateway South Road to Luhn Lane (approximately RP 70 to 64). Although the district is designated with a jurisdictional boundary, it does not have formal land use designations documented. This zoning district was designated with the primary purpose of establishing regulations for highway signing, including billboards.

The Gallatin Canyon/Big Sky Zoning District begins at approximate RP 56, just north of Karst’s Camp and extends south about 15 miles to the Red Cliff Campground. Within the US 191 study area, USFS lands are designated as public land use. The Karst’s Camp area is zoned as residential cluster single family with a small section of commercial and industrial mixed land use. Community facilities are located at the MT 64 intersection (RP 48) where the Big Sky Chamber of Commerce is located, and at the Beaver Creek intersection (RP 45.3) where Ophir School and Lone Mountain High School are located. A pocket of low-density residential cluster single family land use is located just north of the MT 64 intersection (between RP 51.5 and 49.5). Surrounding the MT 64 intersection, lands on the west side of US 191 are zoned as community commercial, on the east side of US 191 lands are zoned as residential single family. South of the intersection (between RP 48 and 46.5) the adjacent lands are zoned as commercial use. Between Cummings Lane and Beaver Creek Road, the adjacent lands are primarily designated as residential single-family use varying in density. A zoning map is provided in the *Environmental Scan* (**Appendix F**).

1.3. Past, Current, and Planned Projects

US 191 was originally paved and constructed in its current state in the mid-to-late 1950s as West Gallatin Highway. Several projects within the study corridor have taken place over the past 60 years. Those projects consist of a variety of work including resurfacing or reconstruction with slope flattening, widening, the addition of turn lanes, guardrail, striping, signing, and other safety improvements.

The MDT online summary of road and bridge construction projects awarded since July 23, 1987, was reviewed to identify projects previously implemented on US 191 within the study area. Since 1987, MDT has completed 17 projects along the corridor. **Table 1.1** lists these projects along with a brief description of the scope of the project.

Table 1.1: MDT Projects on US 191 Since 1987

Name	Project ID	Letting Year	Description
Guardrail 3 Locations District 2	HES 4141(39)	1988	Guardrail installation
Gallatin Canyon—Gallatin County	HES 50-2(26)63	1991	Guardrail installation
Gallatin Gateway—North & South	NH 50-2(29)70	1992	Widening and resurfacing
S. Of Spanish Creek—Gallatin County	STPHS 50-2(32)68	1994	Slope flattening
Bozeman-Four Corners	STPP 50-2(25)82	1994	Resurfacing
Safety Improvements—Gallatin Canyon	STPHS 50-1(15)8	1998	Safety improvements
Gallatin Gateway N&S	NH 50-1(19)70	2002	Seal and cover (RP 70.2-73.3 and RP 74.4-81.9)
Turnbays—S of Gallatin Gateway	NH 50-2(38)73	2004	Left turn lanes at Little Bear Creek Rd and Wilson Creek Rd
US 191/MT 64 Int Imp—E Big Sky	HSIP 50-2(58)50	2006	Intersection improvements
Slope Flattening – Widening – Gallatin Canyon	NH-HSIP 50-1(17)45	2008	Slope flattening, turn lanes, guardrail
Erosion Prot—Gallatin Canyon	NH 50-2(53)55	2008	Erosion control (retaining walls and structures)
North Gallatin Canyon	NH 50-2(65)65	2009	Resurfacing
N Gallatin Canyon—Four Corners	NH 50-2(67)70	2011	Resurfacing
Gallatin Canyon/Big Sky	SFCN 50-2(74)48	2011	Aesthetic Timber Facing
Turn Lanes – Gallatin Canyon	NH 50-1(28) 42	2012	Grade, widening, added turn lanes
Four Corners—North	NH-NHTSA-HSIP 85-1(10)0	2012	Reconstruction with added capacity
Guardrail Upgrade—Gallatin	NH-G 50-2(83)56	2019	Guardrail replacement and erosion treatment along river

Source: MDT Awarded Projects Search: https://app.mdt.mt.gov/project-search/project/search

The Montana 2019-2023 *Surface Transportation Improvement Program* (STIP) is a federally required publication that shows funding obligations over the next five years. This program identifies improvement projects to preserve and improve Montana's transportation system. The *Montana 2019-2023 STIP*[18] identifies the following future projects for US 191 within the study area:

- **Turnbay – North of Gallatin Gateway (RP 76.8):** Intersection improvements at the intersection of US 191 and Gooch Hill Road. Improvements include a right-turn lane on US 191 for northbound vehicles at Gooch Hill Road.

- **SF 179 Gallatin Canyon VMS:** Safety improvements through Gallatin Canyon. Improvements include installation of permanent variable messaging signs (VMS) to notify drivers of real-time roadway conditions and emergency situations. Preliminary locations for the VMS boards are in the Big Sky area (RP 47 - 48) and near Gateway South Road (RP 70.3 – 71.5).
- **S of Spanish Creek – S (RP 61.4 to 65.2):** Pavement rehabilitation on a 3.8-mile segment of US 191 between Storm Castle Road and Cascade Creek Road.
- **Bridge Decks Hwy 64 Big Sky:** Bridge rehabilitation on MT 64, Bridge #5905 on US 191 over the Gallatin River (RP 49.8) is included in this project. The bridge deck is to be resurfaced (mill and overlay).
- **HSIP Program:** Miscellaneous safety improvements across the MDT Butte district. Specific projects have not yet been defined, projects may or may not be completed on US 191 through this program.

In addition to the projects programmed by MDT, Gallatin County, on behalf of Big Sky, will complete a project at the MT 64/US 191 intersection. The project will be fully funded by a TIGER grant. The project will include installation of northbound lead left-turn phasing at the existing signal. Several other roadway improvement projects will be funded by the TIGER grant but occur on MT 64, not the study corridor.

1.4. Planned Developments within Study Area

There are currently four new developments proposed within the study area. US 191 is the main access for all developments. Completion of these developments may have an impact on traffic operations and conditions of the study corridor. In some cases, traffic mitigations have been proposed as conditions to the applications. A summary of these developments is provided in the following sections.

Quarry Subdivision

A Planned Unit Development (PUD) and attached multi-family housing is being proposed along US 191 north of Michener Creek Road (RP 47.1). The property currently contains an active gravel pit. The proposed PUD consists of 23 lots (12 residential lots and 11 commercial lots), 135 single-family dwelling units, 130 multi-family dwelling units, and 170,000 square feet of commercial space. The application proposes three accesses onto US 191 including the existing access to the gravel pit currently at this location. The existing shared use path along US 191 is maintained in the site plan, and several trails throughout the property are also proposed. A Traffic Impact Study (TIS) will be prepared to determine what traffic mitigation will required by this development.

Blackfoot Hills

Blackfoot Hills is a new development planned at RP 47. No traffic mitigation is anticipated at this site as the improvements made by the Quarry Subdivision will likely satisfy traffic needs.

Gateway Village

Gateway Village is a large 600 parcel subdivision on US 191 just south of Gallatin Gateway. Traffic mitigation for this subdivision requires the developer to install a two-way left turn lane between Cottonwood Road and Mill Street (RP 75.83 to 76.20). The project is scheduled for 2020.

Firelight Minor Subdivision

A minor subdivision is being proposed adjacent to US 191 south of Wilson Creek Road (RP 73.4). The proposed development includes a five-lot commercial subdivision with three lots being for commercial condominiums. Primary access to the property will be provided via Wilson Creek Road. The development is currently in the preapplication stage.

2.0. DEMOGRAPHICS

This section provides an overview of socioeconomic characteristics of the study area. Demographic and socioeconomic information was reviewed to help determine recent trends in population, age distribution, employment, economic status, and commuting for area residents. Historic and recent trends in area demographics help define existing conditions and aid in forecasting techniques, as there is a direct correlation between motor vehicle travel and socioeconomic indicators. Note that socioeconomic data sources often lag considerably behind the actual years of interest. This analysis presents the most recent data available and indicates recent and potential changes in the area.

2.1. Population

A review of demographics within the study area is appropriate to gain an understanding of historical trends in population and characteristics of the population relevant to transportation planning. Understanding population composition is necessary, as the data may influence the types of improvements identified. For example, an aging population may indicate a need for specific types transportation improvements such as transit services and/or non-motorized infrastructure improvements. The presence of a disadvantaged population may warrant other considerations.

2.1.1. Historic Population Trends

Gallatin County has been, and continues to be, one of Montana's fastest growing counties. The county grew by more than 57,000 residents between 1970 and 2010—representing a 175 percent overall increase in population. With the exception of the 1980s, the county's population increased by more than 30 percent every decade since 1970. The City of Bozeman, northeast of the US 191 corridor, also experienced significant growth between 1970 and 2010 when its population doubled from 18,670 to 37,280 residents. For comparison, the population of the US and Montana grew by about 52 and 42 percent, respectively, between 1970 and 2010. **Table 2.1** shows historic and estimates of current population for Gallatin County, the City of Bozeman, the State of Montana, and the US.

Table 2.1: Population Change Since 1970

Area	1970	1980	1990	2000	2010	2018 Estimate(i)	Growth (ii) (1970-2018)
Gallatin County	32,205	42,865	50,463	67,831	89,513	111,876	2.6%
Unincorporated County Areas	9,768	15,914	21,231	30,293	40,184	49,094	3.4%
City of Bozeman	18,670	21,645	22,660	27,509	37,280	48,532	2.0%
State of Montana	694,409	786,690	799,065	902,195	989,415	1,062,305	0.9%
United States	203,392,031	226,545,805	248,709,873	281,421,906	308,745,538	327,167,434	1.0%

(i) Estimate as of July 1, 2018
(ii) Compound Annual Growth Rate (CAGR)
Source: US Census Bureau, Current Estimates Data available from American Fact Finder.

Since 2010, Gallatin County's population has grown by 25 percent and is now estimated at nearly 112,000 residents. About 44 percent of the County's population currently resides in unincorporated areas and 43 percent of the population resides in Bozeman. Gallatin County grew by 2.6 percent per year on average between 1970-2018 period. Unincorporated areas of the county grew even faster at 3.4 percent per year. During the same 48-year period, the populations of Montana and the nation grew at a rate of about 1 percent per year, well below the rates seen for geographies in Gallatin County.

2.1.2. Recent Population Trends for the Study Area

The study area for the study corridor lies within County Census Tracts 12 and 16 and crosses portions of the Four Corners Census Designated Place (CDP), Gallatin Gateway CDP, Big Sky CDP. A CDP is a concentration of population defined by the US Census Bureau for statistical purposes only. Census Tract 12 extends from Four Corners (Huffine Lane) to Spanish Creek Road and includes the Four Corners and Gallatin Gateway CDPs. Census Tract 16 extends from Spanish Creek Road to the Yellowstone National Park boundary south of the Big Sky and includes the Big Sky CDP.

To better understand growth trends in this part of Gallatin County, population data was obtained from the US Census Bureau and American Community Survey (ACS)[19] for the various census geographies in the study area. **Table 2.2** shows total population and growth statistics for Census Tracts 12 and 16, the Four Corners CDP, Gallatin Gateway CDP, and Big Sky CDP (which includes a portion of Madison County). These statistics are compared with Gallatin County and the State of Montana.

Table 2.2: Population Growth Since 2000

Location	Population (2000)	Population (2010)	Percent Growth (2000-2010)	Current Population (2018 Estimate)	Percent Growth (2010-2018)	CAGR (2010–2018)
Montana	**902,195**	**989,415**	**9.7%**	**1,062,305[(ii)]**	**7.4%**	**0.9%**
Gallatin County	**67,831**	**89,513**	**32.0%**	**111,876[(ii)]**	**25.0%**	**2.8%**
Census Tract 12	3,723	4,839	30.0%	5,280[(iii)]	9.1%	1.1%
Four Corners CDP	1,828	3,146	72.1%	4,051[(iii)]	28.8%	3.2%
Gallatin Gateway CDP	[(i)]	856	--	892[(iii)]	4.2%	0.5%
Census Tract 16	[(i)]	2,195	--	2,625[(iii)]	19.6%	2.3%
Big Sky CDP	1,221	2,308	89.0%	2,904[(iii)]	25.8%	2.9%
Unincorporated Areas of Gallatin County	30,293	40,184	32.7%	49,094	22.2%	2.5%

[(i)] Census Tract 16 and the Gallatin Gateway CDP were created after the 2000 Census; thus, data is not available prior to the 2010 Census.
[(ii)] US Census Bureau, Annual estimates of population as of July 1, 2018.
[(iii)] Estimated population per ACS 2013-2017; Estimated population shown is assumed to be the 2017 value.

Since 2010, portions of Gallatin County crossed by the study corridor have seen significant growth. The populations of Census Tracts 12 and 16 grew by 1.1 and 2.3 percent per year, respectively, since 2010. Growth in both the Four Corners CDP and Big Sky CDP is estimated to be around 3.0 percent per year since 2010. However, the Gallatin Gateway CDP showed slower growth with an estimated growth of 0.5 percent per year since 2010. The data shows the population of Gallatin County has generally grown at an annual rate of around 2.8 percent. This growth rate is more than three times higher than that seen by Montana as a whole.

2.1.3. Population Characteristics

Table 2.3 shows the race and ethnicity characteristics in Gallatin County, Census Tracts 12 and 16, and the Four Corners, Gallatin Gateway, and Big Sky CDPs based on the ACS estimates for the 2013-2017 period for these selected geographies. Similar statistics are provided for the State of Montana for comparison purposes. The ACS data are period estimates meaning they represent the characteristics of the population and housing over a specific data collection period (in this case 5 years). For this reason, the total populations shown differ from those recorded during the 2010 Census. The percentages listed for ethnic groups presented in the table may not match the Census total percentages and percentages may not add up to 100 percent.

The populations of Gallatin County and its geographic subareas are predominately white with percentages of minority populations generally at or lower than those seen for the State of Montana. The racial and ethnic composition of population in Census Tract 16, which includes the Big Sky CDP, varies somewhat from that of Gallatin County and the state as the areas include higher percentages of Hispanic/Latinos residents.

Table 2.3: Population Characteristics (2013-2017)

Characteristics of Population	Census Tract 12	Four Corners CDP	Gallatin Gateway CDP	Census Tract 16	Big Sky CDP	Gallatin County	State of Montana
RACE/ETHNICITY							
White (alone or in combination)	99.3%	98.4%	99.4%	99.1%	98.3%	96.7%	91.6%
Black or African American	0.1%	-	0.6%	0.2%	0.7%	0.3%	0.4%
American Indian/Alaska Native	0.3%	0.3%	-	-	0.4%	1.0%	6.5%
Asian	0.2%	-	-	0.6%	0.6%	1.3%	0.7%
Native Hawaiian/Pacific Islander	-	-	-	-	-	-	0.1%
Some Other Race	-	1.3%	-	-	-	0.6%	0.5%
Two or More Races	1.3%	0.9%	3.8%	0.4%	2.8%	2.1%	2.8%
Hispanic/Latino (of any race)	1.9%	4.0%	0.6%	7.5%	7.7%	3.3%	3.6%
EJ Minority Population(i)	2.5%	4.3%	1.2%	8.3%	9.4%	5.9%	11.3%
AGE DISTRIBUTION							
% under 18 years old	24.9%	29.6%	22.5%	20.6%	20.1%	20.4%	22.0%
% 18-64 years old	61.1%	59.8%	63.0%	69.0%	70.5%	68.2%	60.9%
% 65 years and older	14.0%	10.6%	14.5%	10.4%	9.4%	11.4%	17.1%
Median Age	38.7	35.8	41.2	36.7	34.2	33.4	39.8
DISABLED POPULATION							
% Persons with a Disability	7.1%	5.1%	8.6%	3.0%	3.9%	7.6%	13.6%
% Disabled (18 and under)	0.8%	1.5%	1.0%	0.0%	2.9%	2.6%	3.8%
% Disabled (65 and older)	24.5%	15.8%	41.1%	10.6%	8.5%	25.1%	34.6%
TOTAL POPULATION	**5,280**	**4,051**	**892**	**2,625**	**2,904**	**100,733**	**1,029,862**

(i) Environmental Justice Minority Population includes Black or African Americans, Hispanic or Latinos of any race, American Indian and Alaska Natives, Asians, and Native Hawaiian and Pacific Islanders.

The ACS data shows Gallatin County's population is younger when compared to all Montana residents. The age distribution data shown in **Table 2.3** indicates the county has a lower share of young residents (under 18 years) and has a lower share of residents aged 65 years and older than the state. The Big Sky CDP had the lowest percentages of residents under 18 years and residents over age 65 of the geographies reviewed for this study. The median age of County residents is about 6.5 years less than that for all residents of the state. Within the county, the median age of residents living in Census Tract 12 and the Gallatin Gateway CDP is higher than for other county areas.

The 2013-2017 ACS data for Gallatin County and the other county geographies was reviewed to obtain information about the number of residents with disabilities (which include hearing or vision difficulties, cognitive difficulties, and ambulatory difficulties). This information is important to review since segments of the population with disabilities may require special accommodations for transport or unique considerations in the design of transportation infrastructure. The ACS data showed the percentages of Gallatin County residences with one or more disabilities was well below that for all residents of the state. The share of residents age 18 and under and residents 65 years and older with disabilities in the county was also generally lower than for all Montana residents. Within the Gallatin Gateway CDP, the percentage of disabled residents age 65 and older was well above the percentages seen for all residents of the county and the state.

2.1.4. Population Projections

In April 2013, the Montana Department of Commerce Census & Economic Information Center released county-level population projections through 2060. The projections were developed by Regional Economic Models Inc. (REMI) for the state and all counties using the firm's eREMI model. Projections for Gallatin County, based on the model, estimate the county's population to be 120,920 by 2040.

The 2017 *Bozeman Transportation Master Plan*[20] includes a comprehensive summary of population projections for Gallatin County through 2040 based on information from numerous local planning documents and projection sources. The summary estimated 2040 populations for the county ranging from a low of about 122,000 to more than 220,000 with annual growth rates ranging from 1 to 3 percent. The plan assumed an annual growth rate of about 2.3 percent which resulted in a projected 2040 population for Gallatin County of around 176,200.

A report titled *Demographic and Real Estate Market Assessment*[21] was prepared in January 2018 to help inform the city of Bozeman's *Growth Policy Update* process. The report examined demographic trend information and projected Gallatin County's population to be 151,200 by 2040 using an annual growth rate of 1.5 percent.

2.1.5. Housing Characteristics

Table 2.4 presents information about housing occupancy and tenure for Montana, Gallatin County, and the US 191 corridor study area. According to the 2013-2017 ACS data, about 16 percent of housing units in Montana are vacant, and about 53 percent of those units are considered season, recreational, or occasional use. Gallatin County had 46,600 housing units, including 40,723 occupied units and 5,877 vacant units (about 14 percent). Countywide, about 53 percent (3,088) of the vacant housing units were considered seasonal, recreational, or occasional units. Census Tract 12 and the Four Corners CDP showed high percentages of owner-occupied units while the Gallatin Gateway CDP and Census Tract 16 (including the Big Sky CDP) showed higher shares of rental units. Approximately 72 percent of the total housing units in the Big Sky CDP (2,622) were shown as vacant housing units with 75 percent (1,955) identified as seasonal, recreational, or occasional units.

Table 2.4: Housing Occupancy and Tenure (2013-2017)

Area	Total Housing Units	Occupied Housing Units			Vacant Housing Units	
		Total Occupied	Owner Occupied	Renter Occupied	Total Vacant	Seasonal, Recreational, Occasional Use
Montana	501,099	419,975	284,168	135,807	81,124	43,186
Gallatin County	46,600	40,723	25,089	15,634	5,877	3,088
Census Tract 12	2,337	2,072	1,595	477	265	144
Four Corners CDP	1,619	1,478	1,213	265	141	29
Gallatin Gateway CDP	426	365	259	106	61	19
Census Tract 16	2,362	1,017	671	346	1,345	1,169
Big Sky CDP	3,651	1,029	727	302	2,622	1,955

2.1.6. Personal Travel and Commuting Characteristics

Information about the number of workers (16 years and older) and their commuting characteristics is also available from the ACS. The ACS information provided estimates of the total share of workers who commute or work at home, transportation modes used by commuters, and mean travel times to work for commuters. **Table 2.5** presents commuting characteristics for workers in Gallatin County and Census Tracts 12 and 16. Similar statistics for the State of Montana is provided for comparison.

The table shows that 96 percent or more of residents in occupied housing units within Gallatin County and Census Tracts 12 and 16 had access to at least one vehicle. This is slightly higher than seen for residents of all occupied housing units in Montana.

Table 2.5: Mode of Transportation to Work (2013-2017)

Subject	Census Tract 12	Census Tract 16	Gallatin County	State of Montana
% Occupied Households with Access to 1+ Vehicle	**97.9%**	**99.1%**	**96.3%**	**94.9%**
Number of Workers 16 Years and Older	2,676	1,527	55,572	490,818
% Who Commuted to Work	83.9%	92.3%	92.9%	93.6%
% Who Worked at Home	16.1%	7.7%	7.1%	6.4%
Drove alone, car, truck, van	71.0%	69.8%	73.6%	75.6%
Carpooled	9.8%	13.5%	9.3%	9.7%
Public Transportation (excluding taxicabs)	0.2%	2.6%	0.4%	0.8%
Walked to Work	2.2%	4.4%	5.9%	5.1%
Other means of commuting	0.7%	2.0%	3.7%	2.4%
Mean Travel Time to Work	**21.2 min**	**18.1 min**	**17.7 min**	**17.8 min**

According to ACS data for the 2013-2017 period, 83 percent of the commuting workers in Gallatin County rely on personal vehicles or carpools for transportation to work destinations. The share of workers in the county who drove alone to work is slightly below that seen for the state and nation. The share of workers who walked to work or used other means to commute is also higher in Gallatin County and Census Tract 16 (which includes the Big Sky area) than that seen for Montana. Workers in Gallatin County and Census Tracts 12 and 16 have similar or slightly longer commute times than seen elsewhere in the state.

2.2. Economic Conditions and Income Characteristics

2.2.1. Gallatin County Employment Trends

Gallatin County is Montana's fourth most populous county, while Bozeman, the county seat, is the state's fourth largest city. The economy of Gallatin County is diverse with services and technology, construction, finance and real estate, manufacturing, wholesale and retail trade, and government, all playing notable roles. Bozeman's transition into a regional trade and service center provides a solid basis for continued economic growth.

Employment by industry for Gallatin County for milestone years between 1980 and 2017 is represented in **Table 2.6**. The most recently available data shows that total full and part-time employment in the county was 85,030 in 2017, 98 percent of which were non-farm related employment. Total full and part-time employment in Gallatin County grew at a rate of approximately 3.8 percent per year over the 37-year period.

Table 2.6: Employment Trends for Gallatin County (1980–2017)

Employment	1980	1990	2000	2010	2017	Change (1980-2017)	
						Net Change	CAGR
Total Full/Part time Employment	**21,731**	**31,744**	**51085**	**65,353**	**85,030**	**63,299**	**3.8%**
Farm Employment	1,075	1,128	1,377	1,200	1,378	303	0.7%
Non-Farm Employment	20,656	30,616	49,708	64,153	83,652	62,996	3.9%
Employment by Industry							
Agricultural Services & Forestry	180	363	824	524	592	412	3.3%
Mining	106	175	171	496	588	482	4.7%
Construction	1,222	1,782	4,743	5,591	8,546	7,324	5.4%
Manufacturing	1,325	2,021	3,118	2,648	4,206	2,881	3.2%
Transportation & Public Utilities	772	1,025	1,509	1,376	1,995	1,223	2.6%
Wholesale Trade	551	1,094	1,677	1,701	2,155	1,604	3.8%
Retail Trade	4,311	6,263	10,614	8,112	9,736	5,425	2.2%
Finance, Insurance & Real Estate	1,633	2,316	3,508	7,210	9,325	7,692	4.8%
Services	4,461	8,408	15,037	25,747	35,011	30,550	5.7%
Federal & Civilian Government	567	610	580	670	578	11	0.1%
Military	279	404	374	447	479	200	1.5%
State & Local Government	5,249	6,155	7,553	8,735	9,380	4,131	1.6%

Source: US Department of Commerce Bureau of Economic Analysis – Table CAEMP25

Table 2.6 shows that between 1980 and 2017, the most notable net increases in employment in Gallatin County occurred in the services industry, where the total number of jobs increased by 30,550. Other industry sectors showing sizable increases in employment since 1980 include: finance, insurance and real estate (net gain of 7,692 jobs); construction (net gain of 7,324 jobs); retail trade (net gain of 5,425 jobs); state and local government (net gain of 4,135 jobs); and manufacturing (net gain of 2,881 jobs). No declines in employment were seen in any of the industry categories; however, the military, federal and civilian government, agricultural services, and mining sectors each added fewer than 500 jobs in the county over the 1980 to 2017 period.

Table 2.7 compares estimated employment by industry for Gallatin County, Census Tract 12 (includes the Four Corners and Gallatin Gateway areas) and Census Tract 16 (includes Gallatin Canyon and Big Sky areas) based on ACS data for the 2013-2017 period. Census Tract 12 is estimated to have higher percentages of workers in the construction, finance and real estate, and agricultural industries than the county as a whole. The data for Census Tract 16 shows a significantly higher percentage of workers in the entertainment, recreation, accommodations, and food services industry and the construction industry than the county. The data shows relatively few manufacturing jobs among workers living in Census Tract 16. Both Census Tracts are shown to have lower percentages of workers in the education, health care, and social assistance service industry than Gallatin County.

Table 2.7: Workers by Industry (2013-2017)

Industry	Gallatin County		Census Tract 12		Census Tract 16	
Agriculture, forestry, fishing, hunting, and mining	2,077	3.7%	144	5.2%	64	3.8%
Construction	5,854	10.3%	433	15.8%	196	11.6%
Manufacturing	3,746	6.6%	194	7.1%	16	0.9%
Wholesale Trade	1,591	2.8%	74	2.7%	33	1.9%
Retail Trade	7,113	12.5%	219	8.0%	188	11.1%
Transportation, warehousing, and public utilities	1,490	2.6%	34	1.2%	53	3.1%
Information	720	1.3%	54	2.0%	10	0.6%
Finance and Insurance, and real estate and rental and leasing	3,101	5.5%	313	11.4%	94	5.6%
Professional, scientific, management and administrative	6,390	11.3%	312	11.4%	130	7.7%
Education services, health care, and social assistance	13,174	23.2%	406	14.8%	190	11.2%
Arts, entertainment, and recreation, and accommodation, and food services	7,359	13.0%	278	10.1%	680	40.2%
Other services, except public administration	2,370	4.2%	227	8.3%	39	2.3%
Public administration	1,766	3.1%	59	2.1%	-	-
Total Employed Population 16 yrs and over	**56,751**		**2,747**		**1,693**	

2.2.2. Employment Status and Income Measures

Table 2.8 presents ACS data on the employment status and estimated income levels of residents of Gallatin County, various geographic subdivisions of the county, and the State of Montana for the 2013-2017 period. The estimates show that the percentage of the employed workforce in the county is similar to that seen for Montana as a whole. The Four Corners CDP showed a slightly higher percentage of employed workers than seen for all of Gallatin County and the state. The estimated percentage of employed workers in Gallatin Gateway CDP was below that seen for the county and state.

Table 2.8: Employment Status and Income Statistics (2013-2017)

Characteristics of Population	Census Tract 12	Four Corners CDP	Gallatin Gateway CDP	Census Tract 16	Big Sky CDP	Gallatin County	State of Montana
EMPLOYMENT							
Civilian Labor Force	2,835	2,198	521	1,766	1,999	59,282	523,071
Employed %	96.9%	98.3%	92.3%	95.9%	95.8%	95.7%	95.2%
Unemployed %	3.1%	1.7%	7.7%	4.1%	4.2%	4.3%	4.8%
INCOME MEASURES							
Median Household Income	$75,156	$81,550	$64,417	$79,250	$80,551	$59,397	$50,801
Per Capita Income	$41,736	$43,221	$31,135	$38,188	$36,548	$33,181	$28,706
Persons Below Poverty	7.0%	5.5%	11.1%	11.0%	14.2%	13.0%	14.4%

According to the 2013-2017 ACS five-year estimate, median household income levels in Census Tracts 12 and 16 including the Four Corners, Gallatin Gateway and Big Sky CDPs were substantially above those for all residents of Gallatin County and the State of Montana. Per capita income levels were also higher than those seen for all residents of the state. However, per capita income levels for residents of the Gallatin Gateway CDP were estimated to be about $2,000 less than those of all county residents. Census Tracts 12 and 16, as well as the Four Corners and Gallatin Gate CDPs, had fewer residents living below the poverty line than seen for all residents the county and state. The share of persons living below the poverty line in the Big Sky CDP was similar to that seen for the state (14.2 versus 14.4 percent) but slightly higher than Gallatin County (13.0 percent).

2.3. Economic Development Trends

The economy of Gallatin County is diverse and most economic sectors are expanding as demonstrated by the employment data presented earlier in **Table 2.6**. While approximately 43% of the Gallatin County population resides in Bozeman, the city represents approximately 77% of the total employment in the county. For this reason, the future economic trends in the county will be strongly influenced by the economic conditions occurring in the Bozeman area. Bozeman's 2018 *Demographic and Real Estate Market Assessment* evaluated employment growth rates and projected an average annual job growth rate of 1.5 percent for the 2017-2045 period. This growth rate represents an annual increase of about 1,500 jobs per year over the next several decades.

Bozeman will continue to serve as the regional trade and service center in southwestern Montana due to its concentration of retail, healthcare, and technology enterprises and the presence of Montana State University. Additionally, the Bozeman area and Gallatin County serves a robust and expanding recreation and tourism-based economy. Bozeman is the gateway for access to a wide variety of outdoor recreation found in the county including ski areas, blue ribbon streams, abundant public lands, and Yellowstone National Park.

For the past three decades, the Big Sky area has been a growth center in Gallatin County for both jobs and housing. Based on master plans for major developments in the Big Sky area (Boyne USA, Moonlight Basin Ranch, Spanish Peaks Resort, and Yellowstone Club), continued residential, commercial, and recreational development is expected. During August 2016, Boyne Resorts released *Big Sky 2025: A Focused Vision for the Future*[22], a 10-year improvement plan for the ski area. The plan outlines $150 million in proposed improvements to increase recreational facilities, services, and other amenities on the mountain. The 2017 *Moonlight Basin Overall Development Plan*[23] states that of the 1,651 allocated housing units that were previously approved in 2007, more than 450 have already been subdivided and/or developed and nearly 1,200 remain to be developed. The plan also proposes approval of an additional 190 housing units on the property and providing facilities catering to year-round recreation. The prospects of additional growth in the Big Sky area suggests continued construction employment and development of retail trade and service businesses in the foreseeable future.

3.0. PHYSICAL FEATURES AND CHARACTERISTICS

US Highway 191 is a major north-south route across the US that connects Canada and Mexico. The highway passes through the states of Montana, Wyoming, Utah, and Arizona. Within the study area, US 191 connects the Montana communities of Four Corners, Gallatin Gateway, and Big Sky and passes through the Gallatin National Forest. The study corridor generally parallels the Gallatin River throughout the study area and passes through the Gallatin Canyon to the Madison Valley. The corridor is situated between the Gallatin and Madison Mountain Ranges of the Continental Divide.

The corridor dates back to the late 1800s/early 1900s when the Chicago, Milwaukee & St. Paul Railway (Milwaukee Road) reengineered the road from Gallatin Gateway (formerly named Salesville) to Yellowstone National Park in order to promote tourism in the park. The historic Gallatin Gateway Inn was built as the terminus of the Milwaukee Road which operated a branch line to the inn from 1927 to 1961. In those years, park visitors arrived by train and were transported by bus into Yellowstone via the Gallatin Canyon. Starting in 1954, the US Department of Commerce Bureau of Public Roads constructed the West Gallatin Highway as part of the Montana Forest Highway System. The highway was later designated as part of US 191 sometime in the 1970s.

The Milwaukee Road historically operated a transit service within the US 191 study corridor to transport tourists to Yellowstone National Park.

Primary users of the roadway consist of local residents, commuters between the greater Bozeman/Belgrade area to Big Sky, recreationists on lands and waters in the Gallatin National Forest, tourists visiting Yellowstone National Park and other attractions in the region, and commercial users. Land uses in the study area are mixed and include residential, commercial, industrial, agricultural, mixed use, and recreational land uses. Numerous recreation sites exist along US 191 and others are reachable from the highway. These sites include fishing access sites, picnic areas, day use sites, trailheads, and campgrounds.

3.1. Land Use and Right-of-Way

Ownership of the land in the corridor is a mix of public and private. Various state and federal entities hold public land including the US Forest Service (USFS), Montana State Trust Lands, and Montana Fish, Wildlife and Parks. There are also many areas held in easement for nongovernmental conservation groups such as Montana Land Reliance and The Nature Conservancy. Adjacent to the roadway, much of the land is in private ownership with low density development zones. Right-of-way widths vary within the corridor. For the majority of the corridor, widths are at least 100 feet but become as wide as 400 feet in some locations.

3.2. Roadway Surfacing

The MDT Road Log contains information for roadway surface width, lane width, shoulder width, surfacing thickness, and base thickness. The roadway surface width varies along the study corridor. The majority of the corridor has a paved surface width of approximately 28 feet, which includes one travel lane in each direction and shoulders. Along the corridor there are occasional turn lanes and a one-mile long passing zone north of the canyon. There is also a two-way left-turn lane (TWLTL) or dedicated turn lanes between Four Corners and Gallatin Gateway.

There is a 0.9 mile-long passing lane for northbound vehicles just outside of the canyon.

Pavement condition indices are measured and tracked annually in the corridor by MDT. Their pavement management system (PvMS) is used to analyze the collected data to determine the relative performance of the pavement. Items of primary interest include the presence and degree of cracking and rutting. By understanding the condition of the pavement, the most appropriate treatments and resources to extend pavement life can be identified. Several pavement condition indices are monitored through the PvMS. The performance measures and corresponding indices use a numerical value of 100 (assigned to a new pavement with no flaws) through 0 (representing highly degraded pavement). The following performance measures are routinely used to track pavement conditions:

- **Ride Index (IRI):** Determined by using an internationally applied roughness index in inches per mile and converting to a 0 to 100 scale.
- **Rut Index (RI):** Calculated by converting rut depth to a 0 to 100 scale. Rut measurements are taken approximately every foot and averaged into one-tenth mile reported depths.
- **Alligator Crack Index (ACI):** Measured by combining all load associated cracking and converting the index into a 0 to 100 scale.
- **Miscellaneous Cracking Index (MCI):** Calculated by combining all non-load associate cracking and converting the index into a 0 to 100 scale.
- **Overall Performance Index (OPI):** This is determined by combining and placing various weighting factors on the IRI, RI, ACI, and MCI figures and converting the index to a 0 to 100 scale. The OPI is calculated to provide a single index describing the current general health of a particular route or system.

The most important performance measure is the OPI, as this index includes all the aforementioned indices. An OPI of 80 to 100 is considered “good”, 60 to 79.9 is “fair,” and 0 to 59.9 is “poor.” As shown in **Table 3.1**, the various pavement condition performance measures generally indicate fair or good performance. The OPI indicates that the pavement is in fair condition for most of the corridor with the exception of between Squaw Creek Bridge and Cascade Creek Road (RP 61.4 and 65.2) which is in poor condition.

The majority of the corridor was resurfaced or treated in 2012/2013 with the exception of the section between RP 41.5 and 48.4 which was resurfaced in 2007, and the section between RP 61.4 and 65.2 which was treated in 2008. MDT has a project programed for fiscal year 2023 to rehabilitate the surface in the section between RP 61.4 and 65.2 (see **Section 1.3**).

Table 3.1: Pavement Condition Indices

Begin RP	End RP	IRI	RI	ACI	MCI	OPI	Constructed	Last Surface / Treatment
81.90	73.26	82.89 Good	58.59 Fair	99.79 Good	97.60 Good	66.17 Fair	1964	2012 / 2012
73.26	70.20	85.71 Good	64.28 Good	99.36 Good	99.58 Good	71.38 Fair	1960	2012 / 2012
70.20	65.20	82.24 Good	67.08 Good	99.88 Good	99.67 Good	71.56 Fair	2013	2013 / 2013
65.20	61.40	76.46 Fair	52.01 Fair	98.54 Good	97.22 Good	59.30 Poor	1997	1997 / 2008
61.40	48.40	81.76 Good	58.14 Fair	99.60 Good	97.99 Good	65.82 Fair	1987	2012 / 2012
48.40	41.50	78.13 Fair	62.67 Good	96.78 Good	92.79 Good	64.40 Fair	1987	2007 / 2007

Source: MDT Pavement Management System, 2018, https://app.mt.gov/cgi-bin/pvms/pavement.cgi

3.3. Posted Speeds

The posted speed limits within the study area vary from 45 miles per hour (mph) within the Four Corners and Big Sky communities to 70 mph between Gateway South Road and the mouth of Gallatin Canyon. In some locations, the posted speeds differ for passenger cars and trucks. The speed limit also varies based on daytime and nighttime conditions. There is one school zone in the study area between Windy Pass Trail and Beaver Creek Road. The reduced speed zone is in effect during school hours when the lights are flashing. The posted speed limits are shown in **Table 3.2** and **Figure 3.1**.

Table 3.2: Posted Speed Limits

Approximate Location	Begin RP	End RP	Posted Speed	Posted Speed (Trucks)
Four Corners to 2nd Street	81.9	81.4	45 mph	N/A
2nd Street to Gallatin Gateway Inn	81.4	76.4	55 mph	N/A
Gallatin Gateway Inn to Mill Street	76.4	76.1	50 mph	N/A
Mill Street to South Cottonwood Road	76.1	75.7	55 mph	N/A
South Cottonwood Road to Gateway South Road	75.7	70.6	70 mph (Day) 65 mph (Night)	65 mph
Gateway South Road to MT 64	70.6	48.1	60 mph	60 mph (Day) 55 mph (Night)
MT 64 to Frenchman Road	48.1	47.3	50 mph	N/A
Frenchman Road to Windy Pass Trail	47.3	45.5	60 mph	60 mph (Day) 55 mph (Night)
Windy Pass Trail to Beaver Creek Road	45.5	45.3	45 mph	N/A

MDT performed a Speed Limit Investigation in June 2015 on US 191 between RP 43 and 57 at the request of the Big Sky Chamber of Commerce. At the time of the investigation, the posted speed between MT 64 and Frenchman Road (RP 47.3) was 55 mph which was not compliant with Montana Transportation Commission action in October 2007 which required a posted speed of 50 mph. The speed limit was changed to 50 mph through this segment following the investigation. The investigation also does not show a definite need or benefit for a change in the existing approved speed limit configuration on the remainder of the corridor studied.

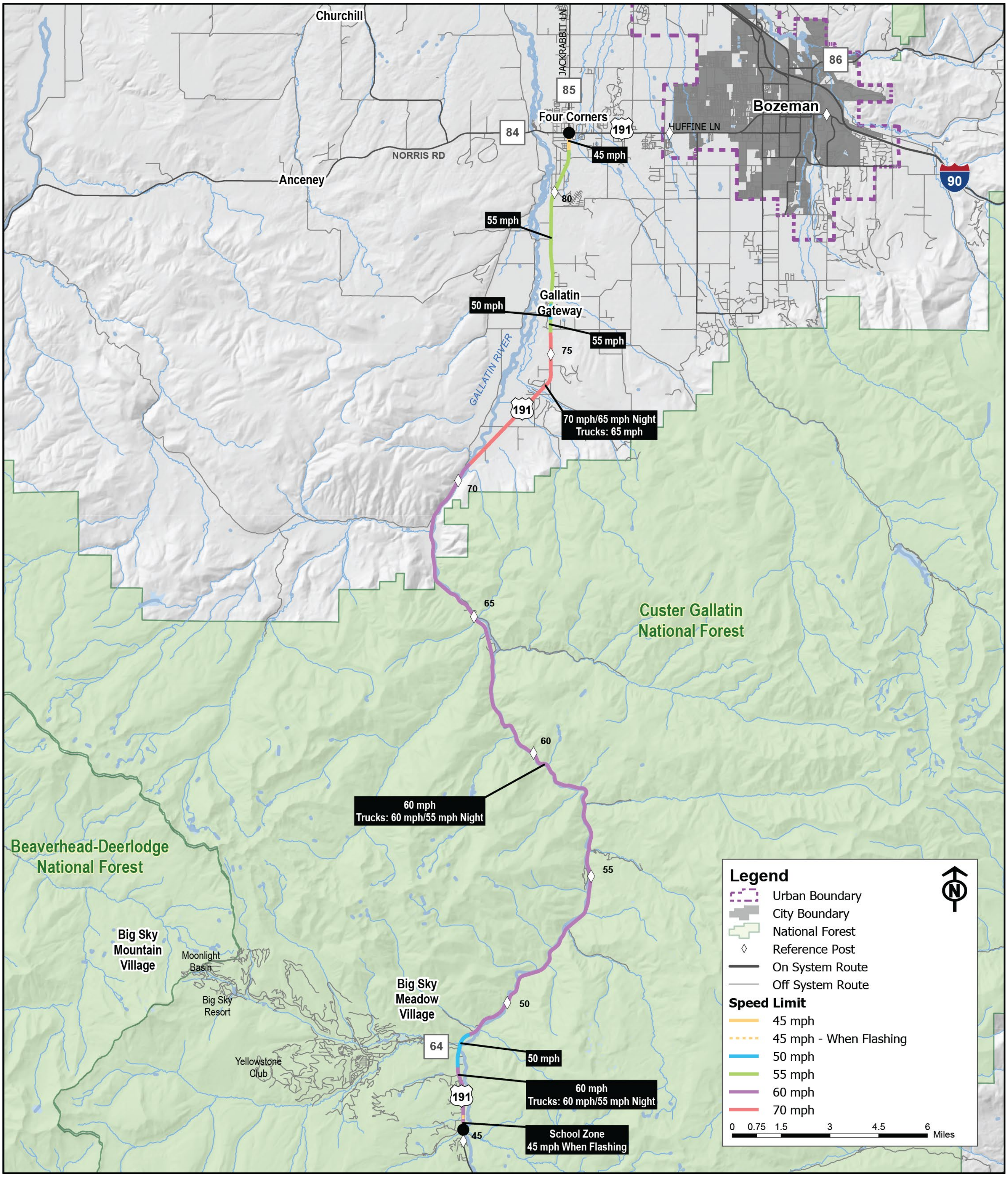


Figure 3.1: Posted Speeds

3.4. Access Points and Turnouts

There are numerous public and private access points along the study corridor. Access points were identified through a review of available GIS data, field review in October 2019, and aerial imagery from 2019. Based on this review, 386 access points were identified along the corridor. Many of the accesses are permitted through MDT, however, some unpermitted accesses do exist along the corridor, especially through the Gallatin Canyon. Of the 386 total access points, 79 were considered public roadways, 196 were private approaches, 49 were farm field approaches, 40 were recreation approaches, and 22 were designated turnouts. Accesses were defined based on the most typical use as noted during the field review and based on aerial photography. Accesses were only defined as turnouts if they were signed as such. Several undesignated or undeveloped turnouts exist along the corridor, many of which are used for recreational access.

The angle of approaches is also of importance. The angle of approach is the angle at which the approaching road intersects the major road. Desirably, roadways should intersect at or as close to 90° as practical. Intersection skews greater than 30° from perpendicular are typically undesirable, as the driver's line of sight becomes restricted. Accordingly, the approach angle is recommended to be between 60° and 120°. There were 12 skewed access points on the corridor, 4 are public approaches.

Table 3.3 provides a summary of access points grouped in incremental segments along the study corridor. The table shows the number and density of approaches for the various roadway segments. The density of approaches per mile is also shown in **Figure 3.2**.

Table 3.3: Access Points Along Study Corridor

Segment	Begin RP	End RP	Length (mi)	Access Points					Density (per mi)	Skewed (<60°)
				Public	Private	Farm	Rec	Turnout		
Four Corners to Gallatin Gateway	81.9	76.3	5.6	28	57	16	--	--	18.04	0
Gallatin Gateway to Gallatin South Road	76.3	70.4	5.9	13	17	26	1	--	9.66	2
Gateway South Road to Squaw Creek Bridge	70.4	65.2	5.2	5	16	5	7	--	6.35	3
Squaw Creek Bridge to Cascade Creek Road	65.2	61.4	3.8	8	38	1	5	6	15.26	2
Cascade Creek Road to Moose Creek	61.4	56.2	5.2	3	3	1	7	9	4.42	2
Moose Creek Road to Deer Creek	56.2	51.5	4.7	4	20	--	11	6	8.72	2
Deer Creek to MT 64	51.5	47.9	3.6	4	20	--	9	--	9.17	1
MT 64 to Beaver Creek Road	47.9	45.3	2.6	14	25	--	1	--	15.38	0
		Total	36.6	79	196	49	41	21	10.55	12

The access point density is highest along the Gallatin Gateway to Four Corners segment with about 18 approaches per mile, the majority of which are private driveways for residences and commercial businesses. Similarly, the density on the Beaver Creek Road to MT 64 segment is about 15 approaches per mile with the majority being private accesses for businesses and residences. The density through the Gallatin Canyon varies from about 4 to 15 approaches per mile with most approaches being for private residences and recreational access.

There is an access control plan in place for the segment of US 191 from Four Corners (RP 81.9) to Gateway South Road (RP 70.5). There are also access control plans developed for Huffine Lane, Norris Road, and MT 64 near the study area as shown in **Figure 3.2**.

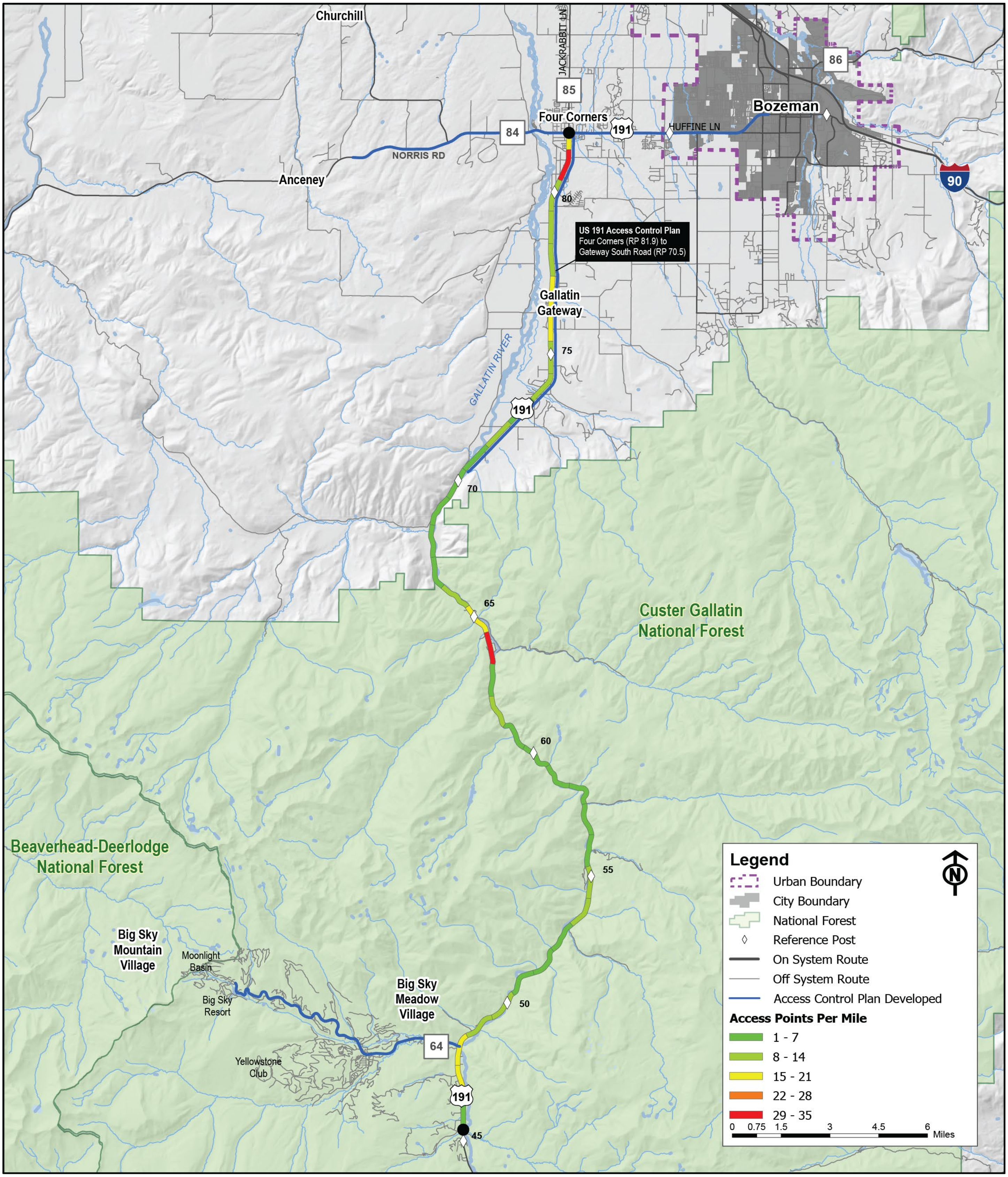


Figure 3.2: Access Point Density

There are 22 designated turnouts along the study corridor, all of which occur within the Gallatin Canyon (RP 48 to 70). The turnouts vary in length, width, and spacing but are provided where feasible in order to facilitate free flow traffic conditions. Per *Montana Code Annotated 61-8-311*, the operator of a slow-moving vehicle with four or more vehicles behind it should utilize turnouts to allow following vehicles to pass. Several turnouts within the corridor are also used by recreationists for parking and river access. At times turnouts are not available for slower vehicles who want to pull over and let traffic pass because of parked vehicles using the sites for recreation purposes.

There are many designated turnouts along the corridor which facilitate access to popular recreation areas.

There were 40 access points along the corridor noted as recreational accesses. In addition to those 40 points, several of the turnouts and public approaches are also used for recreation. The *Gallatin Canyon River Access Site Assessment* identified over 70 access points within the study area used for access to the Gallatin River. Within the corridor, recreation opportunities consist of fishing, floating, rafting, kayaking, hiking, camping, hunting, rock climbing, picnicking, and more. Several of the recreational accesses are not publicly designated but rather are perpetuated by sustained public use. Vehicles parked along the roadside in undesignated areas can cause safety concerns.

3.5. Passing Zones

Passing opportunities are provided along the corridor in areas where roadway geometrics allow. Passing areas are designated by broken yellow center pavement markings. No passing zones are established in areas where there is insufficient passing sight distance or near public approaches. The following information summarizes the guidelines for no-passing zones as described in the MDT *Road Design Manual:*[24]

- For determining a no-passing zone, the distance along a driver's line of sight is measured from a 3.5-foot height of eye to a 3.5-foot height of object.
- For 2-lane rural highways of level terrain on the NHS, the no-passing zone design speed will be 70 mph.
- The minimum passing sight distance required for a 70-mph no-passing zone design speed is 1,200 feet.
- The minimum length for a no-passing zone is 500 feet.
- If the length between successive no-passing zones in the same direction of travel is less than 1,000 feet, then the gap between the no-passing zones should be closed.
- A no-passing zone should be marked in advance of intersections at a minimum distance of 500 feet.

Figure 3.3 shows the passing zones along the corridor as documented through on-site field review and aerial imagery. A total of 30 passing zones, 15 northbound and 15 southbound, exist along the corridor. There is also a passing lane, approximately 0.9 miles long, in the northbound direction between RP 70.6 and 71.5. All but two passing zones appear to be in accordance with the MDT Road Design Manual guidelines. The two passing zones that do not appear to meet standards are both less than 50 feet short of the 1,000-foot standard.

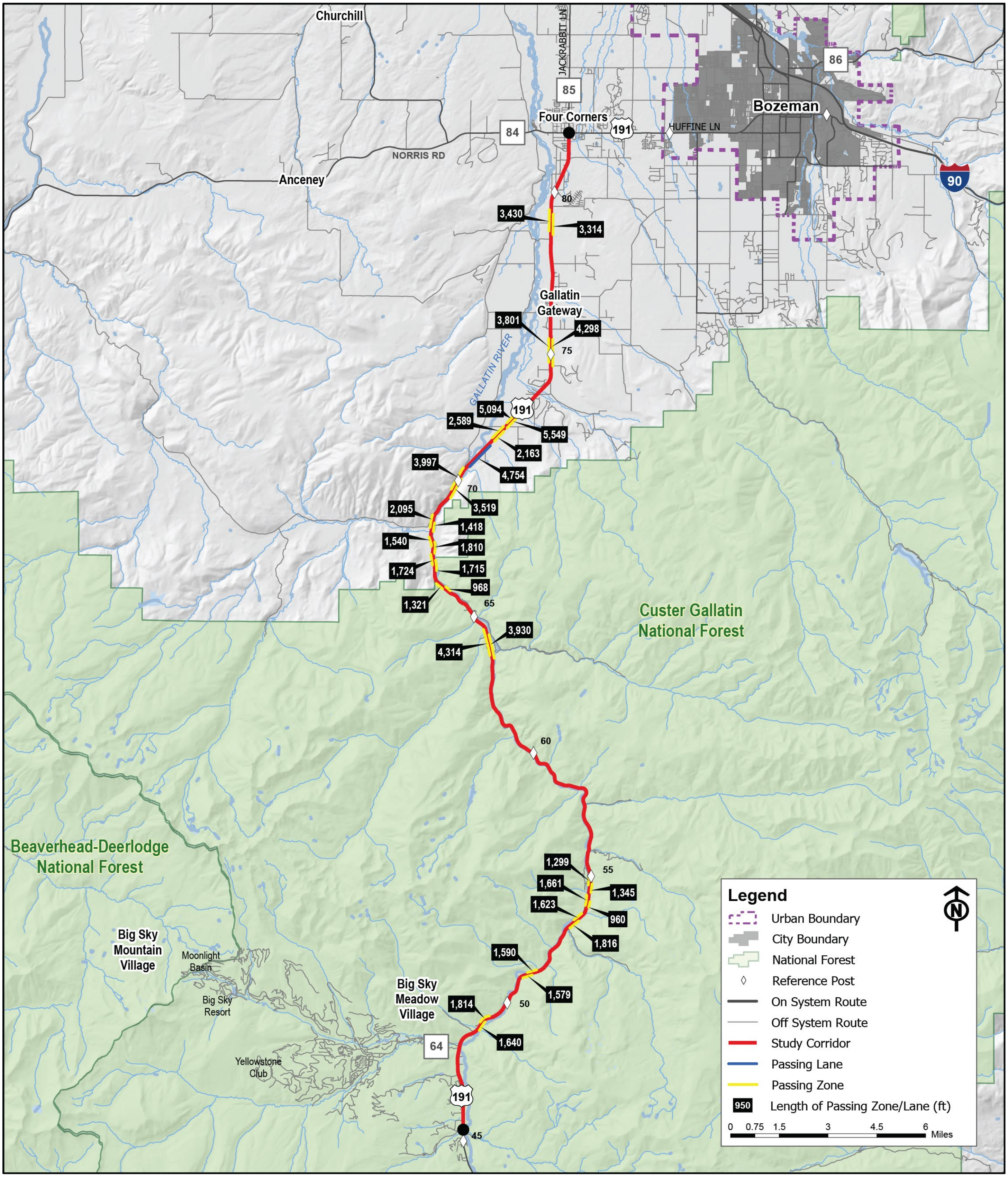


Figure 3.3: Passing Zones

3.6. Utilities

Northwestern Energy provides power connections throughout the corridor. Overhead power lines are present intermittently along both sides of the highway within the study area and occasionally cross over or under the roadway. Northwestern Energy also has natural gas utilities within the corridor. Telephone and broadband internet services are currently provided by 3 Rivers Communications within the study area. The services use both fiber optics and copper cables. Century link also provides telephone and internet services in the study area. Qwest and Verizon each have one telephone line within the study area near Karst's Camp (RP 55). Montana Opticon has one fiber optic utility crossing near the Four Corners intersection. Some individuals within the corridor are served by the Four Corners and Gallatin Gateway Water and Sewer Districts. Others outside the district boundaries obtain water and sewer services via wells and septic tanks, respectively.

3.7. Maintenance and Operations

MDT is responsible for maintenance of US 191 throughout the entire study area. This includes repairs and preventative maintenance of the roadway as well as maintenance of the various signs and structures within the highway right-of-way. US 191 is under the jurisdiction of the Big Sky/Gallatin Gateway MDT Maintenance Section, a subsection of the Bozeman Maintenance Division. There is an MDT Maintenance Section House and Sand/Salt Stockpile located at RP 72.

Winter Operations

Winter snowplowing and sanding are also the responsibility of MDT maintenance personnel. The study corridor is considered a Level I and Level II winter maintenance area according to the MDT *Maintenance Operations and Procedures Manual*[25]. A Level I winter maintenance area includes roadways within or adjacent to a 3-mile radius to towns or cities with an average daily traffic (ADT) greater than 5,000 vehicles per day (vpd). US 191 from Four Corners to the mouth of the Gallatin Canyon is a Level I maintenance area. Level I routes are eligible to receive up to 24 hours-per-day coverage during a winter storm event. A Level II winter maintenance area includes roads outside of the 3-mile radius buffer which carry 1,000 to 3,000 vpd. Level II routes are eligible for 17 hours-per-day coverage, typically between 5:00 AM and 10:00 PM, during a winter storm event. US 191 beginning at the Gallatin Canyon and extending through the end of the study area is considered a Level II maintenance area. Implementation of coverage is at the discretion of MDT's Bozeman Area Maintenance Chief. The primary objective is to keep one lane in each direction open to traffic. Snow packed and/or icy surfaces are acceptable, but they may be treated with abrasives or abrasive/chemical combination.

Snow storage on US 191 is a known issue. Snow is typically piled in turnouts or on the roadside. Within the canyon, shoulders are narrow, and turnouts are few. During heavy snowfall events lanes can become narrower and passing opportunities more limited.

Heavy Vehicle Operations

There is an existing MCS scale site by Four Corners at RP 81.8 on the west side of the highway. The site is typically permanently staffed although the position is currently vacant. The site is equipped with weigh in motion (WIM) and PrePass capabilities. The scale site is used by MCS to inspect the weight of vehicles traveling on the highway to ensure that the roadway is not compromised by an overweight vehicle. Permits issued by MCS are required for oversize and overweight vehicles. The site serves all cardinal directions and currently accommodates bi-directional entry and exit maneuvers and has two bidirectional lanes within the site. During a typical day, the scale is open to both north and southbound movements. During periods of high traffic, the scale is closed for northbound truck traffic. Site operators are cognizant of congested conditions and can close the scale when necessary. A traffic study was conducted in 2015 to evaluate the operations and safety of the site (see **Section 1.2.3**). MCS determined that some minor improvements would be necessary in the interim but in order to accommodate future traffic demands, relocation and expansion of the site will be necessary.

Emergency Operations

MDT maintenance personnel have noted concerns with road closures and blockages due to crashes along the corridor, especially through the canyon. Temporary Variable Message Sign (VMS) boards have been installed along the corridor at three locations (RP 72.1, 55.1, and 48.2) to alert oncoming traffic of road closures and other real-time traffic conditions. MDT maintenance personnel are able to radio to the district office in order to change the messaging on the boards as emergency situations occur.

There are three emergency call boxes along US 191 within the study area.

There is little to no cell coverage within the Gallatin Canyon. To aid in emergency situations and dispatch emergency services, there are currently five emergency call boxes along US 191, three of which are in the study area. Those call boxes are located at Lava Lake (RP 61), Moose Creek (RP 56), and Karst's Camp (RP 55). All call boxes are installed and maintained by the Big Sky Rotary Club.

Emergency Services

Gallatin County Emergency Management is responsible for the coordination of the public safety agencies, such as fire, police, ambulances, public works, volunteers, and more, before, during, and after an emergency. The agency serves the Four Corners, Gallatin Gateway, Big Sky, and unincorporated areas of Gallatin County within the study area.

The US 191 corridor is served by two rural fire districts, Gallatin Gateway and Big Sky, and by the Forest Service. The Gallatin Gateway Rural Fire District covers the area surrounding US 191 between Four Corners and Luhn Lane (RP 62 to 82). The Big Sky Fire Department cover the area around US 191 between Moose Creek and Rainbow Ranch Road (RP 45 to 56 within the study area). Fire management outside of these districts is the responsibility of the West Gallatin National Forest Fire Management Zone. Within the study area, the West Zone has several fire engines based at the Bozeman Ranger District and the Shenango Work Center. The Gallatin Rappel Crew is based at the Shenango Helibase, located across the Squaw Creek Bridge (approximate RP 65).

The communities and neighborhoods of Four Corners and Gallatin Gateway are served by Gallatin County Sheriff's Office deputies assigned to the greater Gallatin Valley area. The Gallatin Canyon is patrolled by the Gallatin County Sheriff's Office in conjunction with the West Yellowstone Police Department, Madison County Sheriff's Office, Forest Service, Yellowstone Park Service, Montana Fish, Wildlife and Parks, Montana Department of Livestock, and Montana Highway Patrol.

Medical services for emergency situations are primarily served by Bozeman Health's Big Sky Medical Center or Bozeman Deaconess Hospital. Both locations have on-site helipads for air ambulance transport. Bozeman Deaconess Hospital is a Level III Verified Trauma Center.

3.8. Geotechnical Conditions

The areas from Four Corners to the mouth of the Gallatin Canyon, and from MT 64 to the end of the study area, are relatively flat and open with no prominent geological features. Within the Gallatin Canyon, however, there are several geological features and soil characteristics. These considerations are discussed in the following subsections.

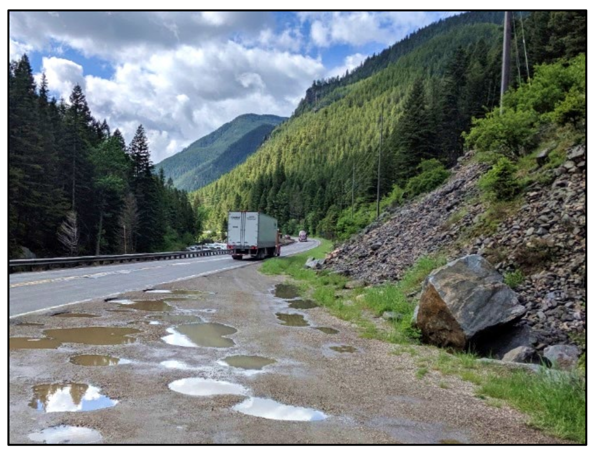
3.8.1. Slope Stability

From the mouth of the Gallatin Canyon to MT 64, US 191 lies in a narrow river canyon formed by the Gallatin River bounded on both sides by steep mountainous terrain with frequent exposures and outcrops of bedrock. This portion of the corridor also crosses approximately six mapped faults and is adjacent to a known landslide in the area known as Karst's Camp Ranch (RP 54.5). The corridor is situated in a moderately active seismic area adjacent to numerous meta-stable talus slopes that could become unstable if disturbed.

The portion of US 191 within Gallatin Canyon has numerous major fill/embankment areas along its length. Many of these areas are very steep in nature and are located adjacent to the Gallatin River. This portion of the study corridor also has significant cut slopes at several locations including RP 66.7, 61.3, 58.5, 57.5, and 53.0. The cuts at RP 58.5 (Greek Creek Campground) and RP 57.5 (Swan Creek) were reconstructed in 2011. Significant mechanically stabilized earth walls have been used at some locations including Greek Creek (RP 58.5), the bridge at Swan Creek (RP 57.5), the bridge at the West Fork Gallatin River (RP 48.0), and Beaver Creek (RP 45.2). The walls were constructed with the primary purpose of reducing the roadway footprint and reducing impacts to sensitive areas.

3.8.2. Rockfall Hazards

In 2017, a *Rockfall Hazard Process Assessment*[26] was prepared to assess changes in MDT's rock slope assets, gather additional data, and develop new hazard and risk assessment tools that would allow MDT to develop an updated management program. The research project evaluated several poorly performing sites and provided conceptual mitigation costs for each. The evaluation included various locations along the study corridor through Gallatin Canyon.



Multiple rockfall hazard locations have been identified along the corridor.

The data from the research project, contained in MDT's new *Rock Slope Asset Management Program* (RAMP) database, indicates that there are currently 14 areas within the Gallatin Canyon with Rock Slope rockfall slope conditions rated as "poor." In these areas, there is potential for rockfall events, possible emergency road closures, and significant disruption of normal traffic operations. Specific areas include approximate RPs 49.5 to 50.5, 52 to 53.5, 56.5 to 58, and 59 to 63. When working in these areas with rockfall hazards, the types of mitigation measures that can be expected for future projects include blasting, scaling, rock bolting, netting and drapery, rockfall retention structures/fences, and improved or reconfigured roadside ditch configurations. There are currently no physical rockfall protection barriers present in the canyon.

3.9. Hydraulics

US 191 generally parallels the Gallatin River throughout the entire study area. Within the Gallatin Canyon the river is very close to the US 191 and is often directly adjacent to the roadway. The study corridor crosses the Gallatin River at three locations and also crosses several other streams, irrigation canals, and ditches. **Table 3.4** presents the major stream and river crossings.

Table 3.4: Stream and River Crossings

Name	Approximate Location (RP)	Crossing Structure
South Cottonwood Creek	76.7	Bridge
Big Bear Creek	73.7	Culvert
Big Bear Creek	73.8	Culvert
Wilson Creek	72.9	Culvert
Gallatin River	70.5	Bridge
Spanish Creek	68.2	Bridge
Logger Creek	65.0	Culvert
Hell Roaring Creek	64.5	Culvert
Cave Creek	61.9	Culvert
Gallatin River	61.3	Bridge
Greek Creek	58.1	Culvert
Swan Creek	57.3	Bridge
Moose Creek	56.0	Culvert
Tamphery Creek	54.0	Culvert
Portal Creek	53.3	Culvert
Goose Creek	51.9	Culvert
Gallatin River	49.8	Bridge
Dudley Creek	48.9	Culvert
West Fork Gallatin River	48.0	Bridge
Michener Creek	47.1	Culvert
Beaver Creek	45.2	Culvert

The US 191 study corridor generally parallels the Gallatin River. The corridor crosses the river at three locations while also crossing several other streams and tributaries within the study area.

Drainage along the study corridor is generally controlled by simple drainage ditches. Curb and gutter exist at the Four Corners intersection but ends 300 feet south of the intersection. Drainage is generally well controlled, however, it was noted during the field review that many of the turnout areas may have poor drainage, as evidenced by standing water. Other hydraulic structures within the study corridor consist of culverts and bridges.

3.10. Bridges

MDT's Bridge Program emphasizes asset management and preservation. This emphasis promotes a "right treatment at the right time" philosophy in prioritizing and selecting projects on MDTs bridge system. MDT has defined bridge program objectives and performance measures to assist with this process. The objectives and measures are intended to identify the right treatments for Montana's bridges, and promote cost-effective bridge preservation, appropriate safety-related work, and economic growth.

There are nine bridges along the study corridor. **Table 3.5** shows the bridge locations, physical characteristics, condition ratings, and design loads. New bridges on the NHS system (non-interstate) with an ADT of 400 vpd or more are recommended to have a roadway width of at least 36 feet or equal to the width shown on the *NHS Route Segment Map*, whichever is greater. The map suggests a width of 40 feet or greater for the US 191 corridor. For an existing bridge to remain in place, it is recommended to have a roadway width of at least 28 feet. Based on these standards, all bridges meet this requirement to remain in place, but only two bridges, West Fork Gallatin River and Swan Creek bridges, meet new bridge construction standards.

Bridge conditions are determined using the National Bridge Inventory (NBI) general condition ratings (GCR). The GCRs are used to describe the existing bridge as compared to its as-built condition. The material used, as well as the physical condition of the deck, superstructure, and substructure of the bridge are considered in the rating. GCRs are given a numerical rating ranging from 0 (failed condition) to 9 (excellent condition) as described in the *FHWA Coding Guide*.[27]

There are nine bridges in the study corridor, all of which meet current design standards to remain in place. Some of the bridges are currently in need of repair and/or maintenance.

Bridges are considered structurally deficient if the superstructure or substructure elements are rated less than 5 on the NBI scale. When a bridge is classified as structurally deficient, it does not mean that it is unsafe. These bridges typically require increased maintenance and repair to remain in service and eventual rehabilitation or replacement to address overall deficiencies. Based on the ratings given in **Table 3.5**, none of the bridges in the study area are structurally deficient. However, the bridges over the Gallatin River (at RP 61.3) and Spanish Creek have superstructure or substructure GCRs of 5 and are thus considered to be in fair condition and are candidates for repair. All other bridges in the study area have superstructure and substructure GCRs greater than 5 and are therefore considered to be in good condition and are candidates for continued preservation.

While deck condition is assessed similarly to structure condition, deck condition has two classifications to better assist in determining appropriate preservation treatments. Based on the ratings given in **Table 3.5**, there are three bridges with a deck rating of 5, meaning those bridges are considered to be in fair condition and are candidates for resurfacing. Two of the bridges over the Gallatin River (RP 49.8 and 61.3) and the bridge over Spanish Creek meet this condition. The other six bridges have a deck rating of 6 and are also considered to be in fair condition but these bridges are candidates for healer/sealer treatments. However, the appropriate preservation and repair actions for these bridges will need to be determined through more in-depth field investigation and testing.

Another consideration for bridge condition is the scour rating which is an assessment of the bridge's vulnerability to scour. Bridge scour is the removal of streambed material caused by swiftly moving water from around bridge abutments of piers. The rating ranges from 0 to 9. Five of the bridges in the study area have a scour rating of 5 which means the bridge foundation is determined to be stable and the scour is determined to be within the recommended limits. The other four bridges have a scour rating of 8 meaning the bridge foundation is stable and the scour is determined to be above the limits.

The American Association of State Highway Transportation Officials (AASHTO) *Standard Specifications for Highway Bridges*[28] identifies design vehicle loads. Older bridges in the US were designed to accommodate either an H 15 or HS 20 loading while newer bridges are designed to accommodate HL 93 loading. All but two of the bridges in the study area have design loads of HS 20 (three-axle semitrailer combination weighing 36 tons). MDT *Bridge Design Standards*[29] require a design load of HL 93 (an HS 20 truck with a lane load added) for new bridge construction, and a design load of HS 15 for bridges to remain in place. Based on these specifications, all of the bridges on the corridor meet design standards to remain in place and only two bridges meet standards for new bridge construction (West Fork Gallatin River and Swan Creek bridges).

Table 3.5: Bridges in the Study Area

MDT ID	Location (RP)	Feature Crossed	Year Built	Structure Length (ft)	Roadway Width	Deck Rating	Super Rating	Sub Rating	Scour Rating	Design Load
5913	81.5	Spain-Ferris Ditch	1964	21.2	38.0	6	6	7	8	HS 20
5912	77.7	Farmer's Canal	1964	21.2	38.0	6	6	7	8	HS 20
5911	76.7	South Cottonwood Creek	1964	21.2	38.0	6	6	7	5	HS 20
5910	70.5	Gallatin River	1958	265.9	29.3	6	6	7	5	HS 20
5909	68.2	Spanish Creek	1955	70.0	28.0	5	5	5	5	H 15
5908	61.3	Gallatin River	1950	233.9	28.0	5	5	6	5	HS 20
5907	57.3	Swan Creek	2009	58.0	50.5	6	6	6	8	HL 93
5905	49.8	Gallatin River	1952	160.0	28.0	5	7	7	5	HS 20
5904	48.0	West Fork Gallatin River	2009	97.3	68.2	6	7	7	8	HL 93

3.11. Other Transportation Modes

3.11.1. Freight and Heavy Vehicles

The freight and heavy vehicle traffic operating on US 191 consists mainly of commercial truck traffic, construction vehicles, and smaller delivery trucks. US 191 is one of three north-south routes through southwestern Montana that reaches Interstate 90. The other routes are Interstate 15 and US Highway 287 through the Madison Valley. US 191 is the preferred route by many commercial drivers because the road is maintained, remains open during the winter months, and is more direct for deliveries to Idaho, California, and Utah. A permanent MCS scale site exists near the Four Corners intersection. MCS is currently evaluating the need for the scale site and considering relocation of the scale site if significant need is determined (see **Section 1.2.3**).

As of September 1994, commercial vehicles transporting hazardous materials with a Department of Transportation requiring placards are prohibited from operating on sections of US 191 under NPS jurisdiction in and around Yellowstone Park. Exceptions are permitted for local deliveries. There are currently no restrictions within the study corridor.

Between June 2008 and July 2010, US 191 was closed to semitrucks while a highway improvement project to install turn bays, widen shoulders, flatten slopes and install new guardrail was completed. As a federal aid highway, it would violate both state and federal laws to indefinitely restrict truck traffic on US 191.

3.11.2. Transit

Several transit and shuttle services are available within the study area. Many of the services provide connection between Bozeman International Airport (about 10 miles north of the study area) and Big Sky Resort. The various services include the Skyline Bus, West Yellowstone Foundation Bus, Yellowstone Club Bus, and several other private and shared ride services from Bozeman to West Yellowstone including transportation in and around Big Sky.

The Skyline Bus is a year-round, scheduled, public transit service between Bozeman and Big Sky. The service is operated by the Big Sky Transportation District. The Link bus route, between Bozeman and Big Sky, runs seven days a week during the summer and winter seasons. During the shoulder-season (April 22 to May 27 and September 23 to November 24), the Link route operates Monday through Friday. Riders can pay a cash fare or purchase a bus pass at a variety of participating businesses. The Canyon-Mountain bus route provides service from Corral & Rainbow Ranch (south of the US 191 study area) though Big Sky Meadow Village and up to Big Sky Resort/Moonlight Basin during the shoulder-season. The local service is available by demand response Monday through Friday during the shoulder season and is fare free. In fiscal year 2019, Skyline provided 957,565 rides.

The Skyline bus provides year-round public transit service between Bozeman and Big Sky.

The West Yellowstone Foundation Bus is a reservation-based public transit service between Bozeman and West Yellowstone. The bus provides weekly round trips for any purpose with advanced reservations on a first come first served basis. Fares are $15 for seniors (aged 60+) and $20 for non-seniors. The bus service provided 1,273 rides in fiscal year 2019. The Yellowstone Club provides a closed-door shuttle service from Four Corners to Yellowstone Club. Many of the Yellowstone Club employees reside in Bozeman and Four Corners. This transportation option is only available to Yellowstone Club employees.

The study area also experiences considerable seasonal use by local, regional, and national tour bus and charter bus operators between April and October. Karst Stage, North of Yellowstone, and Big Sky Shuttle charter transportation services for seasonal visitors between the Bozeman International Airport, Big Sky, and West Yellowstone.

3.11.3. Pedestrians and Bicyclists

Based on information from Strava Metro's Heat Map[30], the US 191 corridor experiences moderate to high bike activity in the Four Corners, Gallatin Gateway, and Big Sky areas. Biking activity through the canyon is very low. Pedestrian activity along US 191 is low in the Four Corners and Gallatin Gateway areas and moderate to high in the Big Sky area. There is no pedestrian activity in the Gallatin Canyon except along trails branching from US 191.

There are two shared use paths along the study corridor and several trails starting near US 191 but diverging east or west of the corridor. The Gateway shared use path is a 9-ft wide asphalt path along the east side of US 191 beginning at the intersection of Zachariah Lane (RP 77.8) ending at Rabel Lane/Mill Street (RP 76.3). The path crosses under US 191 to Mill Street (RP 76.3). Approximately four miles remain to complete the trail connection into Four Corners at Lower Rainbow Road (RP 81.0). Sustained public use has created an informal trail adjacent to the shoulder on the west side of US 191. The Big Sky Trail shared use path is a 10-ft wide asphalt path along the west side of US 191 beginning just before the junction of MT 64 (RP 48) and ending at Beaver Creek Road (RP 45.3).

Two shared use paths existing in the study area, one in Gallatin Gateway and one between Big Sky Canyon Village and Ophir School.

3.11.4. Air Service

The Bozeman Yellowstone International Airport is located about 10 mile north of Four Corners. The airport provides year-round service. There are a number of shuttle options between the airport and Big Sky Resort, Yellowstone National Park, and surrounding areas. As discussed previously, many of the shuttle services utilize US 191 to provide access to visitor destinations from the airport.

The Yellowstone Airport, located in West Yellowstone about 45 miles south of the study corridor, offers both commercial and general aviation services. The airport is owned by MDT and operates May to October. The airport is popular for recreationists to access Yellowstone National Park, Big Sky, Island Park, Ennis, and Virginia City.

The Ennis – Big Sky Airport, located in Ennis, MT, about 20 miles west of the study corridor, is a county-owned, public-use airport. The airport services corporate and general aviation aircraft year-round but does not offer commercial flights. A helicopter shuttle ride is offered from the airport to the resorts in Big Sky. The resorts can also be accessed via Jack Creek Road, a private 30-mile road connecting Ennis and Big Sky. The road is owned and maintained by Moonlight Basin Resort. Access to Jack Creek Road is granted via membership to the Madison Valley Ski Club with permission from Moonlight Basin Ranch. Access is granted on a year-to-year basis with no expressed or implied warranties on continued access in years to come. Nighttime access to the road is prohibited.

The Briar Creek Airport is located in Gallatin Gateway about two miles east of the study corridor. The airport is privately owned and consists of two runways.

4.0. GEOMETRIC CONDITIONS

Existing roadway geometrics were evaluated and compared to current MDT standards. The analysis was conducted based on a review of public information, MDT as-built drawings, GIS data, and field observations. The use of as-built drawings was limited due to the drawings being unavailable, missing information for some segments and outdated for others along the study corridor.

US 191 was originally constructed to its current state in the mid to late 1950s. Several improvement projects have taken place over the past 60 years along the study corridor. Those projects consist of a variety of work including resurfacing or reconstruction with slope flattening, widening, the addition of turn lanes, guardrail, striping, signing, and other safety improvements. For most of these improvement projects, updated horizontal and vertical curvature data were available. For others, only horizontal curve data was available. Resurfacing projects typically do not include updated as-built plans, therefore the curvature on the segments without improvement projects is likely still the same as when the road was constructed in the 1950s.

Horizontal curvature data is missing between RP 49.9 and 51.9. Data for vertical curvature is missing between the same mileposts, as well as between RP 61.2 and 61.8 and RP 70.1 to 81.9. The terrain along these segments is generally flat and it is likely that these segments meet current vertical profile standards.

4.1. Design Criteria

The MDT *Geometric Design Standards*[31] specifies general design principles and controls that determine the overall operational characteristics of the roadway and enhance its aesthetic appearance. The geometric design criteria for the study corridor are based on the current MDT design criteria for rural principal arterials on the Non-Interstate National Highway System.

The study corridor traverses terrain ranging from level to mountainous.

Table 4.1 provides current standards for rural Non-Interstate NHS roadways. For this classification, design speed may vary depending on terrain conditions. According to the definitions in the *Geometric Design Standards,* the corridor is likely to be considered level or mountainous terrain. The terrain through the Gallatin Canyon can generally be classified as mountainous terrain whereas the sections of roadway outside the canyon are generally level.

For the topography and roadway classification of US 191, the design speed ranges from 50 mph for mountainous terrain to 70 mph for level terrain. Posted speeds may differ from design speed. The standards in the *Geometric Design Standards* provide critical design criteria depending on design speed and roadway classification. Design speed and terrain type will ultimately be determined as necessary during the project development process for any improvement options forwarded from this corridor study.

Table 4.1: Recommended Geometric Design Criteria Standards

Design Element			Design Criteria		
Design Control	**Design Speed (minimum)**	Level	70 mph		
		Rolling	60 mph		
		Mountainous	50 mph		
Roadway Elements	**Travel Lane Width**		12 ft		
	Shoulder Width		Varies		
	Cross Slope	Travel Lane	2%		
		Shoulder	2%		
	Median Width		Varies		
Cut Sections	**Ditch**	Inslope	6:1 (width 10 ft)		
		Width	10 ft minimum		
		Slope	20:1 towards backslope		
	Backslope Cut Depth at Slope Stake	0-5 ft	5:1		
		5-10 ft	Level/Rolling: 4:1 Mountainous: 3:1		
		10-15 ft	Level/Rolling: 3:1 Mountainous: 2:1		
		15-20 ft	Level/Rolling: 2:1 Mountainous: 1.5:1		
		>20 ft	1.5:1		
Fill Slopes	**Fill Height at Slope Stake**	0-10 ft	6:1		
		10-20 ft	4:1		
		20-30 ft	3:1		
		>30 ft	2:1		
Alignment Elements	**DESIGN SPEED**		**70 mph**	**60 mph**	**50 mph**
	Stopping Sight Distance		730 ft	570 ft	425 ft
	Passing Sight Distance		1,200 ft	1,000 ft	800 ft
	Minimum Radius (e=8%)		1,810 ft	1,200 ft	760 ft
	Spiral Curve Section		See Chapter 3, Section 3.2 of the RDM		
	Superelevation Rate		e_{max} = 8.0%		
	Vertical Curve Length	Crest	See Chapter 4, Section 4.4 of the RDM		
		Sag			
	Maximum Grade	Level	3%		
		Rolling	4%		
		Mountainous	7%		
	Minimum Vertical Clearance		17 ft		

Source: MDT Geometric Design Standards,
https://www.mdt.mt.gov/other/webdata/external/cadd/RDM/STANDARDS/GEOMETRIC-DESIGN-STANDARDS.pdf

4.2. Roadway Width

Throughout most of the corridor, the roadway is a two-lane highway with the occasional turn lanes and a one-mile-long passing zone located just north of the canyon. At the beginning of the study corridor at Four Corners, US 191 has two southbound lanes, two northbound through lanes, and dedicated northbound right- and left-turn lanes. The pavement at the intersection is 90 feet in width.

The study corridor is generally 28 feet wide through the canyon. Between Four Corners and Gallatin Gateway the roadway is wider areas to accommodate turn lanes and a two-way left-turn lane at various locations.

South of the Four Corners intersection, US 191 transitions into a two-lane highway with a center TWLTL or dedicated left-turn bays for most of the length between Four Corners and Gallatin Gateway. Through this section, US 191 is typically 32 feet in width with some wider locations to accommodate turn lanes. At Lower Rainbow Road (RP 81.1), there is a dedicated southbound right turn lane in addition to the TWLTL resulting in a pavement width of 64 feet. At Mill Street (RP 76.3), there are dedicated southbound right-, through, and left-turn lanes as well as a dedicated northbound left-turn lane and shared through/right-turn lane. The pavement width is also 64 feet at this location.

Just south of Wilson Creek Road (RP 73.5), US 191 transitions back to a two-lane highway with a width of 32 feet. Before approaching the Gallatin Canyon, there is a northbound passing lane which begins just north of Gateway South Road and continues north past Kleinschmidt Road (RP 70.6 to 71.5). The roadway through this section is 44 feet in width.

Through Gallatin Canyon (RP 70.6 to 48.0), US 191 is a two-lane highway ranging in width from 28 feet to as wide as 48 feet where turn lanes have been installed in recent years. The turn lanes were installed at the approaches to Castle Rock Inn (RP 66), Greek Creek Campground (RP 58), Moose Creek Campground (RP 56), and Karst's Camp (RP 55).

As US 191 approaches the junction with MT 64 (RP 48.0), it widens to approximately 70 feet to allow spacing for two lanes, a southbound right-turn lane, and wide shoulders. South of the junction, US 191 becomes a two lane-highway with a center TWLTL or individual left-turn bays with a width of about 52 feet. At a few points between MT 64 and Beaver Creek (RP 48.0 to 45.3), US 191 widens to about 60 feet to allow for a separated southbound right-turn lane. The right turn lanes serve the Riverview Lane (RP 46.2), Windy Pass Trail (RP 45.7), and Beaver Creek Road approaches (RP 45.3).

The MDT *Geometric Design Standards* recommend a minimum travel lane width of 12 feet on rural NHS routes. The MDT *NHS Route Segment Plan*[32] suggests a width of 40 feet or greater for the corridor. While the corridor satisfies this 12-foot travel lane width, there are locations that do not satisfy the 40-foot minimum recommended roadway width. This is especially true in the Gallatin Canyon where space is limited due to the presence of the Gallatin River and steep hillsides.

4.3. Horizontal Alignment

Elements comprising horizontal alignment include curvature, superelevation (i.e., the bank on the road), and sight distance. These horizontal alignment elements influence traffic operation and safety and relate directly to the design speed of the corridor. MDT's geometric design standards for horizontal curves are defined in terms of curve radius, which varies based on design speed. For a 70-mph design speed, the minimum recommended radius is 1,810 feet with a minimum stopping sight distance (SSD) of 730 feet. For a 50-mph design speed, the minimum recommended radius is 760 feet with a minimum SSD of 425 feet.

There are several curves along the study corridor with limited sight distance due to steep side slopes.

Appendix B summarizes each horizontal curve identified along the study corridor. A determination of whether the curve meets standards was decided based on the design criteria discussed previously. The controlling design criteria for the horizontal curves are radius and SSD. For a horizontal curve, SSD is evaluated based on the ability to see through the inside of the corner. Minimum sight obstruction distances were calculated based on the MDT design criteria. The minimum sight obstruction distance is measured from the center of the inside travel lane and defines the area that should be clear of obstructions to allow for the recommended SSD.

Table 4.2 summarizes the horizontal curves and the design speed that each of the curves meets. There are 88 existing horizontal curves along US 191 within the study area. Approximately 55 percent of the curves (48 curves) do not meet the minimum standards for horizontal curvature based on a 70-mph design speed for level terrain. Of those curves, 15 meet the minimum design standards for rolling terrain (60-mph design speed) and 17 meet the standards for mountainous terrain (50-mph design speed). Approximately 18 percent of the curves (16) do not meet minimum design standards for an NHS Non-Interstate route. **Figure 4.1** shows the locations of the substandard curves.

Table 4.2: Horizontal Curves -- Design Speed Met

Design Speed Met (mph)	Number of Curves	Percent of Curves	Terrain
80	24	27%	Level
75	7	8%	Level
70	9	10%	Level
Total ≥ 70	**40**	**45%**	**Level**
65	5	6%	Rolling
60	10	11%	Rolling
Total ≥ 60	**55**	**63%**	**Rolling**
55	6	7%	Mountainous
50	11	13%	Mountainous
Total ≥ 50	**72**	**82%**	**Mountainous**
45	15	17%	Do Not Meet Standards
40	0	0%	Do Not Meet Standards
35	1	1%	Do Not Meet Standards
Total < 50	**16**	**18%**	**Do Not Meet Standards**

Note: Information does not include section between RP 49.9 and RP 51.9. Data based on best available as-builts.

4.4. Vertical Alignment

Vertical alignment is a measure of the elevation change of a roadway. The length and steepness of grades directly affect the operational characteristics of the roadway. The controlling design limits for vertical curves are SSD, vertical curvature (K-value), and maximum grade. Vertical curves can be placed into two categories: crest and sag. A crest curve is created at the top of a hill or when the grade decreases. Conversely, a sag curve occurs at the bottom of a hill or when the grade increases.

Appendix B lists the location and controlling design features for the vertical curves along the study corridor. According to the MDT *Geometric Design Standards*, the maximum allowable grades for a 70-mph design speed is 3 percent for level terrain, 4 percent for rolling terrain. Minimum lengths of crest or sag curves at various design speeds are commonly defined by the K-value, which represents the horizontal distance needed for a vertical curve to produce a one percent change in gradient. Minimum K-values relate lengths of vertical curves to required sight distance on crest curves and to headlight beam distance on sag vertical curves. For a 70-mph design speed (level terrain), minimum K-values of 247 and 181 are recommended for crest and sag vertical curves, respectively. For a 60-mph design speed (rolling terrain), minimum K-values of 151 and 136 are recommended for crest and sag vertical curves, respectively.

Table 4.3 summarizes the vertical curves on US 191 and the design speed that each of the curves meets. Within the study area, there are 92 vertical curves. Approximately 9 percent of the vertical curves (8) do not meet minimum design standards for a 70-mph design speed for level terrain. Of those curves, 6 meet design standards for a rolling terrain (60-mph design speed), and 1 curve meets standards for mountainous terrain (50 mph design speed). While one curve appears to not meet standards for an NHS Non-Interstate route, it was determined during field review that the curve has since been flattened. **Figure 4.1** shows the locations of the substandard curves.

Table 4.3: Vertical Curves -- Design Speed Met

Design Speed Met (mph)	Number of Curves	Percent of Curves	Terrain
80	70	76%	Level
75	9	10%	Level
70	5	5%	Level
Total ≥ 70	**84**	**91%**	**Level**
65	3	3%	Rolling
60	3	3%	Rolling
Total ≥ 60	**90**	**98%**	**Rolling**
55	0	0%	Mountainous
50	1	1%	Mountainous
Total ≥ 50	**91**	**99%**	**Mountainous**
Total < 50	**1**	**1%**	**Do Not Meet Standards**

Note: Information does not include section between RP 48.4 and 51.8, RP 61.2 and RP 61.8 or RP 70.1 and 81.9. Data based on best available as-builts.

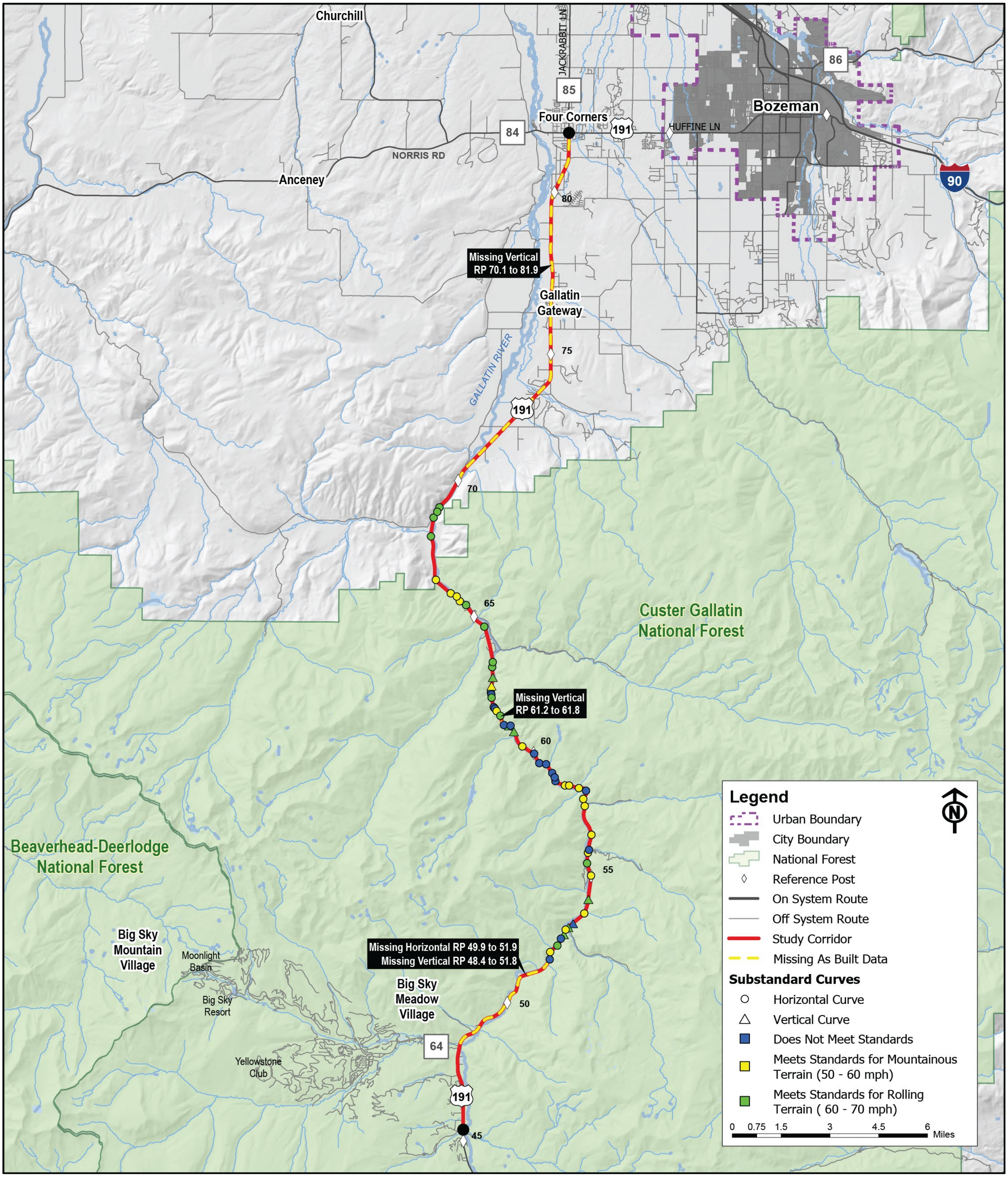


Figure 4.1: Substandard Curve Locations

4.5. Clear Zone

The roadside clear zone, starting at the edge of the traveled way, is the total roadside border area available for safe use by errant vehicles. This area may consist of a shoulder, a recoverable slope, a non-recoverable slope, and/or a recovery area. The desired clear zone width for the US 191 corridor ranges from 22 to 46 feet depending on traffic volumes, speeds, and roadside geometry. Clear zones are evaluated individually based on the roadside cross section. It is generally desirable to attain adequate clear zones by removing or shielding obstacles, if costs are reasonable.

The study corridor has areas with narrow clear zones and limited sight distances particularly within Gallatin Canyon.

The Gallatin Canyon is narrow with little room for road expansion. The proximity of the Gallatin River and the steep side slopes restrict the ability to provide for recommended clear zone widths as outlined by MDT design standards. In many locations, guardrail has been installed along the roadside to shield drivers from obstacles and in areas with steep side slopes.

In certain instances within the study area, it may be impractical to protect or remove certain obstacles within the clear zone. As improvement options develop, roadside clear zones should be designated, to a practical extent, to meet current MDT design standards. This may include slope flattening, clearing trees along the roadside, and/or widening shoulders.

4.6. Sight Distance

Sight distance is the length of roadway visible to a driver and is influenced by the geometry of the road (horizontal or vertical curves) and obstacles alongside the road. Sight distance is commonly defined in three ways: passing sight distance, stopping sight distance, and intersection sight distance. In general, the driver of a vehicle should have an unobstructed view and enough distance to perceive, react, and safely stop for or avoid approaching vehicles and other hazards.

There are several locations throughout the corridor where sight distance is hindered, most of which occur through the curving sections of the Gallatin Canyon. A history of crash trends at any of these locations could indicate a need for removal of vegetation or the cutting of an embankment on horizontal curves along the corridor. A review of crash data is provided in **Section 6**.

5.0. TRAFFIC CONDITIONS

An evaluation of traffic operations for the study corridor was completed using available data provided by MDT in addition to supplemental field-collected data. Turning-movement counts were conducted at three major intersections within the study area over a 24-hour period. Mainline traffic volume data for existing and historic conditions were available at multiple locations within the study area. Visual observations were made for driver behavior, vehicle queuing, and general traffic characteristics. The following sections provide details about the existing and projected traffic characteristics for the study corridor. Detailed data are available in **Appendix C**.

5.1. Existing Traffic Volumes

Traffic volumes along the study corridor are typically collected annually as part of MDT's traffic data collection program. A total of six data collection sites are located along the study corridor. Of those six sites, one is an Automatic Traffic Recorder (ATR) site and one is WIM site. The ATR and WIM sites are permanent and collect volume and classification data continuously. The data collected at the other four short-term count sites is typically completed annually and is used to determine an average daily traffic (AADT) volume. **Table 5.1** shows the 1999 and 2018 AADTs for the count sites along US 191. Additionally, traffic volumes over the past 20 years are plotted in **Figure 5.1**. Existing volumes along the study corridor range from a low of just under 6,000 vpd south of MT 64, to a high of over 17,000 south of Huffine Lane in Four Corners.

5.2. Projected Traffic Volumes

The selection of an appropriate growth rate for the area is important for forecasting future traffic conditions and to help identify corridor needs. To help identify an appropriate growth rate, historic traffic conditions were evaluated. Historic growth rates for the study corridor can help project future conditions as past growth may be indicative of future growth. Since traffic volumes can vary greatly over short periods of time, an analysis of multiple years of historic data was conducted to more accurately project future conditions. AADT data for the past 20 years (1999 through 2018) were used to determine the growth along the study corridor. **Table 5.1** shows the changes in traffic volumes over various periods of time. **Figure 5.1** shows the historic AADT data graphically.

Table 5.1: Historic Traffic Growth

Site ID	Location	RP	1999 AADT	2018 AADT	20-Year Growth	10-Year Growth	5-Year Growth
16-3A-008	US 191 S of Huffine Ln	81.5	6,890	17,367	3.2%	5.0%	10.1%
16-3A-007	US 191 N of Blackwood Rd	79.9	6,580	11,003	2.7%	2.8%	8.0%
16-3A-006	US 191 S of Gooch Hill Rd	76.9	4,640	10,266	2.8%	3.5%	7.2%
W-107	US 191 7 Mi. S of Four Corners 1.5 Mi. S of Gallatin Gateway	74.8	4,912	8,126	2.0%	6.4%	7.4%
A-043	NE of Big Sky Rd 1.5 Mi. NE of MT 64	49.8	3,526	6,760	2.3%	6.8%	9.0%
16-4-002	US 191 1 mi S of MT 64	47.9	3,560	5,966	-0.3%	0.6%	10.1%
Weighted Average US 191 Corridor Growth					2.4%	4.3%	8.7%

As shown in **Table 5.1**, traffic volumes are generally greater at the north end of the study corridor through the Four Corners and Gallatin Gateway communities. According to 2018 AADT values, approximately 7,000 vehicles travel through the Gallatin Canyon on an average day.

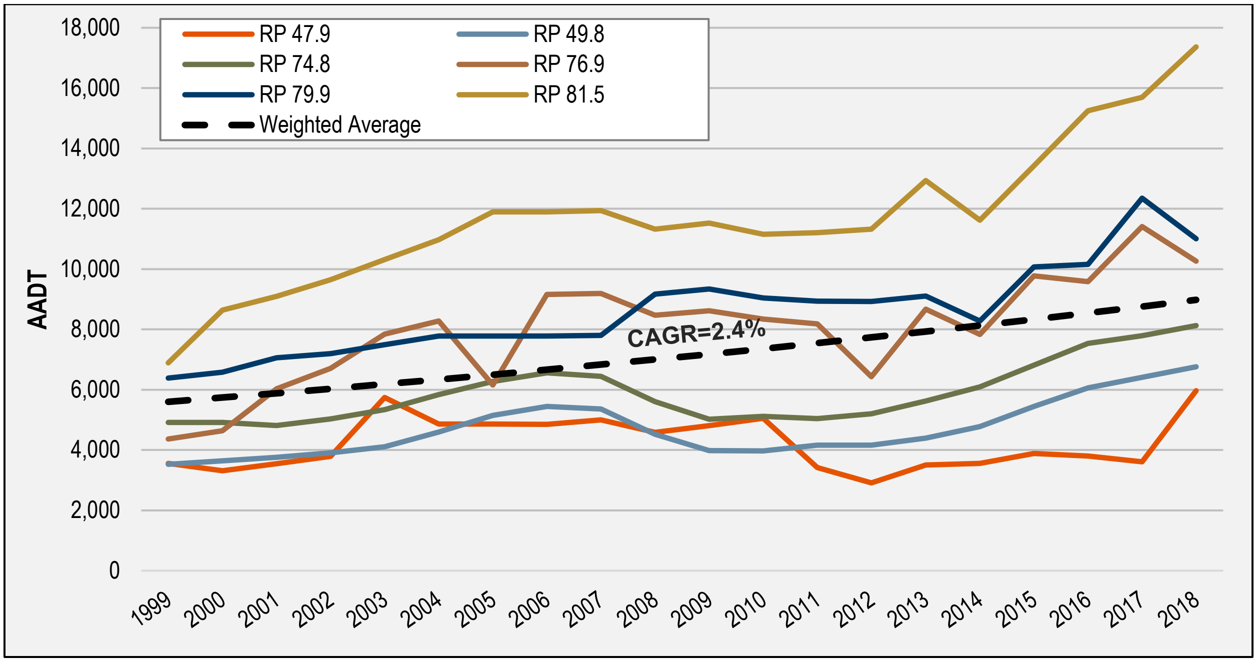


Figure 5.1: Historic Traffic Volumes

Traffic has generally shown high growth over the past 20 years. Between 1999 and 2018, traffic was shown to increase at an annual rate of 2.4 percent along the study corridor. Between 1999 and 2007, AADT within the study area showed steady growth. Between 2007 and 2012 traffic volumes declined likely due to the recession beginning in 2008. The drop in traffic may also be attributed to the fact that US 191 was closed to commercial truck traffic between June 2008 and July 2010. Since 2012, volumes have generally shown sustained growth. The populations in Gallatin County, especially in the Bozeman, Belgrade, and Big Sky areas, have also shown considerable growth over the past few years. Over the past 10 years, the corridor has experienced a growth rate of 4.3 percent per year. Over the past 5 years, traffic has increased by almost 9 percent per year.

5.2.1. Projected Growth Summary

Factoring in the various historic growth rates for the study corridor and the study area as a whole, it was determined that a growth rate of 2.4 percent would be appropriate for the study corridor. This growth rate is the weighted average of the US 191 study corridor over the past 20 years and is anticipated to be representative of predicted traffic growth over the next 20 years. As such, the 2.4 percent growth rate was applied to existing traffic volumes for the projected operational analysis contained in this report. Projected AADT for the study corridor are shown in **Table 5.2**.

Table 5.2: Historic Traffic Growth

Site ID	Location	RP	2018 AADT	2040 AADT*
16-3A-008	US 191 S of Huffine Ln	81.5	17,367	29,456
16-3A-007	US 191 N of Blackwood Rd	79.9	11,003	18,662
16-3A-006	US 191 S of Gooch Hill Rd	76.9	10,266	17,412
W-107	US 191 7 Mi. S of Four Corners 1.5 Mi. S of Gallatin Gateway	74.8	8,126	13,782
A-043	NE of Big Sky Rd 1.5 Mi. NE of MT 64	49.8	6,760	11,466
16-4-002	US 191 1 mi S of MT 64	47.9	5,966	10,119

**Projected based on a compound annual growth rate of 2.4 percent.*

5.3. Heavy Vehicle Traffic

An evaluation of heavy vehicle traffic along the study corridor was made using information from the ATR and WIM sites on US 191. In addition to traffic volumes, the permeant count sites collect commercial vehicle volumes. Note that classification data on the WIM site (W-107) only dates back to 2014, so historic trends are unknown. Volumes for commercial vehicles, both single unit trucks and combination unit trucks, are collected at the sites. **Table 5.3** shows the heavy vehicle traffic data collected at the two MDT permanent count sites. Based on the AADT counts and vehicle classification data, commercial truck traffic accounts for over 12 percent of traffic near Big Sky and almost 9 percent of all traffic near Four Corners.

Table 5.3: Commercial Truck Traffic

Count Site ID	RP	2009 Volume[(i)]			2014 Volume			2018 Volume		
		AADT	Commercial	Percent	AADT	Commercial	Percent	AADT	Commercial	Percent
W-107	74.8	5,020	255	5.1%	6,093	620	10.2%	8,126	1,009	12.4%
A-043	49.8	3,976	(ii)	(ii)	4,776	424	8.9%	6,760	591	8.7%

Source: MDT Transportation Data Management System, https://mdt.ms2soft.com/
(i) Corridor was closed to semitrucks
(ii) Data unavailable

5.4. Seasonal and Daily Variation

The two permanent MDT traffic count sites continuously count data allowing for information on daily and seasonal variations. Analysis of the continuous count data can provide insight to how traffic conditions change throughout the year or week. The following sections discuss the seasonal and daily variations in traffic along the corridor.

Daily Variation

The corridor is shown to experience moderate fluctuations in traffic volumes throughout the week. In 2018, traffic volumes were highest during the weekdays. Weekend traffic was, on average, between 23 and 31 percent lower on the weekends than during the weekdays. Much of this reduction in weekend traffic may be attributed to commuters to the Big Sky area. According to the 2018 *Big Sky Housing Action Plan*[33], almost 50 percent of workers in Big Sky commute from other locations, primarily northern parts of Gallatin County, such as Bozeman and Belgrade. **Figure 5.2** shows the daily variation in traffic along the study corridor.

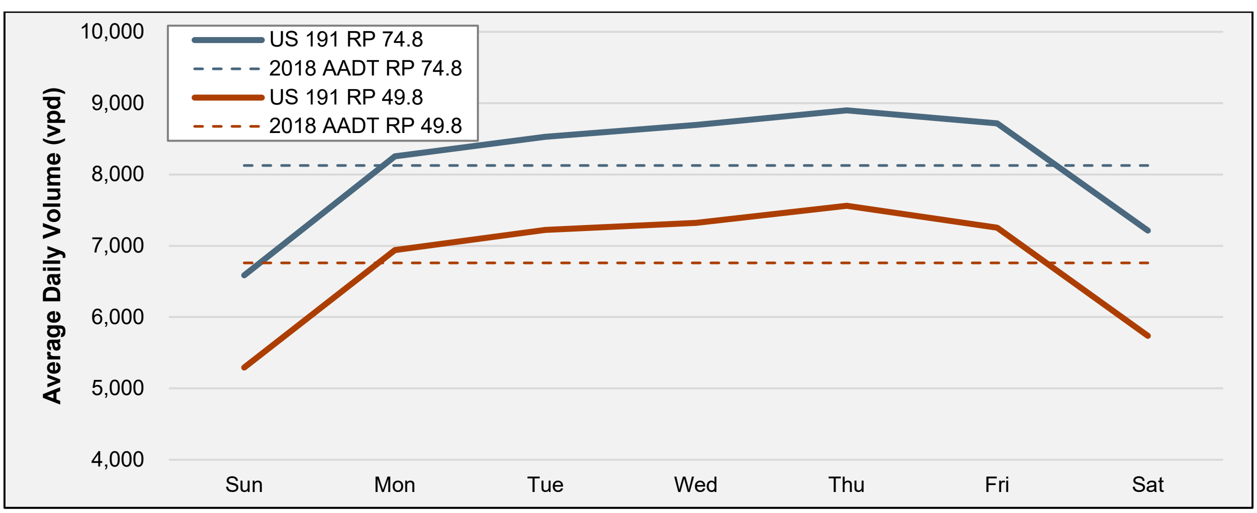


Figure 5.2: Daily Traffic Variation (2018)

Seasonal Variation

Analysis of the traffic counts at each the ATR and WIM sites shows that traffic volumes are highest in the summer months (June through September) and lowest in the shoulder seasons (April through May and October through November). The winter ski season sees traffic volumes typically between peak summer and off-peak months. Traffic volumes are shown to be upwards of 70 percent higher during the peak summer than those seen in November. The seasonal variation of traffic volumes can largely be attributed to heavy recreational and tourism use of the corridor. **Figure 5.3** shows the seasonal variation in traffic along the study corridor.

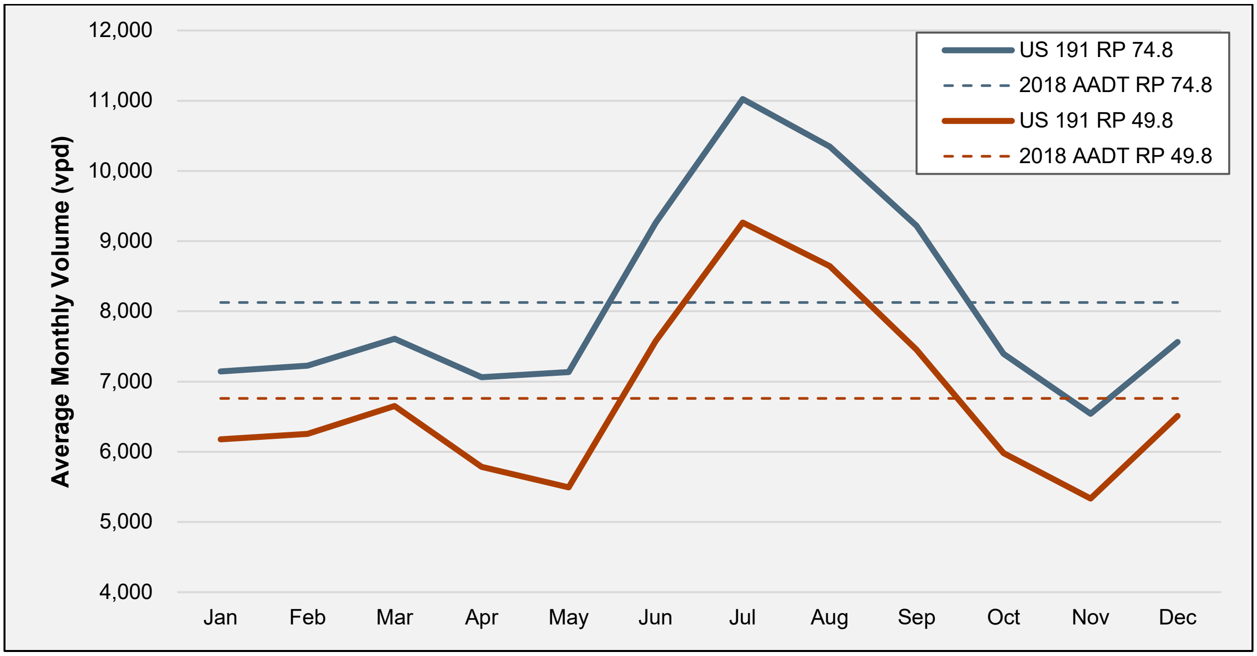


Figure 5.3: Seasonal Traffic Variation (2018)

5.5. Intersection Operations

To supplement AADT counts for the study corridor, intersection turning movement data was collected at three major intersections along the corridor. Vehicle turning movement data was collected at each of the intersections over a 24-hour period on a Thursday in both August and December of 2019. Counts were collected in August to capture peak summer traffic for recreationists along US 191 and visitors to Big Sky and Yellowstone National Park. Data collected in December captured peak winter traffic for the three ski areas in Big Sky and other winter recreation in the area. The data was used to evaluate intersection operations and peak hour conditions with consideration of seasonal variations.

The operational conditions of the intersections are characterized by the Level of Service (LOS). The LOS is based on an alphabetic scale which represents the full range of operating conditions. This scale is defined based on the vehicle delay experienced at the intersection. The scale ranges from “A” which indicates little, if any, vehicle delay, to “F” which indicates significant delay and traffic congestion.

Table 5.4 summarizes the peak hour intersection operational analysis under existing and projected conditions. Additionally, **Figures 5.4** and **5.5** present the traffic operations graphically. More detailed information on the operational analysis is provided in **Appendix D** and **E**. The following sections discuss the general operational characteristics of the three major intersections along the study corridor.

Table 5.4: Intersection Operations

Location	Existing Conditions (August 2019)						Projected Conditions (August 2040)					
	AM		Noon		PM		AM		Noon		PM	
	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)	LOS
Four Corners (S)	**33.4**	**C**	**26.0**	**C**	**38.8**	**D**	**156.8**	**F**	**57.5**	**E**	**170.7**	**F**
Northbound	35.4	D	26.4	C	41.5	D	61.7	E	53.4	D	87.1	F
Southbound	35.1	D	25.1	C	34.3	C	220.6	F	48.4	D	148.1	F
Eastbound	42.2	D	33.9	C	48.9	D	71.3	E	51.4	D	70.8	E
Westbound	26.6	C	22.5	C	35.7	D	188.6	F	70.5	E	294.8	F
Mill Street (TWSC)	**25.4**	**D**	**21.8**	**C**	**57.4**	**F**	**209.0**	**F**	**113.9**	**F**	**2,213.9**	**F**
Northbound	0.3	A	0.2	A	0.4	A	0.4	A	0.2	A	0.4	A
Southbound	0.6	A	0.9	A	0.9	A	0.6	A	1.0	A	1.2	A
Eastbound	23.2	C	19.7	C	44.0	E	199.4	F	105.2	F	2,089.7	F
Westbound	13.4	B	14.6	B	21.7	C	31.5	D	35.2	E	187.1	F
MT 64 (S)	**10.3**	**B**	**13.2**	**B**	**24.5**	**C**	**74.5**	**E**	**17.2**	**B**	**113.0**	**F**
Northbound	6.0	A	7.6	A	15.7	B	10.8	B	15.5	B	20.0	B
Southbound	7.7	A	6.0	A	13.5	B	110.2	F	10.9	B	15.7	B
Eastbound	22.6	C	23.7	C	32.5	C	24.9	C	23.8	C	189.6	F
Location	**Existing Conditions (December 2019)**						**Projected Conditions (December 2040)**					
	AM		**Noon**		**PM**		**AM**		**Noon**		**PM**	
	Delay (s)	**LOS**	**Delay (s)**	**LOS**	**Delay (s)**	**LOS**	**Delay (s)**	**LOS**	**Delay (s)**	**LOS**	**Delay (s)**	**LOS**
Four Corners (S)	**33.7**	**C**	**22.8**	**C**	**34.2**	**C**	**141.6**	**F**	**38.5**	**D**	**112.3**	**F**
Northbound	35.1	D	21.9	C	39.7	D	58.0	E	41.8	D	79.4	E
Southbound	36.0	D	22.9	C	30.7	C	197.4	F	35.8	D	85.3	F
Eastbound	41.9	D	28.8	C	45.9	D	71.3	E	47.0	D	64.9	E
Westbound	26.0	C	20.1	C	27.0	C	166.6	F	34.0	C	180.6	F
Mill Street (TWSC)	**43.5**	**E**	**17.0**	**C**	**39.9**	**E**	**1,076.9**	**F**	**39.8**	**E**	**906.1**	**F**
Northbound	1.5	A	0.1	A	0.7	A	1.9	A	0.2	A	0.8	A
Southbound	0.7	A	1.2	A	0.8	A	0.7	A	1.3	A	1.1	A
Eastbound	40.5	E	16.7	C	33.7	D	1,061.6	F	38.1	E	859.8	F
Westbound	17.8	C	12.0	B	19.4	C	153.8	F	18.6	C	125.1	F
MT 64 (S)	**11.9**	**B**	**13.6**	**B**	**45.5**	**D**	**107.4**	**F**	**16.1**	**B**	**194.7**	**F**
Northbound	6.6	A	6.5	A	15.1	B	12.1	B	11.1	B	17.3	B
Southbound	10.1	B	5.9	A	13.5	B	172.3	F	10.7	B	14.4	B
Eastbound	22.7	C	22.8	C	61.0	E	25.3	C	22.8	C	284.2	F

(S) – Signal; (TWSC) – Two-Way Stop Control

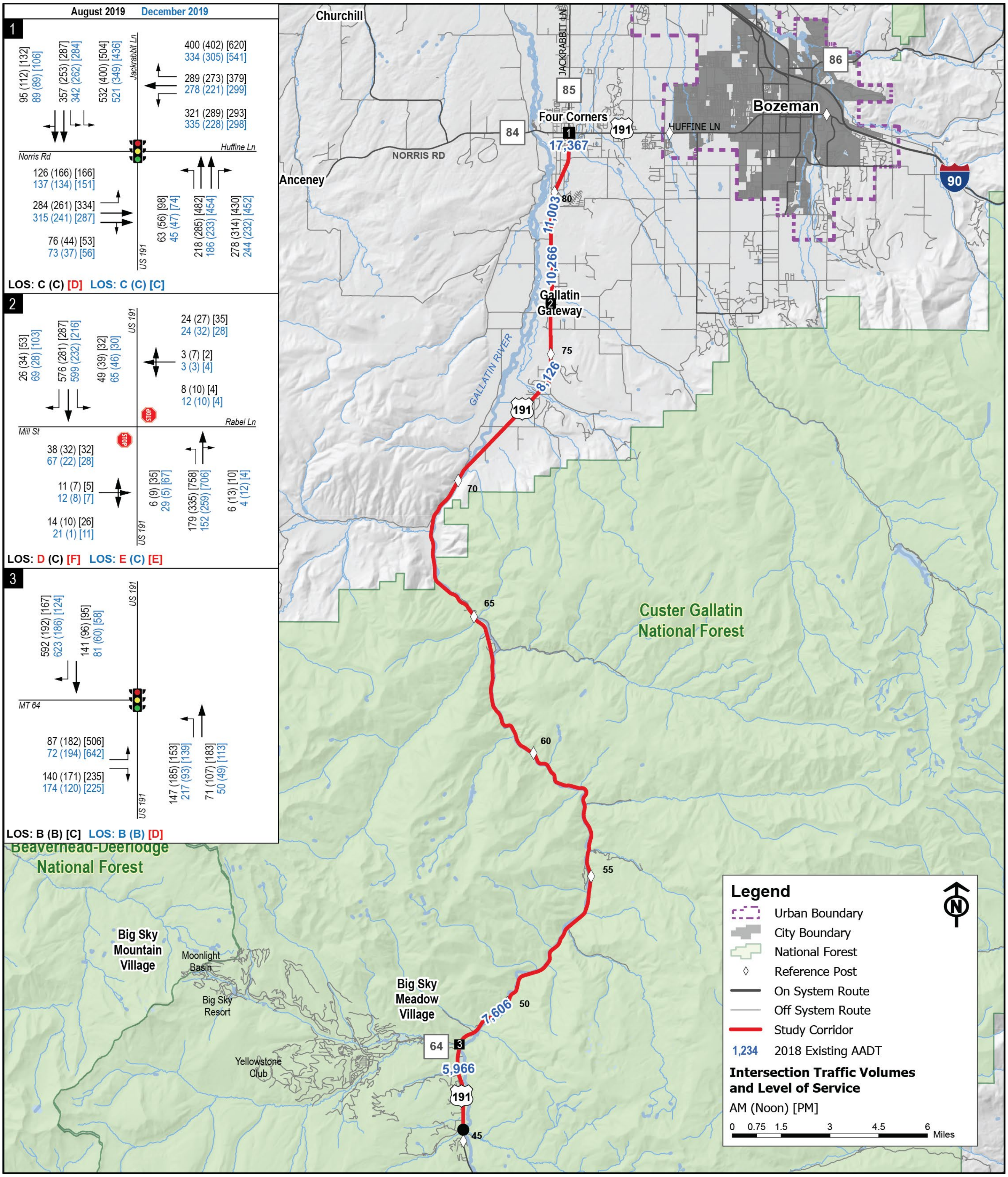


Figure 5.4: Existing Traffic Conditions

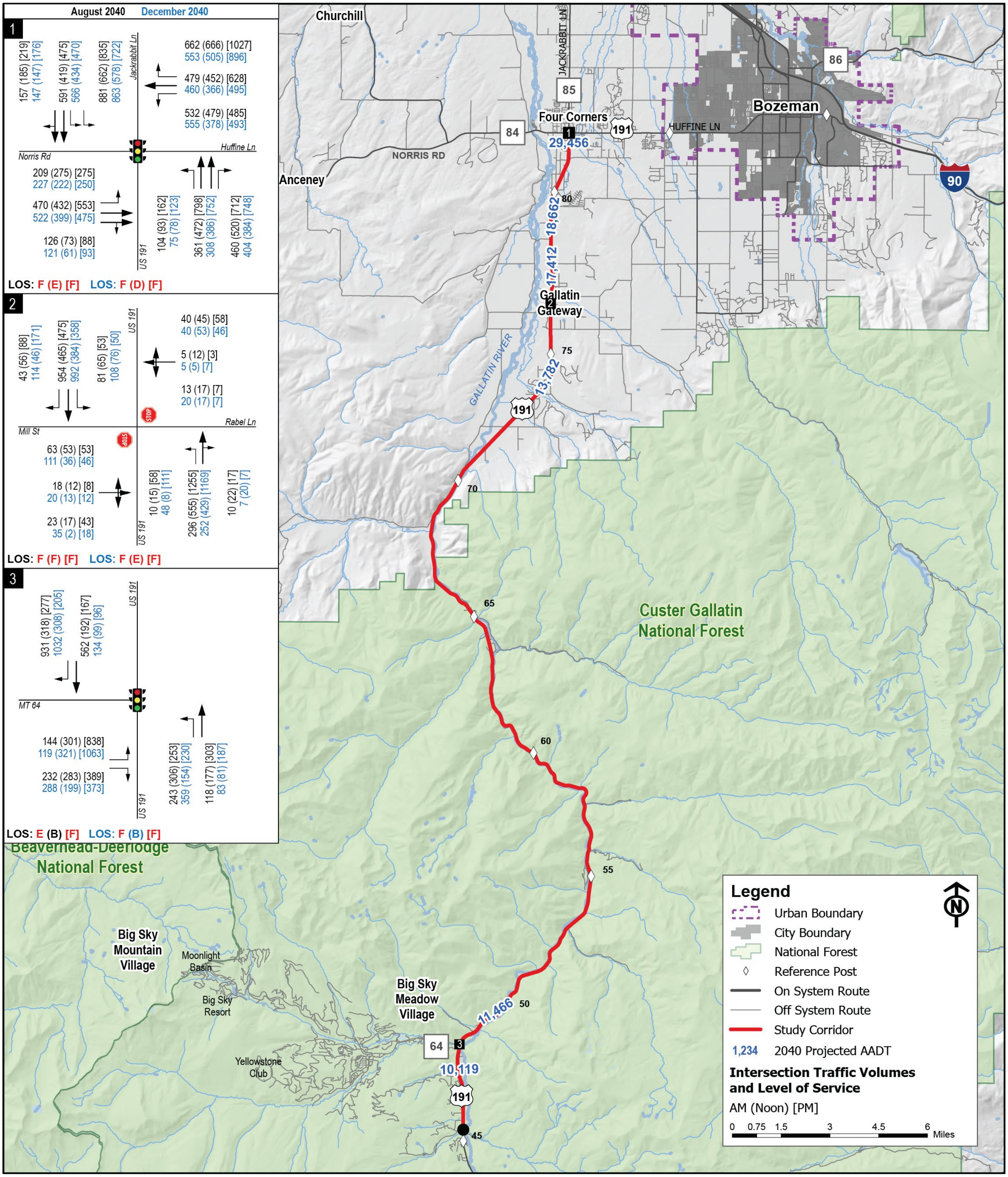


Figure 5.5: 2040 Projected Conditions

Four Corners

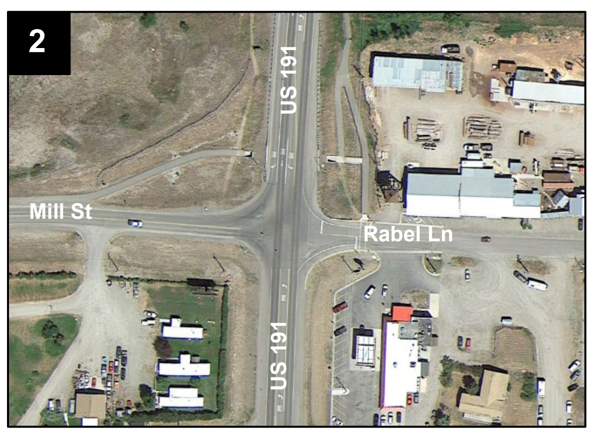
The intersection of US 191/Norris Road/Jackrabbit Lane/Huffine Lane is currently signalized. The northbound approach (US 191) has dedicated right-turn and left-turn lanes and two through lanes. The eastbound approach (Norris Road) consists of a dedicated left-turn lane, through lane, and shared through/right-turn lane. The southbound approach (Jackrabbit Lane) has two dedicated left-turn lanes, a through lane, and a shared through/right-turn lane. The westbound approach (Huffine Lane) consists of dedicated left-turn, through, and right-turn lanes.

There are gas stations on three of the four quadrants of the intersection while a bar/restaurant is located in the fourth. The driveways for these businesses are setback less than 100 feet from the stop bar on all approach legs except along Jackrabbit Lane. There are crosswalks on all approaches.

Under existing traffic conditions, this intersection operated at a LOS C during all peak hours except the August PM peak hour. The intersection experiences about 13 percent fewer vehicles during December than in August but generally operates at the same LOS during the peak travel periods. The eastbound approach (from Ennis) generates the highest delay during all peak hours. The northbound approach (from Big Sky) generates the second highest delay during all peak hours.

Under projected traffic conditions, the Four Corners intersection is predicted to operate at LOS F during the AM and PM peak hours. During the noon peak hour, the intersection operates at LOS E in the summer and LOS D in the winter. All legs, except the westbound leg during the noon peak hour, are projected to operate at LOS D or worse during the AM, Noon, and PM peak hours.

Mill Street



The intersection of US 191/Mill Street/Rabel Lane is currently two-way stop controlled on the minor approaches (east/west). The northbound approach (US 191) has a dedicated left-turn lane and a shared through/right-turn lane. The southbound approach (US 191) consists of dedicated left-turn, through, and right-turn lanes. Both the east and westbound approaches (Mill Street and Rabel Lane, respectively) have one shared left-turn/through/right-turn lane. There is a crosswalk on Rabel lane approximately 50 feet east of the intersection where the shared use path terminates.

Under existing traffic conditions, this intersection operates at a LOS of D, C, and F during the AM, Noon, and PM peak hours, respectively, in the summer peak season. In the winter peak season, the intersection operates at LOS E, C, and E during the AM, Noon, and PM peak hours, respectively. The added delay at the intersection during the winter can be attributed to school traffic (Gallatin Gateway School) as the eastbound traffic volumes are nearly double when school is in session. The north and southbound approaches experience little delay, as these approaches are given the priority movement. The eastbound approach generates the highest delay during all peak hours. When there are high traffic volumes on US 191 during the peak hours, it can be difficult to find an acceptable gap to make a left turn from either the east or westbound approach.

Under projected conditions, the Mill Street intersection is anticipated to operate at LOS E or F during all peak hours. If the intersection remains two-way stop controlled, the north and southbound approaches will continue to operate at LOS A while the east and westbound approaches are projected to experience substantial delay.

<u>**MT Highway 64**</u>

The intersection of US 191/MT 64 is a three-legged intersection which is currently signalized. The northbound approach (US 191) consists of dedicated left-turn and through lanes. The westbound approach (MT 64) has dedicated right-turn and left-turn lanes. The southbound approach (US 191) consists of dedicated right-turn and through lanes. There is a crosswalk on the eastbound approach. The Big Sky Chamber of Commerce and a gas station sit near the intersection, their approaches are located within 250 feet of the intersection.

Under existing traffic conditions, this intersection operates at a LOS of B during the AM and Noon peak hours in both the summer and winter peak seasons. During the PM peak hour, the intersection operates at LOS C in August, but operates at LOS D in December. Although the intersection experiences about 13 percent less traffic in the winter than the summer, the delay on individual approaches can be worse during the winter. The southbound right generates more delay during the AM peak hour, and the eastbound approach generates more delay during the PM peak hour in the winter. This increase in delay can likely be attributed to ski traffic at the resorts in Big Sky. During all peak hours, the eastbound approach (MT 64) generates the highest delay. The delay is primarily attributed to the eastbound right turning movement during the AM and Noon peak hours and the eastbound left turning movement during the PM peak hour.

Under projected conditions, the MT 64 intersection is predicted to operate at a LOS E, B, and F during the AM, Noon, and PM peak hours, respectively, in the summer peak season. In the winter season the intersection operates at LOS F, B, and F during the AM, Noon, and PM peak hours, respectively. With the current signal phasing, the delay is shown to be the worst in southbound direction during the AM peak hour, and in the eastbound direction during the PM peak hour. The southbound right generates a significant amount of delay which could be resolved by implementing right-turn overlap phasing with the eastbound left-turn.

5.6. Travel Time

During the 24-hour periods where turning movements were collected, travel times and speeds between the three intersections were also recorded. **Table 5.5** shows the 85th percentile and mean travel times and speeds along US 191 between the intersections. Note that traffic fluctuates throughout the day and may be slower or faster during on- and off-peak travel times, respectively. See **Appendix D** for more information.

During both the summer and winter counts, data was collected on both a Thursday and a Saturday. At the time of the August counts, MDT was in the process of replacing the guardrail on US 191 through the Gallatin Canyon between the Hellroaring Trailhead and Moose Creek Campground. Speeds were reduced during construction and traffic was closed to one lane within the work zones, causing some delay to traffic in the corridor. Construction hours were weekdays, 7:00 AM to 7:00 PM, therefore the Saturday travel times and speeds are more indicative of free-flow travel. On average, there were about 11 percent fewer cars in December than August and about 23 percent fewer cars on Saturday than on Thursday.

As shown in the table, the travel time in the north and southbound directions is fairly consistent, with a general difference of a minute or less. There do not appear to be any definitive peaks in the travel times collected. Travel times generally vary by about 5 to 10 minutes between Thursday and Saturday, though there do not seem to be any consistent factors influencing travel times. However, fluctuations in travel time may be attributed to slow moving vehicles and general traffic congestion. There is not a significant difference in travel times during the summer and winter, though the mean travel speeds are slightly slower in the winter than in the summer which may be attributed to weather or road conditions.

Based on collected data, vehicles travel, on average, slightly slower than the posted speeds. This is consistent with a speed study conducted by MDT which concluded that the 60-mph speed limit through the canyon is consistent with travel speeds. The study also notes that the curvilinear alignment of the roadway draws travel speeds downward for a short distance in some locations.

Table 5.5: Travel Time

Location	Summer Traffic (Thursday)*				Summer Traffic (Saturday)			
	Travel Time (min)		Speed (mph)		Travel Time (min)		Speed (mph)	
	85th Percentile	Mean	85th Percentile	Mean	85th Percentile	Mean	85th Percentile	Mean
Four Corners to Mill Street – RP 81.9 to RP 76.3								
Northbound	7.3	6.7	55.5	50.8	7.0	6.5	56.4	58.0
Southbound	6.7	6.2	56.6	54.4	6.5	6.2	57.6	55.1
Mill Street to MT 64 – RP 76.3 to RP 48.0								
Northbound	37.2	33.7	56.3	50.8	31.3	29.7	59.9	60.8
Southbound	36.8	33.8	55.3	50.5	32.4	31.0	57.8	55.0
Four Corners to MT 64 – RP 81.9 to RP 48.0								
Northbound	45.0	41.2	54.5	49.8	39.2	37.0	58.2	55.3
Southbound	43.0	40.2	54.9	50.8	39.7	37.6	57.5	54.3
Location	Winter Traffic (Thursday)				Winter Traffic (Saturday)			
	Travel Time (min)		Speed (mph)		Travel Time (min)		Speed (mph)	
	85th Percentile	Mean	85th Percentile	Mean	85th Percentile	Mean	85th Percentile	Mean
Four Corners to Mill Street – RP 81.9 to RP 76.3								
Northbound	7.5	6.8	56.0	56.5	7.0	6.5	56.4	52.8
Southbound	6.8	6.3	56.5	53.6	6.3	6.0	58.2	56.2
Mill Street to MT 64 – RP 76.3 to RP 48.0								
Northbound	31.5	29.9	58.4	55.2	31.5	29.7	61.0	57.4
Southbound	32.6	30.9	60.0	57.0	31.3	30.1	58.6	56.4
Four Corners to MT 64 – RP 81.9 to RP 48.0								
Northbound	38.7	36.7	58.2	55.6	39.7	36.8	59.9	55.6
Southbound	39.4	37.4	57.6	54.6	37.9	36.3	58.3	56.2

**Travel times collected during construction.*

5.7. Highway Operations

The traffic operations of the study corridor were evaluated based on procedures outlined in the *Highway Capacity Manual (HCM)*[34]. Because of the wide range of functions served by two-lane highways, the HCM establishes three classes of highways. The classifications are based on the intended roadway function and the expectation of drivers along the roadway. The following classifications are defined in the HCM:

- **Class I:** Characteristic of a rural area. Users can expect both high speeds and the ability to pass. Both average travel speed and percent time spent following criteria are used to determine LOS.
- **Class II:** Characteristic of a rural area. Users do not necessarily expect to travel at high speeds due to terrain or scenic and/or recreational roadway contexts. Only percent time spent following is used to determine LOS.
- **Class III:** Characteristic of moderately developed areas. Speed limits are low due to surrounding development and passing is generally restricted. Only percent of free-flow speed is used to determine LOS.

For this highway operational analysis, the study corridor was broken into logical segments based on roadway type, context, and where ADT counts were available. The study corridor can be described as any of the three classes, depending on location. For example, in the developed areas of Four Corners, Gallatin Gateway, and Big Sky, speed limits are lower and passing opportunities are more limited, thereby categorizing these segments as Class III. Whereas through the Gallatin Canyon, the terrain and recreational purposes along the corridor categorize the segment as Class II. The remaining segments are likely defined as Class I.

The operational characteristics of the segments are further defined in terms of roadway capacity and LOS. Capacity is the theoretical maximum traffic flow obtainable on the roadway using all available lanes. Individual roadway capacity varies greatly and is calculated based on the procedures identified in the HCM. The maximum number of vehicles that could theoretically be accommodated on a roadway (i.e. physical capacity) is generally greater than the number typically acceptable to driver perception. Capacity is dependent on available lanes, passing opportunities, access points, and speed limits and is generally higher than what a typical driver in a rural community would anticipate.

Roadway LOS is intended to provide a comparison value to represent the driver's perception of the roadway performance. The LOS is based on a combination of factors, all of which play a part in the driver's perception of how the roadway is performing. When drivers experience delays due to reduced travel speeds, lack of passing opportunities, heavy vehicles in the traffic stream, and steep roadway grades, the roadway LOS deteriorates. The following provides a description of each LOS as defined by the HCM:

- **LOS A:** Represents free-flow conditions. Motorists experience high operating speeds and little difficulty in passing. Platoons of three or more vehicles are rare.
- **LOS B:** Passing demand and passing capacity are balanced. The degree of platooning becomes noticeable. Some speed reductions are present but are still relatively small.
- **LOS C:** Most vehicles are traveling in platoons. Speeds are noticeably curtailed.
- **LOS D:** Platooning increases significantly. Passing demand is high but passing capacity approaches zero. A high percentage of vehicles traveling in platoons, and the time spent following is quite noticeable.
- **LOS E:** Demand is approaching capacity. Passing is virtually impossible, and the time spent following is more than 80 percent. Speeds are seriously curtailed.

- **LOS F:** Exists whenever demand flow in one or both directions exceeds the capacity of the segment. Operating conditions are unstable, and heavy congestion exists.

An operational analysis was conducted using *Highway Capacity Software* for two-lane highways. The results of the analysis for both existing and projected conditions are shown in **Table 5.6**. An analysis was performed for both the average day throughout the year, and the average day during the peak season. More detailed data is contained in the appendix.

Table 5.6: Highway Segment Operational Analysis

Site	Begin RP	End RP	Segment Length (mi)	2018 AADT	% No-Passing	Highway Class	Speed Limit (mph)	Access Point Density (per mi)	Level of Service (2018 [2040])	
									Average Annual	Peak Season[(ii)]
16-3A-008	81.9	80.6	1.3	17,367	100%	III	45	36.15	E [E]	F [F]
16-3A-007	80.6	78.5	2.1	11,003	70%	I	55	11.43	E [E]	E [F]
16-3A-006	78.5	75.8	2.8	10,266	100%	III	55	14.64	C [D]	E [E]
W-107[(i)]	75.8	70.4	5.4	8,126	41%	I	70	8.89	C [D]	D [D]
A-043	70.4	47.9	22.4	6,760	82%	II	60	8.35	D [D]	E [E]
16-4-002	47.9	45.3	2.6	5,966	100%	III	60	15.00	C [C]	C [D]

(i) This segment includes a passing lane.
(ii) Peak season rates were determined based on data from the ATR sites

The MDT *Traffic Engineering Manual*[35] lists a target LOS of B for an NHS Non-Interstate route with level/rolling terrain. Based on the analysis in **Table 5.6**, the segments of US 191 are currently operating below the target LOS for this facility. The LOS of the roadway is generally worse during the peak season. Under future traffic conditions, the roadway is projected to operate at a LOS D or worse on all segments except that between MT 64 and Beaver Creek during the average day which is projected at a LOS C.

There are few passing opportunities, high traffic volumes, and a mixture of vehicle types which results in poor levels of service along the corridor.

The LOS of the highway can be improved by reducing vehicular traffic and/or increasing roadway capacity. The capacity can be increased by providing additional passing opportunities and by reducing access density. Additional passing opportunities may be provided by decreasing the no-passing zones (through pavement striping), or by constructing dedicated passing lanes.

6.0. SAFETY

Crash data for the corridor was provided by the MDT Traffic and Safety Bureau for the 10-year period between January 1st, 2009, and December 31st, 2018. This information includes data from crash reports submitted to the Montana Highway Patrol from their patrol officers and from local city/county law enforcement. The crash reports are a summation of information from the scene of the crash provided by the responding officer. Some of the information contained in the crash reports may be subjective. Any crash records from other law enforcement agencies that were not reported to or by the Montana Highway Patrol were not contained in the database and are not included in this analysis.

6.1. Limitations of Data

Although the crash data can help identify trends in behavioral and circumstantial contributors to crashes along the study corridor, there are some limitations to the data. The primary limitation is unreported and unknown data. There are many crash records for which various fields are left blank. Occasionally, a report will have "unknown" listed, rather than a blank field. Without this information, it may be difficult to capture the complete picture of what happened in crashes. Similarly, many crashes, especially those where individuals and vehicles are unharmed, do not get reported to the police. Underreporting can limit the ability to properly and effectively manage road safety, since the analyses in this report are based only on reported crash data. Another limitation may be inconsistencies with reporting. Although protocol has been established and training for filling out crash reports is provided to law enforcement, there may still be inconsistencies or errors in the reporting.

Often-times the available crash data does not provide the full story. Without reading the full crash reports by the investigating officer which contain narratives of the crash occurrence, statements from the individuals involved and witnesses, crash diagrams, citations, and officer opinions as to cause of the collision, a clear picture of the crash may be unattainable. Since it would be time and cost prohibitive to review the full crash reports for all of the crashes that occurred along the study corridor over the past 10 years, the data analysis contained in the following sections is limited to data contained in the crash records. The records are evaluated as reported, there have been no efforts to correct mistakes or fill in blanks.

6.2. Crash Location

The crash locations were plotted using latitude and longitude assigned to each record. The crashes were plotted and grouped based on if they occurred at an intersection or along a roadway segment. According to the records, there were 1,077 crashes reported along the study corridor during the 10-year analysis period. The crash records were reviewed to identify trends, contributing factors, and characteristics as discussed in the following sections. The density of crashes along the corridor is shown in **Figure 6.1**.

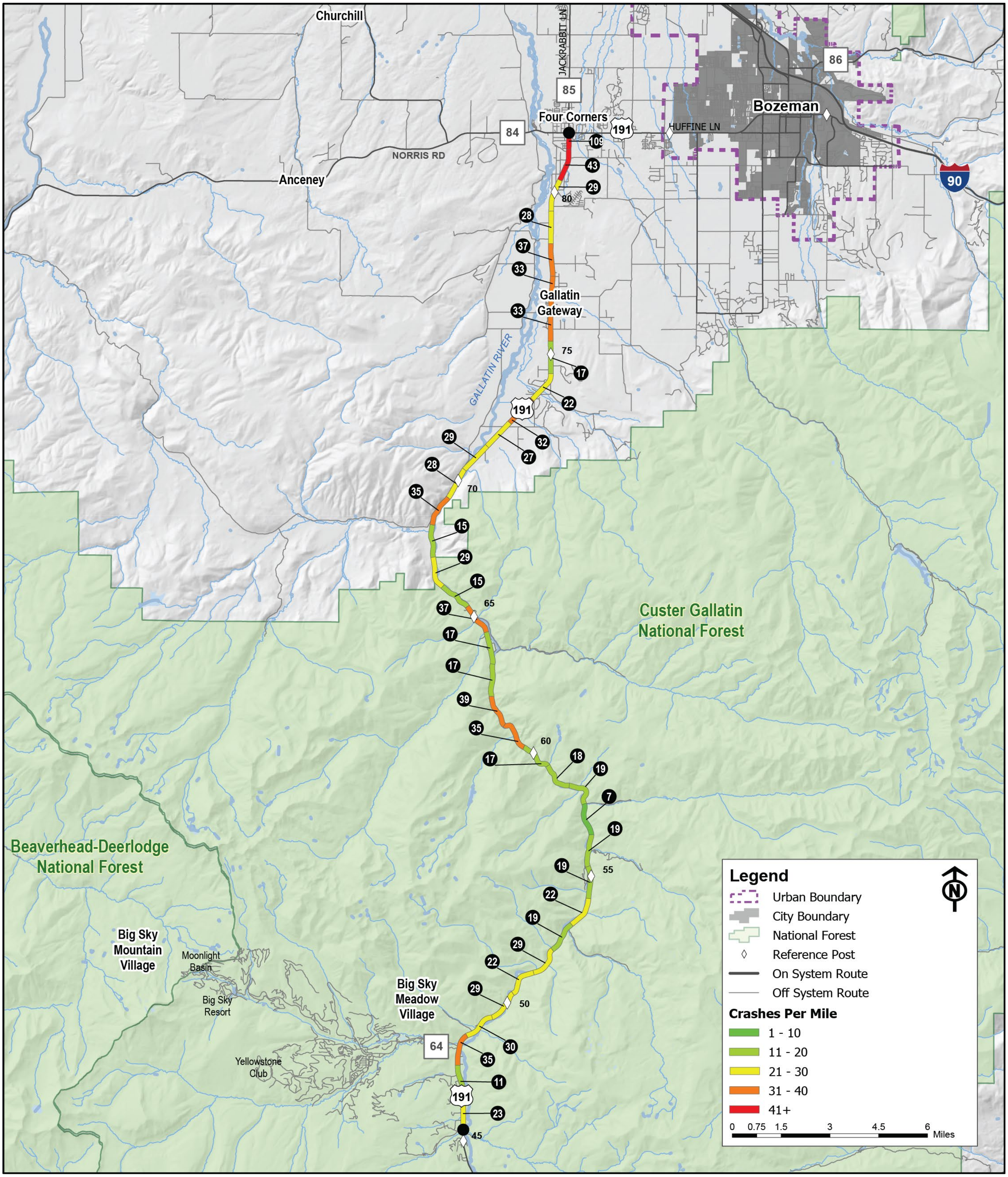


Figure 6.1: Crash Density

6.3. Crash Type

Crash types were grouped into two categories, single and multiple vehicle crashes. Single vehicle crashes are those types that involve only one vehicle. Single vehicle crashes accounted for 63 percent (682) of all reported crashes. Of the single vehicle crashes, wild animal crashes were the most common type, followed by fixed object and rollover crashes.

Multiple vehicle crashes involve two or more vehicles. Multiple vehicle crashes accounted for 37 percent (395) of all crashes. The most common multiple vehicle crash types were rear end crashes followed by and sideswipe and right angle crashes. **Figure 6.2** presents the distribution of crash types along the study corridor.

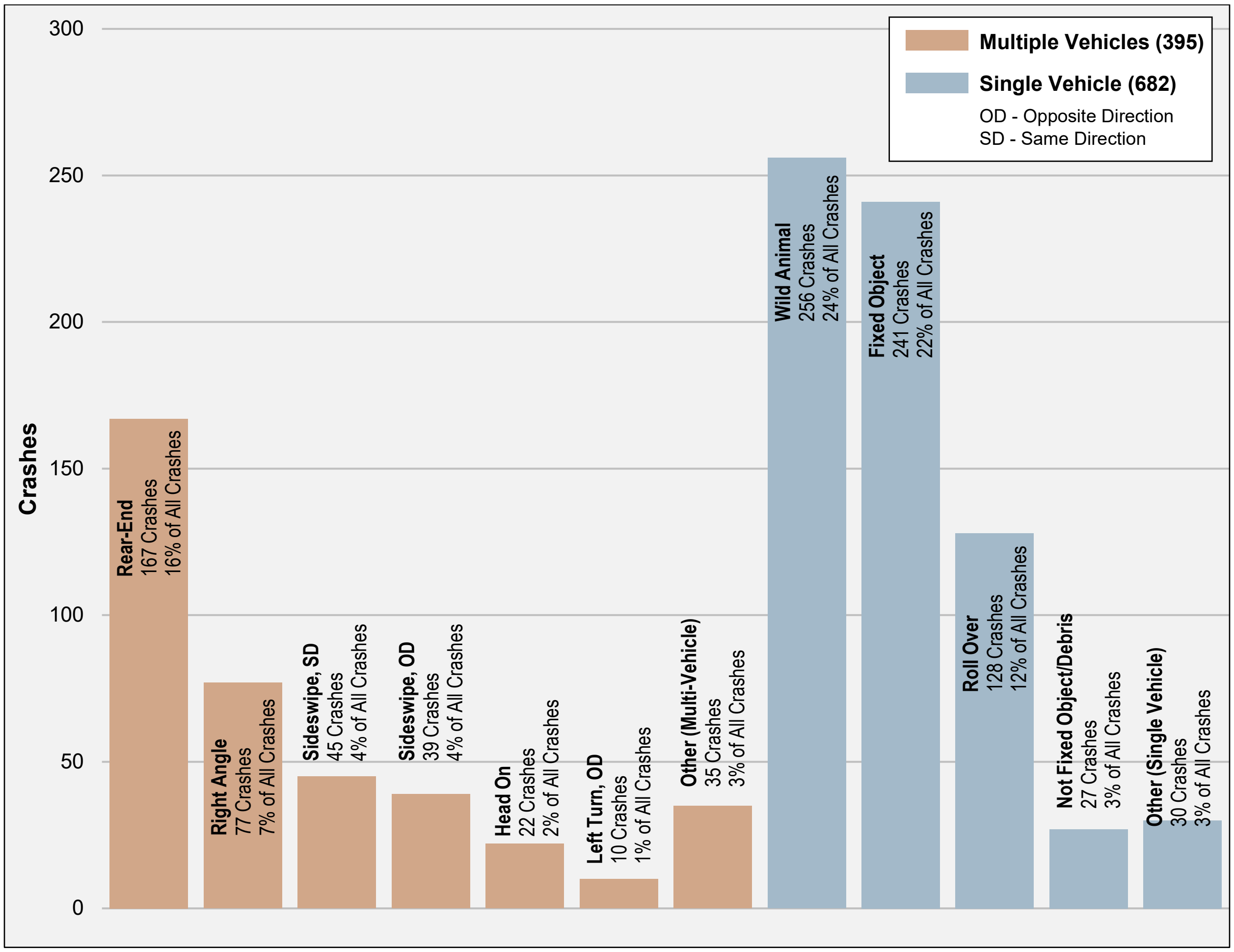


Figure 6.2: Crash Type

Crash types tend to be associated with their relation to a junction (i.e. intersection or driveway). For example, multiple vehicle crashes are more common in locations near junctions. As such, analysis of relation to junction information can help to identify systemic issues within the study area. Of the 1,077 total reported crashes, 78 percent (845) of crashes were non-junction related. The remaining 22 percent (230) of crashes were, in some way, junction related. Of the junction crashes, almost 45 percent (100) occurred at or near the intersection with Jackrabbit Lane/Huffine Lane. Two crashes were reported as unknown, but it can be inferred from spatial mapping that the crashes were non-junction related.

6.4. Crash Period

Each crash record includes the date and time when the crash occurred. These data can be used to determine seasonal and other time dependent trends. Time of day data was analyzed to determine if any specific trends were present. The data were plotted based on the hour the crash occurred and whether the crash occurred on a weekday or weekend. For weekday crashes (74 percent of all crashes), two peaks are apparent. One peak occurs between 6:00 and 8:00 AM which accounted for 18 percent of weekday crashes. The other peak occurs between 3:00 and 8:00 PM and accounts for 36 percent of crashes. For the weekend crashes (26 percent of all crashes), peak periods were less defined as the crashes were more distributed throughout the day. **Figure 6.3** presents the distribution of crashes with respect to the time of day that the crashes occurred.

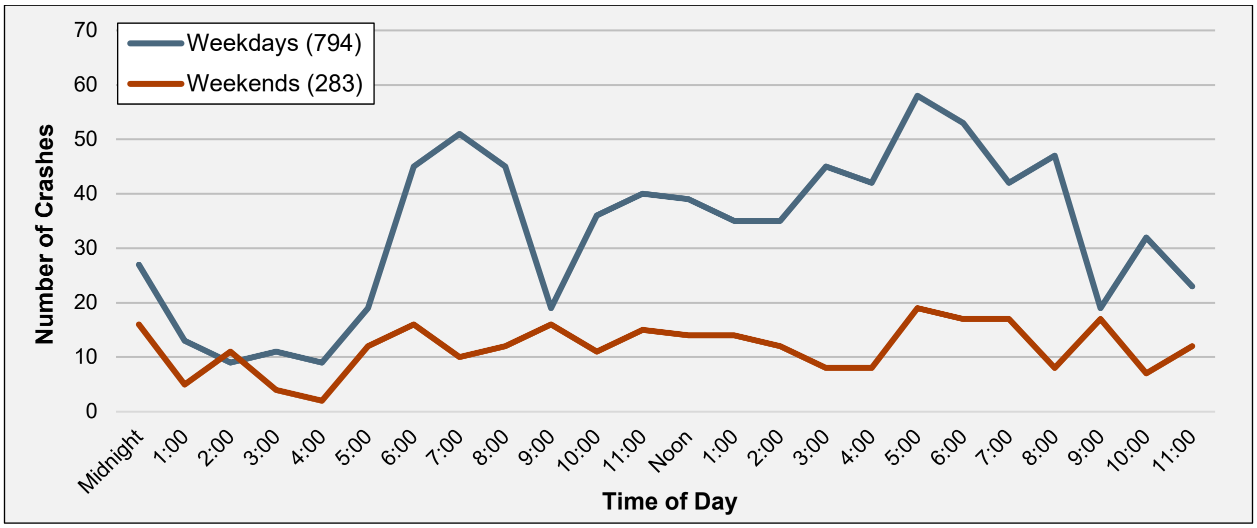


Figure 6.3: Crash Occurrence by Time of Day

The frequency of crashes occurring during each month and on a given day were potted in **Figure 6.4**. In general, the crashes were fairly evenly distributed throughout the week, with the fewest crashes occurring on a Sunday. The highest number of crashes were observed during the winter months (November to February) when almost 50 percent of crashes occurred. Crashes were the lowest during the spring.

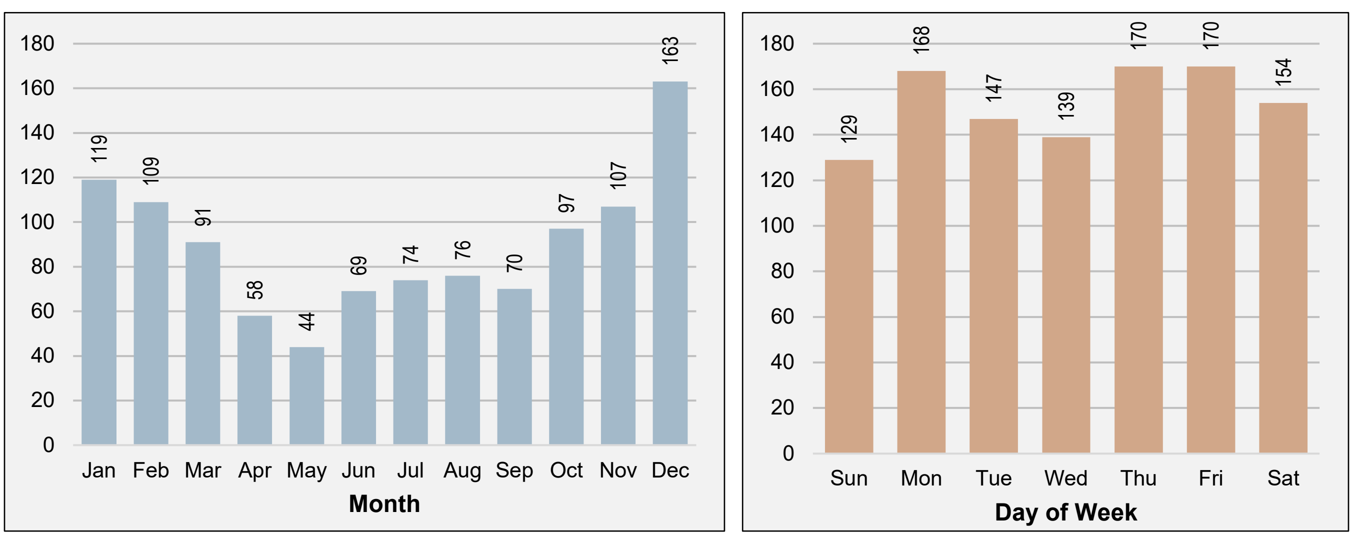


Figure 6.4: Crash Occurrence by Month and Day of Week

Figure 6.5 shows the frequency of crashes occurring per each year over the 10-year analysis period. As shown in the figure, the number of crashes per year has been trending upward. In 2009 there were 67 crashes and in 2018 there were 155 crashes, an increase of over 130 percent. This trend may be somewhat attributed to an increase in traffic volumes during the same period (see **Section 5.2**). As traffic volumes increase, the likelihood of a crash may also increase due to higher exposure rates. During the same 10-year period, the number of severe crashes (those resulting in a fatality or suspected serious injury) varied from year-to-year with a minor overall increasing trend.

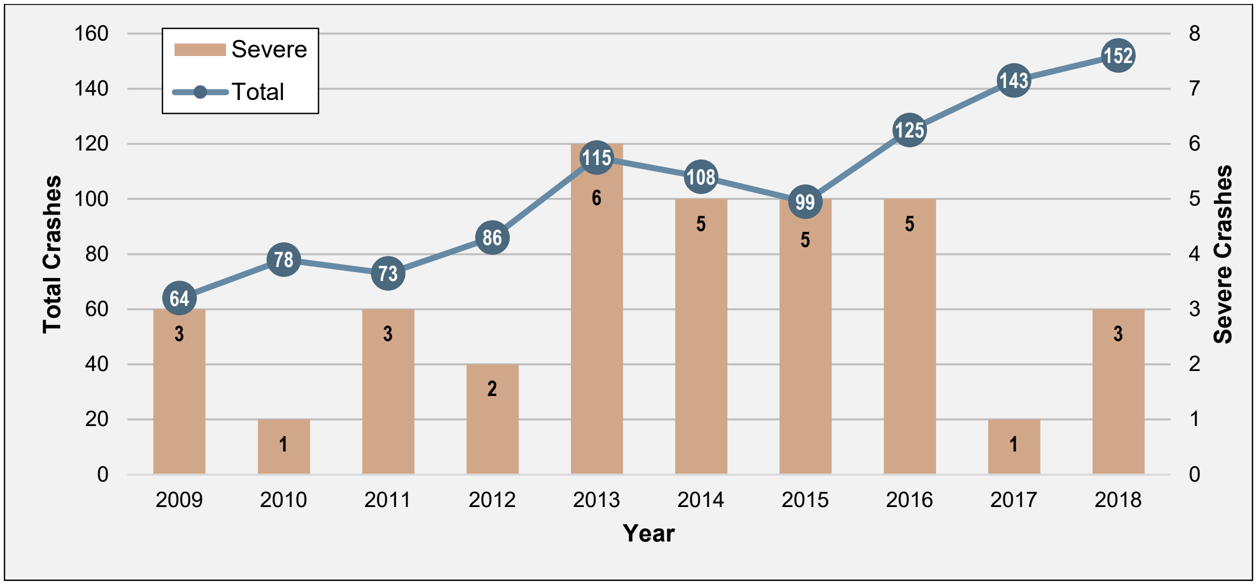


Figure 6.5: Crashes by Year

6.5. Crash Severity

Crashes can be categorized by the severity that is reported. The most severe injury defines the severity for the crash. For example, if a crash results in a fatality and an injury, the crash would be defined as a fatal crash. Crash severity includes, from least severe to most, property damage only (PDO), possible injury, suspected minor injury, suspected serious injury, and fatal injury. Severe crashes are considered to include those resulting in a fatality or suspected serious injury.

The distribution of reported crash severity is presented in **Figure 6.6**. There were seven fatal crashes (0.6 percent) and a total of seven fatalities. There were 27 suspected serious injury crashes (2.5 percent) and a total of 32 suspected serious injuries. The locations of severe crashes are shown in **Figure 6.7**.

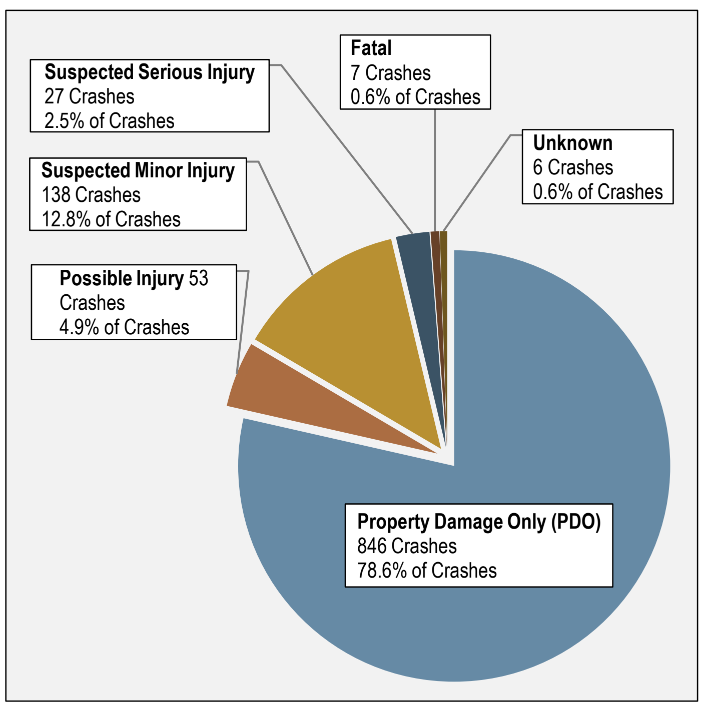


Figure 6.6: Crash Severity

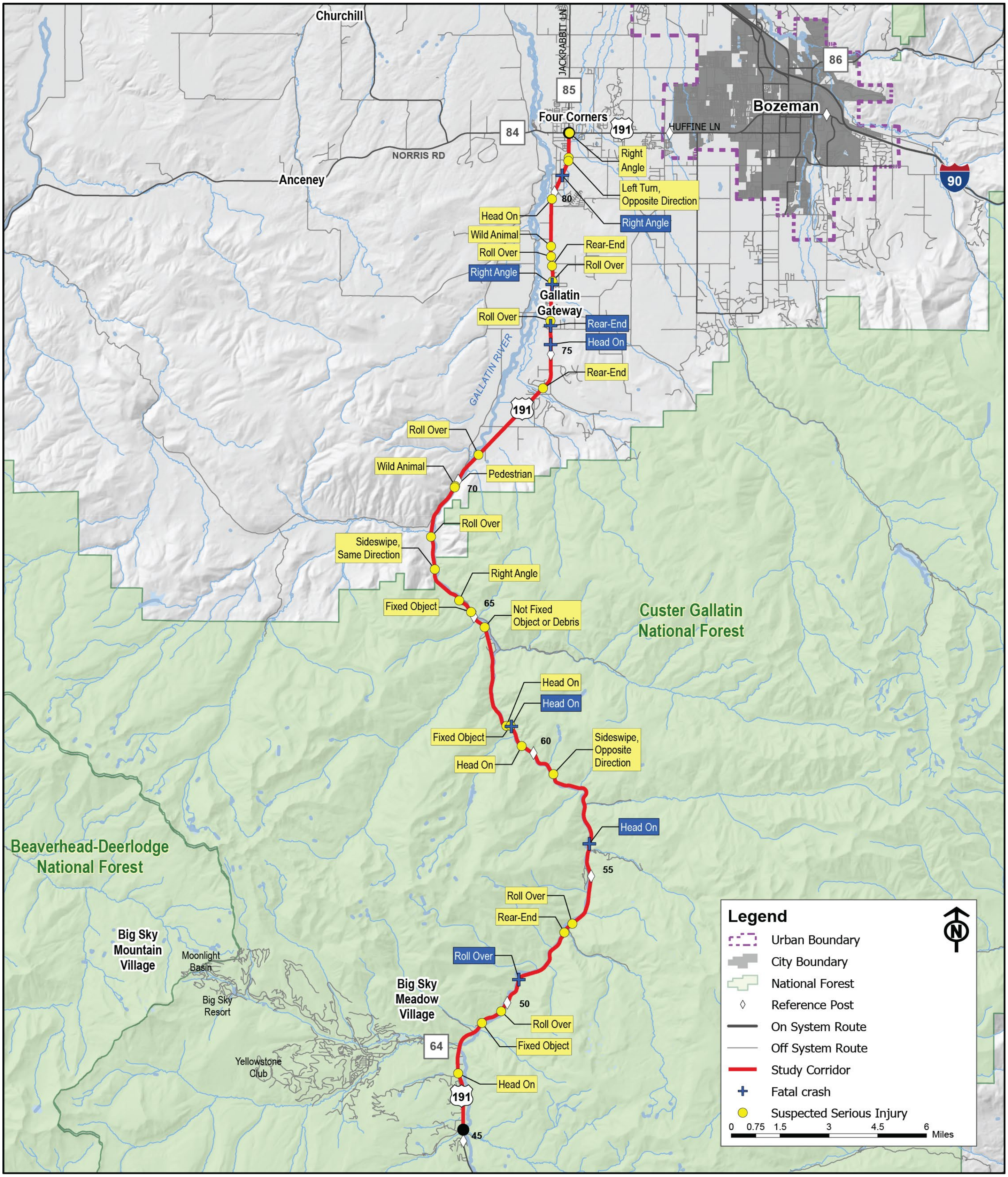


Figure 6.7: Severe Crash Locations

6.6. Environmental Factors

Crash records include information relating to environmental factors such as roadway surface, weather, and lighting conditions. This information was analyzed to determine if any trends exist. The road condition was reported as dry for 611 (57 percent) crashes. Snow, ice, or frost covered roadways were reported for 329 (31 percent) crashes. Daylight conditions were reported for 593 (55 percent) crashes and dark unlit conditions were reported for 381 (35 percent) crashes. With respect to weather conditions, clear weather was reported for 443 (41 percent) crashes and snow was reported for 152 (14 percent) crashes. **Table 6.1** details the relationship between the three environmental factors – weather, road, and lighting. **Figure 6.8** presents the distribution of environmental factors.

Table 6.1: Environmental Factors in Crashes

Road	Weather					
Lighting	Clear	Cloudy	Rain	Snow	Other	Total
Dry	**350**	**255**	**--**	**2**	**4**	**611**
Daylight	*195*	*129*	--	*1*	*2*	*327*
Dark-Lighted	*12*	*12*	--	--	--	*24*
Dark-Not Lighted	*116*	*103*	--	*1*	*1*	*221*
Other	*27*	*11*	--	--	*1*	*39*
Wet	**7**	**47**	**38**	**6**	**--**	**98**
Daylight	*7*	*22*	*25*	*1*	--	*55*
Dark-Lighted	--	*2*	*1*	--	--	*3*
Dark-Not Lighted	--	*22*	*12*	*4*	--	*38*
Other	--	*1*	--	*1*	--	*2*
Ice/Frost	**68**	**88**	**--**	**39**	**7**	**202**
Daylight	*36*	*54*	--	*19*	*4*	*113*
Dark-Lighted	*2*	*2*	--	*1*	--	*5*
Dark-Not Lighted	*24*	*29*	--	*15*	*3*	*71*
Other	*6*	*3*	--	*4*	--	*13*
Snow	**11**	**24**	**--**	**88**	**4**	**127**
Daylight	*5*	*15*	--	*47*	*2*	*69*
Dark-Lighted	--	*1*	--	*2*	*1*	*4*
Dark-Not Lighted	*5*	*8*	--	*30*	*1*	*44*
Other	*1*	--	--	*9*	--	*10*
Other	**7**	**11**	**--**	**17**	**4**	**39**
Daylight	6	9	--	13	*1*	*29*
Dark-Lighted	--	--	--	--	--	--
Dark-Not Lighted	1	2	--	3	*1*	*7*
Other	--	--	--	1	*2*	*3*
Total	**443**	**425**	**38**	**152**	**19**	**1077**

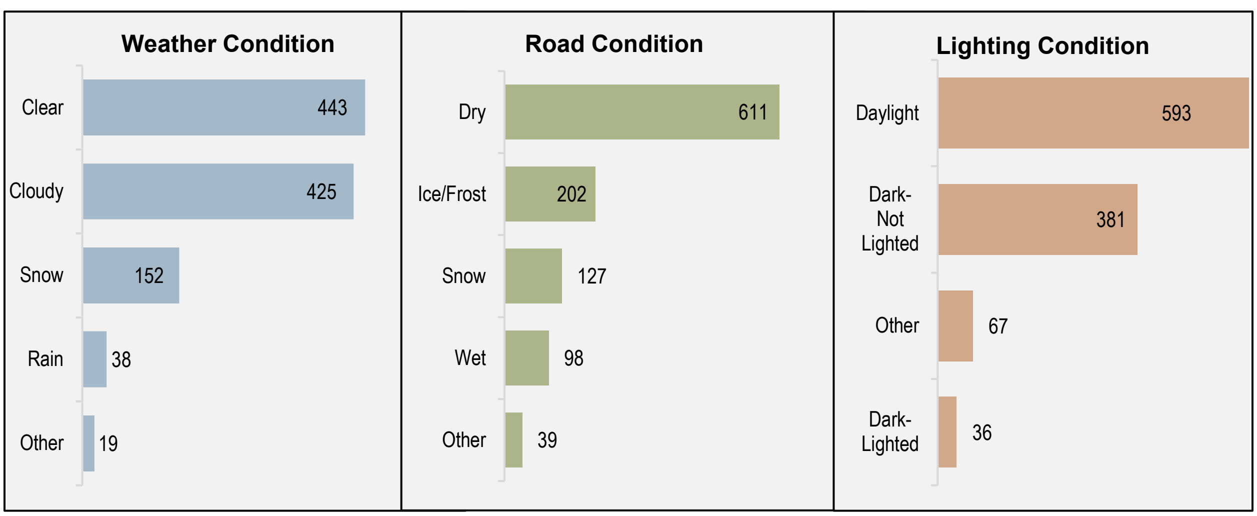


Figure 6.8: Environmental Factors

6.7. Driver Details

Driver gender and age were analyzed to identify any trends that may be present in the data set. Note that in multi-vehicle crashes there are two or more drivers, therefore the total number of drivers exceeds the total number of crashes. A total of 1,478 drivers were involved in the 1,077 reported crashes. Male drivers accounted for 1,047 (71 percent) drivers, while females accounted for 429 (29 percent) drivers. The remaining two drivers where reported as unknown gender.

With respect to driver's age, it was found that the average age of drivers was 39.4 years. The youngest and oldest drivers were reported as 16 and 89 years, respectively. Drivers younger than 25 years accounted for 349 (24 percent) drivers. The age distribution and gender of drivers involved in the reported crashes is shown in **Figure 6.9**.

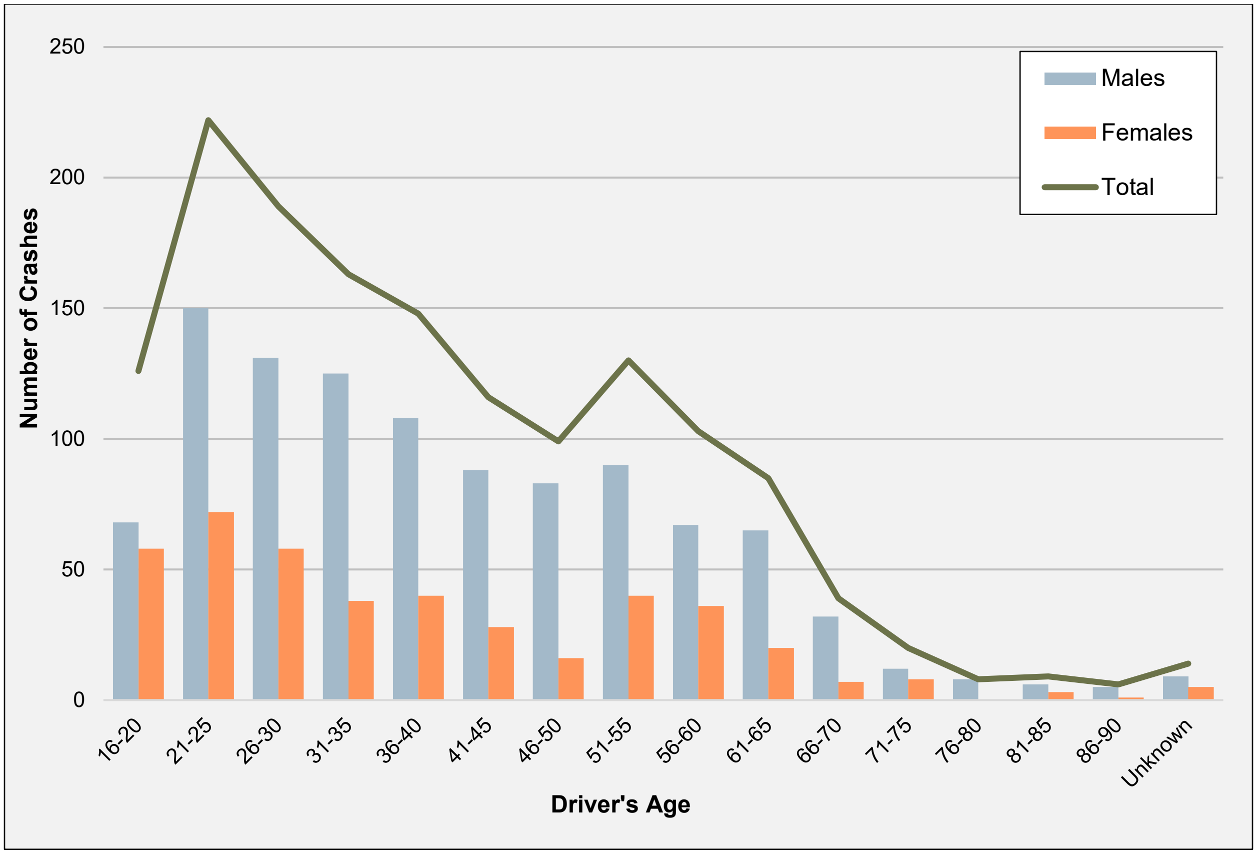


Figure 6.9: Driver's Age and Gender

6.8. Vehicle Details

A total of 1,514 vehicles were involved in the 1,077 reported crashes. The number of vehicles does not match the number of reported drivers as some may not have a listed driver. Of the 1,514 vehicles involved in crashes, passenger vehicles accounted for 1,357 (90 percent). There were 113 heavy vehicles involved in crashes (7 percent), 17 motorcycles (1 percent), and 27 other vehicles (bus, farm equipment, ATV, or snowmobile). Two pedestrians and no bicyclists were involved in crashes over the past 10 years. Of the crashes involving a heavy vehicle, three were fatal and one was a suspected serious injury crash. There was one fatal crash and two suspected serious injury crashes involving motorcycles.

6.9. Animal Carcasses

A review of the MDT Maintenance Animal Incident Database between January 1, 2009, and December 31, 2018 indicates that a minimum of 1,247 animal carcasses were collected and documented along the study corridor. The database contains information on carcasses collected by MDT maintenance personnel; however not all carcass collection is reported consistently or on a regular schedule. This makes the information useful for pattern identification, but not statistically valid. **Table 6.2** summarizes the carcasses collected over the 10-year period. **Figures 6.10** and **6.11** show the locations of deer carcasses and large mammal carcasses, respectively. Note that a carcass location does not necessarily correspond to a crash occurrence or crash location.

Table 6.2: Animal Carcasses Collected

Animal	# of Carcasses Collected	(%)
Whitetail Deer	1,017	82.0%
Mule Deer	99	8.0%
Deer (Unknown Species)	3	0.2%
Elk	77	6.2%
Moose	13	1.0%
Bighorn Sheep	12	1.0%
Black Bear	2	0.2%
Other Wild Animal	7	0.6%
Unknown	10	0.8%
TOTAL	1,240	100%

Source: MDT Animal Incident Database

Deer accounted for the vast majority (90%) of the carcasses collected along this section of US 191, with whitetail deer being the most common species involved. In general, deer carcasses were collected throughout the study area, but with concentrated collection north of Gallatin Canyon between RP 64 and 82.

Large mammal carcasses were more dispersed along the corridor with some concentrations north of Gallatin Canyon and near the Big Sky Meadow Village area. Concentrations of elk carcasses were noted between RP 70 and 76, and between RP 45 and 50 near the MT 64 intersection. Bighorn sheep carcasses were collected mostly between RP 52 and 53. Moose carcasses were more distributed throughout the heart of the canyon. More detail on animal carcasses is provided in the *Environmental Scan*[36].

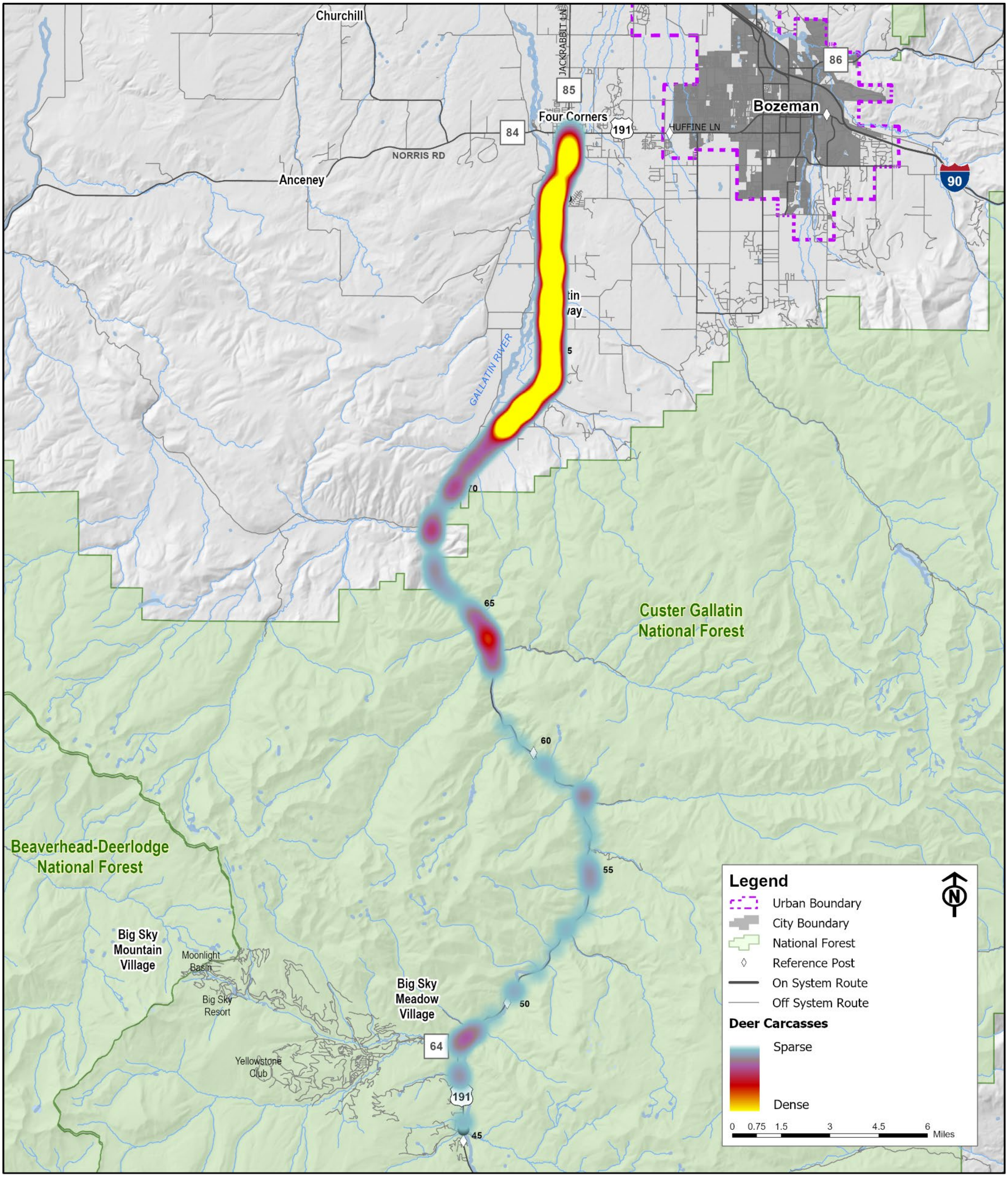


Figure 6.10: Deer Carcass Density

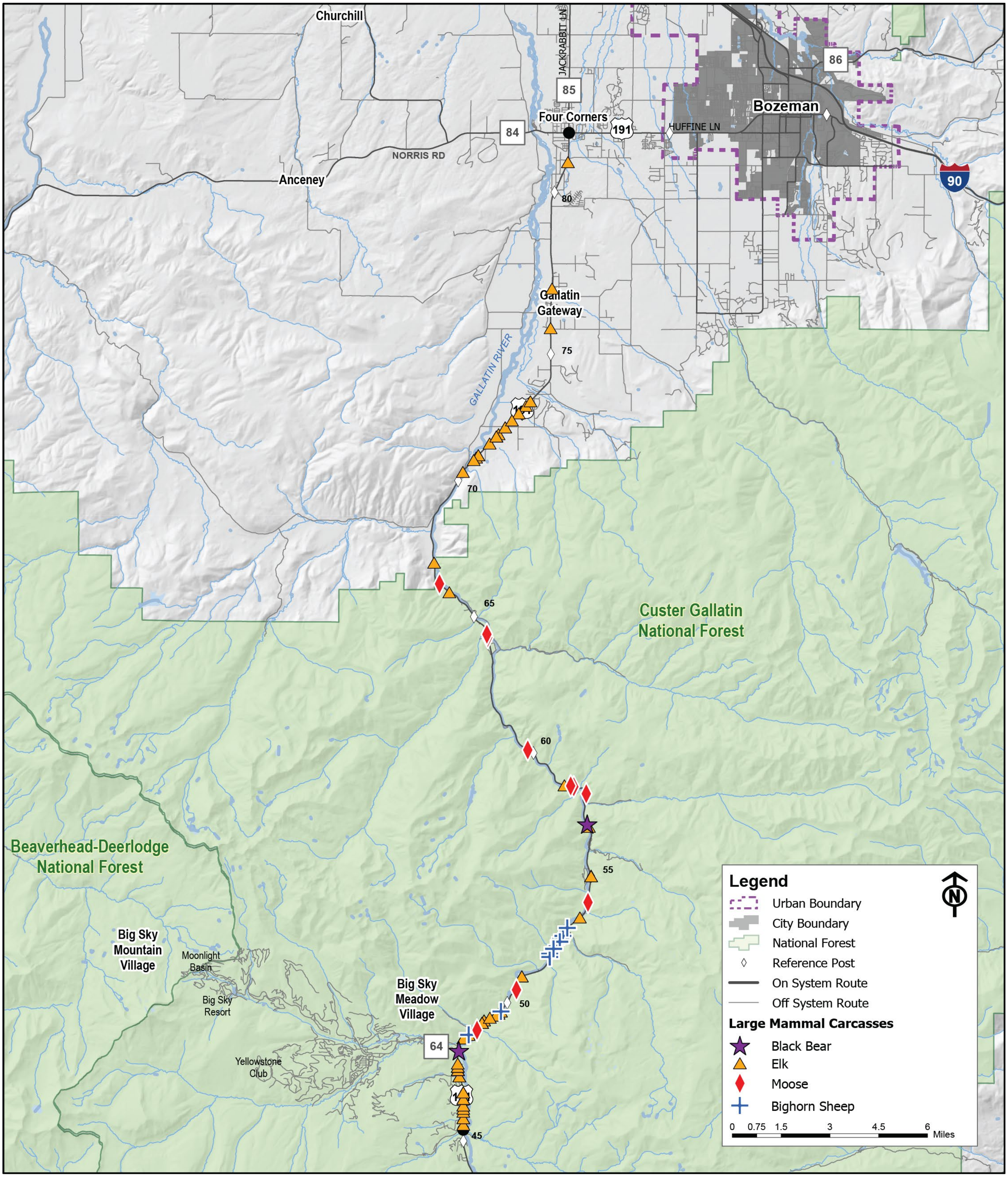


Figure 6.11: Large Mammal Carcasses

6.10. Crash Trends, Contributing Factors, and Crash Clusters

Identification of crash trends based on the supplied data can help identify areas of concern and can inform possible mitigation options. Within the study area, multiple trends and concerns were noted. The following provides an overview of the identified trends.

Total Crashes

Crash clusters based on total number of crashes occurring in a given area were identified throughout the study area. These clusters tend to be located at or near intersections and in areas with higher traffic volumes. There were over 100 crashes reported at the Four Corners intersection and 18 at the MT 64 intersection. Other locations with high volumes of crashes include the s-curve at the Lava Lake trailhead (RP 61 to 62, 52 crashes), the canyon between RP 50 and 51 (31 crashes), the mouth of the canyon around the Gallatin River bridge (RP 70.5, 15 crashes), the canyon between RP 55.7 and 56.1 (14 crashes), the curve between RP 57.5 and 58.1 (14 crashes), and the curve at RP 59.5 (7 crashes).

Wild Animal Crashes

Wild animal crashes were the most common crash type, accounting for 38 percent of single vehicle crashes and 24 percent of all crashes over the past 10 years. An additional 18 crashes reported an animal in the roadway as a contributing circumstance. These crashes include 9 fixed object, 5 rear-end, 3 rollover, and 1 jackknife crash types. Clusters of wild animal crashes were seen north of Gallatin Canyon (RP 64 to 82) and north of the MT 64 intersection (RP 48 to 53). This aligns with the MDT carcass data and locations of carcasses retrieved. Wild animal crashes were more common at night with 68 percent occurring under dark unlit conditions. The crashes mainly occurred under dry road conditions, with 19 percent occurring when roads were snowy, icy, frost-covered, slushy, or wet. Wild animal crashes were typically not severe, with 96 percent being PDO crashes and only two crashes causing serious injury.

Fixed Object Crashes

Fixed object crashes were the second most common crash accounting for 22 percent of all crashes over the past 10 years. No run off the road crashes were reported within the study area during the same timeframe. This is likely because run off the road crashes typically resulted in a fixed object or rollover crash type. The most common object collided with in fixed object crashes were guardrail (100 crashes, 41 percent); a ditch, embankment, or fence (61 crashes, 25 percent); a pole or support (32 crashes, 13 percent); or a tree (20 crashes, 8 percent). Fixed object crashes typically occurred on tight curves or narrow sections throughout the canyon. A cluster of fixed object crashes is seen near the Lava Lake trailhead (RP 61). Fixed object crashes were more common under adverse weather conditions, with 153 crashes (63 percent) occurring on snowy, icy, frost-covered, slushy, or wet roads.

Rear-End Crashes

Between Four Corners and Gallatin Gateway (RP 81.9 to 75.8), 101 rear-end crashes were reported. This section of the corridor has a number of closely spaced intersections and access points. Throughout the canyon, rear-end crashes tended to occur near rural subdivisions, at driveways, and at turnouts. Additionally, seven rear end crashes occurred at the intersection of US 191 and MT 64. Corridor wide, 58 percent of the reported rear-end crashes occurred at or were related to an intersection. The majority (63 percent) occurred on dry roads.

Rollover Crashes

Rollover crashes accounted for 12 percent of all crashes and 19 percent of single vehicle crashes over the past 10 years. The rollover crashes were most common through the canyon with a noticeable cluster of crashes in areas north and south of Spanish Creek Road (between RP 64.5 and 66.5 and RP 69.1 to 69.9). A majority of the rollover crashes (130 crashes, 68 percent) occurred when roads were snowy, icy, frost-covered, slushy, or wet. Approximately 63 percent of rollover crashes did not cause an injury, however, seven crashes resulted in suspected serious injuries and one crash resulted in a fatality.

Snow and Ice

Crashes occurring on poor road conditions (snow, ice, frost, slush, or wet) were common throughout the Gallatin Canyon (RP 49 to 68), especially in the narrow and curvy sections of the roadway. A cluster is seen around the Lava Lake trailhead (RP 61 to 62.5). Crashes occurring on poor conditions included fixed object (34 percent), rollover (20 percent), and rear end (14 percent) crash types. Approximately 35 percent of crashes on poor road conditions were under dark-unlit lighting conditions.

Dark – Not Lighted Conditions

The Four Corners, Gallatin Gateway, and Big Sky areas have some streetlights, but the majority of the corridor is not lit. Approximately 35 percent of crashes along the corridor occurred under dark-not lighted conditions. The majority of these crashes were wild animal crashes (174 crashes, 46 percent), while 94 crashes were collisions with fixed objects (25 percent), and 47 were rollover crashes (12 percent). There were several small clusters dark-unlit crashes, including those at Riverview Lane (RP 46.2, 5 crashes), the curve at RP 52.3 (4 crashes), the curve at RP 61.1 (8 crashes), and at the mouth of the canyon (RP 70.5, 5 crashes). Several small clusters also occurred under dark-unlit conditions through the Four Corners and Gallatin Gateway areas, most of which were wild animal crashes.

Impaired Driving

Impaired driving was a contributing factor in many of the severe crashes. An impaired driver was involved in 5 of the 7 fatal crashes (71 percent), 14 of 27 serious injury crashes (52 percent), and 116 crashes overall (11 percent).

6.11. Level of Service of Safety

In an effort to evaluate overall roadway safety in comparison to similar type facilities, an assessment of Safety Performance Functions (SPF) was used to determine the magnitude of safety problems. The SPF evaluation correlates traffic volumes (AADT) with crash data for roadway segments. The SPF models developed for MDT help provide a comparison of experienced crash frequency and severity to expected rates based on state-wide data. The SPFs contribute to the formulation of the Level of Service of Safety (LOSS). LOSS uses both quantitative measures and qualitative descriptions to characterize safety of a roadway segment in relation to its expected frequency and severity. There are four classifications of LOSS to represent how normal or expected the number of crashes at a specific level of AADT are, and then the level of potential for crash reduction:

- LOSS I - Indicates low potential for crash reduction
- LOSS II - Indicates low to moderate potential for crash reduction
- LOSS III - Indicates moderate to high potential for crash reduction
- LOSS IV - Indicates high potential for crash reduction

The US 191 corridor has been divided into two sections based on terrain type (level, rolling, mountainous) for the LOSS determination. **Table 6.3** shows both the Total Model and Severity Model LOSS ratings for the study corridor segments. As seen in the table, Segment 1 (RP 45 to 55.4) is predicted to have a moderate to high potential for total crash and severity crash reduction. Segment 2 (RP 55.4 to 82) shows a moderate to high potential for total crash reduction and a low to moderate potential for severity reduction.

Table 6.3: Level of Service of Safety

Location		Begin RP	End RP	Total Model LOSS	Severity Model LOSS
Segment 1	Four Corners to Karst Camp	82.00	55.38	III	II
Segment 2	Karst Camp to Beaver Creek	55.38	45.00	III	III

7.0. ENVIRONMENTAL CONDITIONS

This section provides a summary of the *Environmental Scan* developed for this corridor study. The primary objective of the *Environmental Scan* is to provide a planning-level overview of resources and identifies potential constraints and opportunities based on readily available environmental information. Information in the scan is accurate as of October 2019.

The scan is not a detailed environmental investigation. Rather, it is a planning-level scan based on information obtained from various publicly available reports, websites, and other documentation. Multiple environmental studies have been conducted in the study area over the course of several decades. Some of these have addressed proposed improvements to US 191, while others have been concerned with larger-scale issues of land and resource management. Information from these past studies was reviewed and supplemented with publicly available data from federal, state, and local agencies. If improvement options are forwarded from this study into project development, an analysis for compliance with the National and Montana Environmental Policy Acts (NEPA and MEPA) will be completed as part of the project development process. Information provided in the *Environmental Scan* may be used to support future environmental documentation.

7.1. Physical Environment

The following subsections present an overview of items related to the physical environment of the study area.

7.1.1. Land Ownership and Land Use

The land in the study area is primarily owned by the USFS and private landowners. The privately-owned parcels are generally included in the Four Corners, North Gallatin Canyon, and Gallatin Canyon/Big Sky zoning districts. The land immediately adjacent to US 191 is zoned as commercial use, mixed use, public use, and residential single-family use varying in density. The study area and adjacent lands are primarily used for residential use, grazing, timber activity, and recreation. Conservation easements held by Montana Land Resilience, the Nature Conservancy, and Gallatin Valley Land Trust exist along the study corridor. The Gallatin Wildlife Management Area (WMA) has been established along the eastern side of US 191 south of MT 64 to protect important wildlife habitat that might otherwise disappear from the Montana landscape.

If any improvement options are forwarded from the corridor study, additional research and coordination would be needed to determine impacts to existing right-of-way or easements on private and USFS lands.

7.1.2. Soil Resources and Prime Farmland

The *Farmland Policy Protection Act* (FPPA) (7 U.S.C. 4201 et. seq.) requires special consideration be given to soils considered as prime farmland, unique farmland, or farmland of statewide or local importance by the US Department of Agriculture Natural Resources Conservation Service (NRCS). The FPPA is intended to minimize the impact that federal programs, including construction projects funded by federal funds, have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. Based on the NRCS classifications, there are soils classified as prime farmland, prime farmland if irrigated, and farmland of local and statewide importance within the study area. All of these soils are located north of the Gallatin Canyon.

If any improvement options are forwarded from the planning study, coordination with the NRCS will be required to determine if the FPPA applies and necessary NRCS processing requirements. Projects planned and completed without the assistance of a federal agency are not subject to the FPPA.

7.1.3. Geologic Hazards

The study area is located within the Upper Gallatin Watershed and is situated between the Gallatin and Madison Mountain Ranges. The bedrock within the Upper Gallatin Watershed includes Precambrian metamorphic and metasedimentary rocks, Paleozoic and Mesozoic sedimentary rocks, Cretaceous igneous intrusions, and Tertiary volcanic rocks. Sediments in the valleys are primarily alluvial and glacial deposits. The US 191 study area is in a moderate to high seismic risk zone. Several small earthquakes occurred in the Gallatin Gateway area in late 1989/early 1990 ranging in magnitude from 0.5 to 2.5 with depths shallower than 6 miles. Earthquake events near US 191 through Gallatin Canyon appear to be uncommon. Geotechnical investigations would be required for reconstruction or significant improvements to US 191 to determine potential stability, erosion, and settlement concerns posed by surface geology and soil conditions.

7.1.4. Surface Waters

The study area lies entirely within the Gallatin River Watershed. The roadway also lies partially within the Big Bear Creek, Lava Lake, and Porcupine Creek sub watersheds. US 191 generally parallels the Gallatin River throughout the entire study area. US 191 also crosses several named perennial, fish-bearing streams. Additional unnamed streams, wetlands, irrigation canals and ditches, and other waterbodies are also present in the study area.

Road construction and reconstruction activities such as bridge or culvert installation or replacement, placement of fill, or bank stabilization have the potential for impacts to surface waters. Coordination with federal, state, and local agencies would be necessary to determine the appropriate permits based on the improvement options forwarded from this study. Impacts should be avoided and minimized to the maximum extent practicable. Impacts to streams and wetlands may trigger compensatory mitigation requirements.

Water Quality

Within the study area, the Gallatin River, South Cottonwood Creek, Storm Castle Creek and the West Fork Gallatin River are listed as impaired or threatened. The study area falls within the Lower Gallatin and Upper Gallatin Total Maximum Daily Loads (TMDL) planning areas. Most of the required TMDLs have been established and Watershed Restoration Plans have been prepared for each planning area to address impairments identified by the Montana Department of Environmental Quality (MDEQ), improve water quality, and improve habitat conditions.

In Montana, stormwater management is regulated by MDEQ. A Montana Pollutant Discharge Elimination System (MPDES) general permit is required for stormwater discharges from construction activities that result in the disturbance of equal to or greater than one acre of total land area. The applicability of MPDES permits for US 191 would need to be reviewed for any projects that may be brought forward from the corridor study. Special permits for small municipal separate storm sewer systems (MS4s) are required for incorporated cities with a population of at least 10,000 people. Bozeman is a designated MS4 area, but the US 191 study area falls outside currently designated MS4 boundaries. Incorporation of Permanent Erosion and Sediment Control (PESC) measures should be considered with any projects advanced from this study that impact one acre or more, or if the project adversely affects water quality.

Wild and Scenic Rivers

In 1976, Congress designated portions of the Flathead and Missouri Rivers as protected by the *Wild and Scenic Rivers Act* of 1968. Neither of these rivers are within the study area, however, during revision of the *Forest Plan*, a study was conducted to determine if any of the rivers within the forest are found eligible as a wild and scenic river. For eligible rivers, national forest lands in a 0.25-mile-wide buffer will be managed to protect the identified river-related outstandingly remarkable values (ORV), tentative classification, along with retaining the free-flowing nature of the waterway. The ORVs identified for the Gallatin River include recreation, scenery, and heritage. A preliminary classification of Recreational River has been identified for the Gallatin River.

Irrigation Features

The Gallatin River is the source of irrigation water for about three-fourths of the irrigated land in the Gallatin Valley. Most of the water taken from the main stem of the Gallatin River is diverted between the mouth of the canyon and Four Corners. Groundwater is also an important source of water for irrigation in the Gallatin Watershed.

In Gallatin County, most of the current canals and ditches are privately owned and managed by local irrigators. There are over 60 irrigation features in the county with nearly 30 of the features existing in the Four Corners/Gallatin Gateway area. Coordination with appropriate overseeing authorities and affected landowners should be undertaken if irrigation facilities may be affected by improvement options advanced from this planning project to help avoid or minimize impacts to agricultural operations and downstream water users.

7.1.5. Groundwater

Groundwater resources in Gallatin County are under increasing pressure from land use change from irrigated cropland to residential and commercial development. Much of the new development is dependent on individual household wells for potable water, and on septic systems for wastewater disposal. With increased use, there is a potential for groundwater resources to become overutilized in some locations. Based on available data, more than 900 wells are located within the study area, about 50 of which are public water supply wells located at local businesses, schools, or within neighborhoods. There are two water and sewer districts within the study area, Four Corners and Gallatin Gateway. Water and sewer districts may supply water for use in the homes and businesses they serve, provide wastewater treatment and disposal, or both. Impacts to the groundwater supply should be considered in any improvement option that may be brought forward from this corridor study.

7.1.6. Floodplains and Floodways

From Four Corners to the mouth of the Gallatin Canyon, US 191 lies adjacent to the Gallatin River floodplain but the roadway itself lies outside the floodplain boundary (Zone X – area of minimal flood hazard). Most of the area through Gallatin Canyon lies within Zone D (area of undetermined flood hazard). However, near Karst's Camp (approximate RP 56 to 54) and from RP 51 through the end of the study area cross or lie within Zone A (100-year floodplain) of the Gallatin River. Flooding, due to high precipitation events and snowmelt, has occurred in the Gallatin River Watershed in the past but most often affects the smaller streams and creeks within the study area. The *Gallatin County Floodplain Regulations* regulate development activities in flood hazard areas. The Montana Department of Natural Resources has recently completed more detailed floodplain mapping for segments of the Gallatin River. If any improvement options advanced from this study cross or encroach on a regulated flood hazard area, it will be necessary to coordinate with and obtain a floodplain permit from the county floodplain administrator.

7.1.7. Wetlands

Available data show freshwater emergent wetlands and freshwater forested/shrub wetlands along the Gallatin River and other intermittent rivers, streams, and drainages. Wetland delineations would be required if improvement options are forwarded from the corridor study that could potentially affect wetlands. Future projects in the study area would need to incorporate project design features to avoid and minimize adverse impacts on wetlands to the maximum extent practicable. Various state and federal water quality permits may be required to implement construction projects on US 191.

7.1.8. Hazardous Substances

If a project were to overlap a hazardous substance site, a soil investigation would likely be needed to determine the extent of contamination and whether remediation may be necessary. If contaminated soils are present, a special provision regarding handling contaminated soils may be needed. The following sections summarize potential hazardous sites within the study area.

Hazardous Waste Release Sites

There are five hazardous waste release sites in the study area: the NorthWestern Energy Non-PCB Oil Release site (RP 79.5); the Horkley Oil Inc diesel spill (RP 71); the Gallatin Gateway Tanker Release (RP 70.4); the Idaho Asphalt Supply hazardous waste release site (RP 59); and the Southern Idaho Supply ammonium nitrate spill (RP 50). All sites have been remediated and delisted.

Remediation Response Sites

The CMC Asbestos Gallatin Gateway site is an inactive railroad facility located near Gooch Hill Road (RP 77) which was used for storage and transport of asbestos ore. This site was delisted in 1996 following cleanup activities. The Karst Asbestos Mine (RP 56) is located about a mile from US 191 and is accessed by a foot trail. The site has been declared as “No Further Action” and has been referred to other federal cleanup programs. Additional site assessment activities occurred in 1990 and the USFS has rerouted trails to bypass the mine locations. Undiscovered areas of Karst asbestos may be present throughout the study area.

Underground Storage Tanks

There are 28 active underground storage tanks within the study area. There are also 17 tanks permanently out of use and 1 tank that is temporarily out of use. The tanks are located at: Town Pump, Casey’s Corner, and Thriftway Super Stops in Four Corners (RP 82); the Casey’s Corner in Gallatin Gateway (RP 76.2); and the Conoco and Casey’s Corner in Big Sky (RP 48 and 47.6).

Petroleum Tank Releases

There have been several petroleum tank releases in the past in and near the US 191 corridor. All of the claims filed for assistance from the Petroleum Tank Release Compensation Board and Cleanup Fund have been resolved: Thriftway Super Stop (Site 1605064), located in Four Corners; Buffalo Station (Site 5614002) in Gallatin Gateway; Elkhorn Ranch (Site 1603427) south of RP 72; Jasper’s Big Sky Exxon (Site 1606923) in Big Sky; and Frontier Construction (Site 9995003) in Big Sky.

Abandoned and Inactive Mine Sites

There are four mining prospects or abandoned mines in the study area: Bozeman Hot Springs geothermal site (RP 81.3); the Spanish Creek Resource Study gold prospect (RP 68.2); Deer Creek Prospect (RP 51.3); and a copper containing Unnamed Location (RP 49.8). The Karst Asbestos Mine, (RP 56), is an MDEQ Abandoned Mine Priority Site. Two mining features have also been located in the study area: an open pit mine/quarry (RP 72) and an adit (RP 64). Several lode, placer, and millsite mining claims also exist in the study area. All claims within the study area are closed.

Opencut Permits

Three permitted opencut mine sites exist in the study area: Morgan Family LLC (Site 1737, RP 78) operated by TMC Inc.; Ponderosa (Site 2815, RP 47.7) operated by Kenyon Noble Ready Mix; and Section 5 North (Site 3023, RP 47.4) operated by TMC Inc. A pre-application request was filed for Simpson (Site 2866, RP 81). The Gateway Pit (Site 2520, RP 76), is operated by Gateway Village LLC and has a voided permit. The permit for Big Sky Pit (Site 618, RP 47.6) has been released. The permit for Section 5 North (Site 1414, RP 47.4) operated by Knife River-Belgrade has been released. A permit is pending for Section 5 North (Site 2861, RP 47.4).

7.1.9. Air Quality

Gallatin County is considered an attainment area for all pollutants. There are no nearby nonattainment areas. Since Gallatin County is considered in attainment for all pollutants, federally funded transportation projects on US 191 would not be subject to conformity requirements.

7.1.10. Noise

Residences in the study area comprise the only sensitive noise receptors that could be affected by roadway improvements on US 191. Sites protected under 4(f) and 6(f) within the study area may also be considered sensitive noise receptors. Improvements on US 191 will likely require a noise analysis. Detailed noise analyses are often conducted when the potential for noise impacts exists due to substantial changes in roadway design or configuration. Construction activities associated with improvements to US 191 may result in localized and temporary noise impacts in the vicinity of residences. These impacts can be minimized by incorporating measures to control of noise sources during construction.

7.2. Biological Resources

The following information applies to the biological environment within the study area and reflects a baseline natural resource condition. Depending on the level of detail available through the high-level baseline scan, some of the information is presented at the county level, some at the study area level, and some at the corridor level.

7.2.1. Vegetation

Vegetation below tree line consists of coniferous forest, grasslands, shrublands, and willow and aspen groves in the riparian areas. The coniferous forest community is dominated by plant species such as lodgepole pine and Douglas fir but also contains Engelmann spruce, and subalpine fir. Big sagebrush dominates the grassland shrubland community, with other co-dominant shrubs including silver sagebrush, antelope bitterbrush, three tip sagebrush, Idaho fescue, spike fescue, and poverty oatgrass. The riparian community is dominated by black cottonwood, snowberry, Wood's rose, white spirea, red-osier dogwood, pacific willow, sandbar willow, reed canarygrass, and smooth scouring rush. Areas of cultivated crop land and developed lands are also present in the study area, primarily from Four Corners to the mouth of Gallatin Canyon.

Noxious Weeds

Invasive weeds are a growing concern in Gallatin County and throughout Montana. Spotted knapweed and Canada thistle are noxious weeds of greatest concern in Gallatin Canyon. The USFS has expressed concerns about infestations of spotted knapweed and the potential for expansion of hound's tongue, yellow toadflax, sulfur cinquefoil, common tansy, and oxeye daisy. If improvement options are forwarded from this study, field surveys for noxious weeds should take place before any ground disturbance occurs. Practices outlined by the Gallatin County Weed Control District and USFS policies would need to be followed as appropriate.

7.2.2. Biological Community

The historic conversion of previously native riparian and foothill habitat to agricultural operation and, more recently, to commercial and residential developments between Four Corners and the mouth of the Gallatin Canyon has negatively impacted the quantity and quality of wildlife habitat available in this area. If any improvement projects are brought forward from the corridor study, project planners should coordinate with fish and wildlife biologists from MFWP, USFWS, and the USFS to gain further insight into issues related to the management of these species, as well as measures for avoiding, minimizing, or mitigating adverse effects on species and habitat.

Mammals

The Gallatin Range provides suitable habitat for elk, moose, mountain goats, and bighorn sheep because of its relatively large size, its relatively diverse and high-quality vegetative communities and elevational relief, its geographic location and connectivity to other habitats, and its relatively low level of human development. In addition to providing habitat for resident wildlife, the Gallatin Range plays a role in maintaining habitat connectivity for wide-ranging wildlife species such as wolverine, lynx, grizzly bear, mountain lion, and wolf. Known populations of elk and big horn sheep exist in the study area. Sections of the US 191 corridor have been identified as areas of concern for wildlife mortality.

Birds

According to the MNHP database, more than 200 species of birds have been documented in Gallatin County, with the potential for many of these birds to occur or reside in the study area. These species include a wide variety of songbirds, birds of prey, waterfowl, owls, and shorebirds, including several listed as SOC. Many of the bird species are protected under or included in the USFWS *Migratory Bird Treaty Act* (MBTA), *Birds of Conservation Concern 2008* (BCC), or *Bald and Golden Eagle Protection Act of 1940* (16 U.S.C. 668-668c) (BGEPA) listings. Any improvements forwarded from this study should consider potential constraints that may result from nesting times of migratory birds and/or the presence of bald and golden eagle nests.

Fisheries

The Gallatin River and its tributaries support a variety of Montana native and game fish. Several fish species are present in the waters within the study area including six species of trout, longnose dace, mottled sculpin, mountain whitefish, and white sucker. Fish passage and/or barrier removal opportunities may need to be considered at affected drainages if a project is forwarded from this study. Permit conditions from regulatory and resource agencies may also require incorporation of design measures to facilitate aquatic species passage.

Amphibians, Reptiles, and Invertebrates

Amphibian and reptile species known or expected to occur in the study area include but are not limited to the western toad, northern leapord frog, western milksnake, greater short-horned lizard, and snapping turtle. Nearly 30 invertebrate species, many of them listed as a Montana Species of Concern (SOC), have also been observed or are expected to occur in the study area.

7.2.3. Threatened and Endangered Species

There are three species of wildlife, Canada lynx, grizzly bear, and wolverine, listed or proposed for listing in the Endangered Species Act (ESA). All three species have been observed and documented as having a sustained presence within the study area. The whitebark pine and Ute ladies' tresses are two plant species listed in the ESA with a known presence in Gallatin County. The whitebark pine, a candidate species, has been observed near the study corridor, however, it is unlikely that the species is present within the study area. The Ute ladies' tresses has not been observed in the study area. Any improvements forwarded from the corridor study would need to undergo review for compliance with the provisions of the ESA. The listing status of species and critical habitat can change over time; therefore, an up-to-date list of potentially affected species and designated critical habitat should be reviewed for each project.

7.2.4. Other Species of Concern

Species of Concern (SOC) are native animals or plants that are at-risk due to declining population trends, threats to their habitats, and restricted distribution, among other factors. The scan lists six mammals, six birds, one fish, one amphibian, three plants, and three invertebrates considered to be SOC with occurrences in this area of Montana and presents their federal and state statuses. A species occurrence is an area of land or water in which a species is, or was, present. If any projects are brought forward from the feasibility study, a thorough review of wildlife sightings databases should be conducted, and habitats near any proposed project sites should be evaluated to determine their suitability for any SOC. Measures to avoid or minimize disturbance of these species or their habitat should be incorporated into project design and implementation.

7.3. Social and Cultural Resources

The following subsections present an overview of the social and cultural environment within the study area.

7.3.1. Demographic and Economic Conditions

Implementing regulations for MEPA/NEPA require federal, state, and local agencies to assess potential social and economic impacts resulting from proposed actions. Guidelines recommend consideration of impacts to neighborhoods and community cohesion, social groups including minority populations, and local and/or regional economies, as well as growth and development that may be induced by transportation improvements. Detailed demographic and economic information are presented in **Section 2.0** which is intended to assist in identifying populations that might be affected by improvements in the study area.

Environmental Justice

Title VI of the *United States Civil Rights Act of 1964* prohibits recipients of federal financial assistance (states, grantees, etc.) from discriminating based on race, color, or national origin in any program or activity. In order to better meet the EPA's responsibilities related to the protection of public health and the environment, the EPA has developed a new environmental justice mapping and screening tool called EJSCREEN. It is based on nationally consistent data and an approach that combines environmental and demographic indicators in maps and reports. The EJSCREEN report prepared for the study area indicates that minority and/or low-income populations are unlikely to be adversely affected by projects that may be forwarded from the corridor study. This conclusion is supported by the fact that most EJSCREEN environmental and demographic indicator values for the US 191 corridor are below comparable values for the State of Montana, EPA Region, and the Nation. If improvement options are forwarded from this study into project development, environmental justice would need to be further evaluated during the project development process.

7.3.2. Recreational Resources

The US 191 corridor provides direct access to the Custer Gallatin National Forest and indirect access to the Beaverhead-Deerlodge National Forest. The area is highly used by recreationists for hiking, backpacking, camping, rock climbing, rafting, kayaking, fishing, hunting, wildlife viewing, and more. The Big Sky Resort, Moonlight Basin, and Yellowstone Club ski areas are also accessible via the study corridor. Several USFS designated trails, campgrounds, day use areas exist along the US 191 corridor or are accessed via US 191. The use of lands accessed by US 191 provides substantial tourism traffic and economic subsistence for local outfitters and the rural communities along the corridor.

7.3.3. Cultural and Historic Resources

Section 106 of the *National Historic Preservation Act* (36 CFR 800) establishes requirements for taking into account the effects of proposed Federal, Federally-assisted, or Federally-licensed undertakings on any district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NRHP). The implementing regulations of Section 106 require agencies to seek ways of avoiding, minimizing, or mitigating any adverse effects on historic and archaeological properties. Additionally, Section 106 requires consultations with the Indian Tribes that may have current or traditional interests in the project area. Research indicates that five tribes may have potential interests in Gallatin County: Apache Tribe of Oklahoma, Crow Tribe of Montana, Fort Belknap Indian Community of the Fort Belknap Reservation of Montana, Nez Perce Tribe, and Shoshone-Bannock Tribes of the Fort Hall Reservation.

A search of historic properties identified 73 properties within the general vicinity of US 191 including: 2 sites listed on the NRHP—Gallatin Gateway Inn (Site 24GA0746) and Little Bear School (Site 24GA0791); 18 sites determined eligible for the NRHP; and 53 sites with undetermined NRHP eligibility status. A cultural resource survey for unrecorded historic and archaeological properties would be completed within the Area of Potential Effect defined for each project forwarded from this study.

7.3.4. Section 4(f) Resources

Projects that receive federal funding and/or discretionary approvals from the FHWA must demonstrate compliance with Section 4(f) of the *Department of Transportation Act* of 1966 (23 U.S.C. § 138 and 49 U.S.C. § 303). Section 4(f) protects publicly owned public parks, recreation areas, and wildlife/waterfowl refuges. Section 4(f) also protects historic sites of national, state, or local significance on public or private land that are potentially eligible for listing or are listed on the NRHP. The regulations require coordination with the official(s) with jurisdiction when making determinations about the use of protected properties or resources.

The recreational sites within the corridor that may be affected by improvement options forwarded from the planning study may qualify as Section 4(f) properties. If improvement options are forwarded from the corridor study, potential effects on recreational use should be investigated and appropriately considered in accordance with Section 4(f).

7.3.5. Section 6(f) Resources

Projects may also be subject to Section 6(f) of the *Land and Water Conservation Fund (LWCF) Act* which was enacted to preserve, develop, and ensure the quality and quantity of outdoor recreation resources. Section 6(f) protection applies to public recreational sites purchased or improved with LWCF funds. Section 6(f)(3) of the Act prevents conversion of lands purchased or developed with LWCF funds to non-recreation uses, unless the Secretary of the Department of the Interior, through the National Park Service, approves the conversion. Conversion may only be approved if it is consistent with the comprehensive statewide outdoor recreation plan in force when the approval occurs, and the converted property is replaced with other recreation property of at least equal fair market value and of reasonably equivalent usefulness and location.

A project, Gallatin Gateway Recreation Facilities, is the only project implemented in vicinity of the study area that qualifies for protection under Section 6(f) of the *Land and Water Conservation Fund Act*. It is unclear if any of these facilities are within the study area boundary and whether they would be affected by potential improvements to US 191. LWCF funds were not used to acquire lands in the Kirk Wildlife Refuge or the Gallatin WMA. However, the Gallatin WMA was acquired with federal funding through the *Pittman Robertson Wildlife Restoration Act*. This Act requires replacement land mitigation for the use of federally encumbered lands similar to Section 6(f).

7.3.6. Visual Resources

The study area encompasses a wide variety of settings including the US 191 roadway corridor and county roads, highway commercial developments, scattered rural residences, forested lands, mountainous terrain, riparian areas, and wetlands. Actions that may have visual impacts include projects on new locations or that involve expansion, realignment or other changes that could alter the character of an existing landscape or move the roadway closer to residential areas, parks and recreation areas, historic or other culturally important resources.

8.0. AREAS OF CONCERN AND CONSIDERATION

This section provides a list and description of areas of concern and consideration along the study corridor. These areas were identified through review of as-built drawings, field review, public databases, and other resources. More discussion has been provided in the previous sections, and it is reiterated here as appropriate.

8.1. Demographics

Population

- Since 2010, Gallatin County's population has grown by 25 percent. About 44 percent of the county population resides in unincorporated areas.
- The populations in portions of the County crossed by US 191 have seen significant growth ranging from 0.5 to over 3 percent per year in the various communities/areas.
- The populations of Gallatin County and its geographic subareas are predominately white with percentages of minority populations generally at or lower than those seen for the state.
- In general, the population in Gallatin County is younger and has fewer disabilities than Montana as a whole. Gallatin Gateway has older residents and more residents with disabilities than other communities within the study area.
- It is assumed that future population growth in the US 191 study area would mirror historic growth patterns in the county with estimates ranging from 1.5 to 2.5 percent growth per year.
- The Four Corners area showed high percentages of owner-occupied units while the Gallatin Gateway and Big Sky areas showed higher shares of rental units. About 72 percent of the total housing units in Big Sky were shown as vacant with 75 percent identified as seasonal, recreational, or occasional.
- 83 percent of commuters in Gallatin County commute via personal vehicle or carpool. More workers in the County walked to work or used other means to commute than Montana. Workers in the study area have similar or slightly longer commute times than seen elsewhere in the state.

Economic Conditions and Income Characteristics

- Employment in Gallatin County grew at approximately 3.8 percent per year over the past 37 years.
- The Four Corners/Gallatin Gateway area is estimated to have more workers in the construction, finance, real estate, and agricultural industries than the county. The Big Sky area has more workers in the entertainment, recreation, accommodations, and food services, and construction industries than the county.
- The percentage of the employed workforce in the county is similar to that seen for Montana.
- Median household income levels in the Four Corners, Gallatin Gateway, and Big Sky areas were substantially above those for all residents of Gallatin County and Montana.

Economic Development Trends

- Future economic trends in the county will be strongly influenced by the economic conditions in the Bozeman area. Estimates predict an annual job growth rate of 1.5 percent over the next 25 years.
- For the past 30 years, the Big Sky area has been a growth center for Gallatin County in both jobs and housing. Continued residential, commercial, and recreational development is expected.

8.2. Transportation System

Physical Features and Characteristics

- Primary roadway users include residents, commuters between the Bozeman/Belgrade area to Big Sky, recreationists, tourists visiting Yellowstone National Park and other attractions, and commercial users.
- Land uses include residential, commercial, industrial, agricultural, mixed use, and recreational land uses. Numerous recreation sites exist along US 191 and others are reachable from the highway.
- The roadway width along the study corridor ranges from 28 to 90 feet. For most of the corridor, the roadway is a two-lane highway with the occasional turn lanes and narrow shoulders. The majority of the corridor does not meet current width recommendations.
- The pavement is in fair condition for most of the corridor with the exception of between Squaw Creek Bridge and Cascade Creek Road (RP 61.4 to 65.2) which is in poor conditions.
- Of the 386 access points along the corridor, 79 are public roadways, 196 are private approaches, 49 are farm field approaches, 41 are recreation approaches, and 21 are designated turnouts.
- MDT is responsible for general and maintenance of US 191 throughout the entire study area. There are three temporary VMS boards along the corridor to alert oncoming traffic of real-time traffic conditions. There is an MCS Scale site at RP 81.8.
- Speed limits vary along the corridor from 45 mph to 70 mph. The speed varies for passenger cars and trucks and based on daytime and nighttime conditions.
- A total of 30 passing zones, 15 northbound and 15 southbound, exist along the corridor. There is also a passing lane in the northbound direction between RP 70.6 and 71.5.
- There are numerous major steep fill/embankment areas located adjacent to the Gallatin River. There are also locations with significant cut slopes. Some mechanically stabilized earth walls have been used along the corridor.
- MDT’s RAMP identified several locations within Gallatin Canyon with poor rockfall slope conditions. There is potential for rockfall events, possible emergency road closures, and disruption of normal traffic operations at these locations.
- There are nine bridges in the study area. All 9 generally meet standards to remain in place with two meeting new construction design standards. Most of the bridges are in need of some levels of repair and/or maintenance.
- US 191 is highly used by freight and heavy vehicle traffic. Many transit and shuttle services are available within the corridor. There are two shared use paths in the study area for bicyclists and pedestrians. Four airports provide air service within the corridor.

Geometric Conditions

- US 191 was originally constructed in the mid to late 1950s. Several improvement projects have been completed over the past 60 years.
- 48 horizontal curves do not meet standards for level terrain. Of those curves, 15 meet standards for rolling terrain, 17 meet standards for mountainous terrain, 16 do not meet current standards for NHS Non-Interstate routes.
- Eight vertical curves do not meet standards for level terrain. Of those curves, six meet standards for rolling terrain, and one meets standards for mountainous terrain, and one does not meet current standards for NHS Non-Interstate routes.
- The proximity of the Gallatin River and the steep side slopes of the canyon do not allow for standard clear zone widths at many locations. Guardrail has been installed to shield obstacles and prevent run-off-road crashes.

Traffic Conditions

- Existing AADT ranges from approximately 6,000 vpd at the south end to 17,000 vpd at the north end.
- It was determined that a growth rate of 2.4 percent per year would be appropriate for the study corridor to evaluate projected year 2040 conditions based on historic growth trends.
- Commercial truck traffic accounts for 14 percent of the traffic near the Big Sky area and close to 9 percent of the traffic near Four Corners.
- Traffic volumes on US 191 are highest in the summer months (June through September) and lowest in the shoulder seasons (April through May and October through November). Volumes are highest during the weekdays and between 23 and 31 percent lower on the weekend.
- Under existing peak hour conditions, the Four Corners intersection operates at a LOS C or D. The Mill Street intersection operates at failing LOS during the AM and PM peak periods, and the intersection with MT 64 operates at LOS C or better throughout the day.
- The Four Corners intersection and the intersection with Mill Street are both projected to fail during the peak hours under future conditions. The intersection with MT 64 is projected to operate at LOS E and F during the AM and PM peaks.
- Vehicles were shown to travel slightly slower than the posted speeds during peak summer times. Travel times varied by about 5 to 10 minutes throughout the day.

Safety

- There were 7 fatal crashes and 27 suspected serious injury crashes. Those crashes resulted in a total of 7 fatalities and 32 suspected serious injuries.
- Wild animal, fixed object, rear-end, and rollover crashes were the most common crash types.
- Adverse road conditions, dark-not lighted conditions, and impaired driving were common factors in crashes.
- Crash clusters were identified at: Four Corners intersection (113), MT 64 intersection (18), s-curve at the Lava Lake trailhead RP 61 to 62 (52), the canyon between RP 50 and 51 (31), Gallatin River bridge RP 70.5 (15), the canyon between RP 55.7 and 56.1 (14), the curve between RP 57.5 and 58.1 (14), and the curve at RP 59.5 (7).
- US 191 demonstrates moderate to high potential for overall crash reduction along the corridor.

8.3. Environmental Setting

The *Environmental Scan* identifies physical, biological, social, and cultural resources within the study area that may be affected by potential future improvements arising from the *US 191 Corridor Study*. Project-level environmental analysis would be required for any improvements forwarded from this study. Information contained in the Scan may be used to support future environmental documentation for compliance with MEPA/NEPA. The following environmental concerns were noted:

Physical Environment

- Land surrounding the study area is primarily used for commercial activity, livestock grazing, timber activity, and recreation, although there are also several residences accessed by US 191. Conservation easements exist on a few parcels of land adjacent to US 191.
- The Gallatin WMA exists on the east side of US 191 south of MT 64.
- North of the Gallatin Canyon. the study area contains some soils classified as prime farmland, prime farmland if irrigated, and farmland of local or statewide importance.
- The US 191 study area is in a moderate to high seismic risk zone. Several small earthquakes occurred in the Gallatin Gateway area in late 1989/early 1990. Earthquake events near US 191 through Gallatin Canyon appear to be uncommon.

- US 191 parallels the Gallatin River throughout the study area and crosses several perennial, fish-bearing streams, additional unnamed streams, wetlands, irrigation canals and ditches.
- The Gallatin River is listed as "impaired" due to impacts derived from chronic dewatering for crop irrigation. Other waters in the study area are also listed as impaired or threatened.
- There are 5 delisted hazardous waste release sites, 2 delisted remediation response sites, nearly 30 active underground storage tanks, 5 resolved petroleum tank release sites, 4 abandoned mine sites, 2 mining features, 3 permitted opencut mines, and 2 in-progress opencut mine permits in the study area.
- Residences and Section 4(f) properties in the study area are sensitive noise receptors which could be affected by future roadway improvements.

Biological Resources

- Invasive and noxious weeds, including spotted knapweed and Canada thistle, are a growing concern in Gallatin County.
- Native wildlife habitats in the Four Corners and Gallatin Gateway areas have been replaced by commercial and residential developments which have reduced habitat area. The Gallatin Canyon provides forested and riverine habitat for a variety of wildlife species including large ungulates, carnivores, small mammals, raptors, amphibians, reptiles, and aquatic species.
- The Gallatin Range serves as a natural wildlife refuge for elk, moose, mountain goats, and bighorn sheep and plays a role in maintaining habitat connectivity for wide-ranging wildlife species such as wolverine, lynx, grizzly bear, mountain lion, wolf, and elk.
- There is concern for wildlife-vehicle conflicts due to the known habitats and their proximity to US 191 and the observed trend of animal related crashes.
- The grizzly bear, Canada lynx, wolverine, and whitebark pine tree are listed, or candidates to be listed, under the ESA. All three wildlife species have been observed in the study area and the whitebark pine may potentially occur in the area. Several other mammal, bird, fish, and plant SOC have also been observed in the study area.

Social and Cultural Resources

- Demographic data obtained for this study indicate minority and/or low-income populations are unlikely to be adversely affected by projects that may be forwarded from the corridor study.
- Gallatin County's economy was historically driven by agriculture but now thrives on tourism, technology industries, and educational opportunities.
- Several USFS designated trails, campgrounds, day use areas exist along the US 191 corridor, many of which potentially qualify for protection under Section 4(f).
- The area surrounding US 191 is highly used by recreationists, several recreation areas are accessible via the corridor.
- The Gallatin Gateway Recreation Facilities project is the only project in the study area that qualifies for protection under Section 6(f).
- 73 historic properties were identified within the general vicinity of US 191, 2 of which are listed on the NHRP.

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Appendix A:

Bridge Reports

STRUCTURE INSPECTION REPORT

Structure # 05904

WEST FORK GALLATIN RIVER - 2M E BIG SKY

Bridge Inventory Information

Bridge Inspection Date: 06/08/2019

General Location Data	
(22) Owner	01 State Highway Agency
(6A) Feature Intersected	WEST FORK GALLATIN RIVER
(8) NBI Structure Number	P00050047+09981
(9) Location	2M E BIG SKY
(MDT058) FHWA Bridge Condition	2 Fair
(MDT076) Deck Condition	Fair-1
(MDT077) Structure Condition	3 Candidate for Preservation
(SR) Sufficiency Rating	79.0

A- Location Data	
(MDT001) Agency structure name	none
(1) State Code	308
(MDT027) On|Off System	1 On System
(2) MDT Inspection District	02 BUTTE
(MDT115) MDT Administrative District	2 Butte
(MDT116) MDT Financial District	2 Butte
(MDT020) MDT Maintenance Division	22 BOZEMAN
(MDT078) MDT Maintenance Section	22-06 Big Sky
(3) County Code	031 GALLATIN
(MDT117) Border Bridge - Neighboring County Code	000 NONE
(4) Place Code	00000 Rural Area
(7) Facility Carried by Structure	US 191 FH 42
(21) Maintenance Responsibility	01 State Highway Agency
(MDT031) Railroad Over/Underpass	0 Not Applicable
(MDT032) Railroad Owner	NA Not Applicable
(MDT014) Interchange Indicator	0 Not an Interchange
(MDT015) Interstate Ramp Indicator	0 Not a Ramp
(MDT114) MPO	not in MPO boundary
(112) Nbis Bridge Length	Y Long Enough
(MDT120) Environment	
Bridge within a Reservation Boundary	

B- Construction Data	
(27) Year Built	2009
(106) Year Reconstructed	
(MDT102) Years Rehabilitated	
(MDT019) MDT Original Drawing Number	20024
(MDT103) MDT Rehab Drawing Numbers	
(MDT097) Plans in SMS?	
(MDT098) Shop Drawings in SMS	
(MDT017) MDT Original Construction Project Number	NH-HSIP50-1(17)
(MDT099) MDT Rehab Project Numbers	
(MDT018) MDT Original Construction Station	223+84
(MDT100) MDT Rehab Stations	
(MDT021) MDT UPN	A544
(MDT101) MDT Rehab UPNs	
(MDT119) Date Bridge Opened|Re-Opened to Traffic	

C- Improvement Cost Data	
(75A) Type of Work Proposed	
(75B) Work to be Completed by	
(76) Length Of Structure Improvement	ft
(94) Bridge Improvement Cost	
(95) Roadway Improvement Cost	
(96) Total Project Cost	
(97) Year Of Improvement Cost Estimate	

D- Border State Data	
(98A-1) Border Bridge-Neighboring State Code	
(98A-2) Border Bridge - Neighboring FHWA Region Code	
(98B) Border Bridge-Percent Responsibility	
(99) Border Bridge Structure Number	

E- Historical Structure Data	
(37) Historical Significance	5 5 Not eligible for NRHP

F - Bridge Location	
(16) Latitude (DMS)	451555.59

(17) Longitude (DMS)	1111511.00

G - Span and Dimensional Data	
(33) Bridge Median	0 0 No median
(34) Skew (degrees)	0
(35) Structure Flared	0 0 No flare
(42A) Type of Service on Bridge	1 Highway
(48) Length Of Maximum Span	95.1 ft
(49) Structure Length	97.3 ft
(53) Min Vert Clear Over Bridge Roadway	99.99 ft
(101) Parallel Structure Designation	N No parallel structure exists
(103) Temporary Structure Designation	
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(39) Navigation Vertical Clearance	000 ft
(40) Navigation Horizontal Clearance	0000 ft
(116) Minimum Navigation Vertical Clearance	ft

H - Main Span	
(43A) Main Span Material	5 Prestressed concrete
(43B) Main Span Design Type	02 Stringer|Multi-beam or Girder
(45) Number Of Spans In Main Unit	1

I - Approach Span	
(44A) Approach Span Material	0 Not Applicable
(44B) Approach Span Design Type	00 Not Applicable
(46) Number Of Approach Spans	0

J - Deck Data	
(50A) Left Curb|Sidewalk Width	1.4 ft
(50B) Right Curb|Sidewalk Width	9.6 ft
(52) Out-to-Out Deck Width	77.8 ft
(MDT006) Deck Area	7566 Area
(107) Deck Structure Type	1 Concrete Cast-in-Place
(108A) Type of Wearing Surface	0 None (no additional concrete thickness or wearing surface is included in the bridge deck)
(108B) Type of Membrane	0 None
(108C) Deck Protection	1 Epoxy Coated Reinforcing
(MDT104) Bridge Deck Seal	

(MDT105) Polymer Overlay	
(MDT106) Mill and Overlay	
(MDT107) New Bridge Deck	
(MDT108) Experimental Deck	

K - Under Bridge Service	
(42B) Type of Service under	5 Waterway
(54A) Minimum Vertical Underclearance-Reference Feature	N Feature not a highway or railroad
(54B) Minimum Vertical Underclearance	0 ft
(55A) Min Lateral Underclear On Right-Reference Feature	N Feature not a highway or railroad
(55B) Minimum Lateral Underclearance on Right	0 ft
(56) Min Lateral Underclear On Left	0 ft
(111) Pier|abutment Protection	
(113) Scour Critical Status	8 Brdg. foundations stable for asses. or cal. conditions. Cal. scour is above top of footing.
(69) Underclear, Vertical and Horizontal	N Not applicable

L - Load and Rating Data	
(MDT016) Load Rating Date	10/13/2009
(MDT022) Name of Load Rater	AKJ
(31) Design load - Live load for which the structure was designed	6 MS 18+Mod (HS 20+Mod)
(66) Inventory Rating	36.1 ton
(65) Method Used To Determine Inventory Rating	3 Load and Resistance Factor (LRFR) reported in tons
(64) Operating Rating	73.7 ton
(63) Method Used to Determine Operating Rating	3 Load and Resistance Factor (LRFR) reported in tons
(70) Legal Load Status	5 Equal to or above legal loads
(MDT110) Bridge being Rated by Consultant	No
(MDT112) Completed Rating Model?	
(MDT065) Type 3 Truck Inventory Rating	48 ton
(MDT071) Type 3S2 Truck Inventory Rating	58 ton
(MDT068) Type 3-3 Truck Inventory Rating	64 ton
(MDT036) SU4 Truck Inventory Rating	ton
(MDT039) SU5 Truck Inventory Rating	ton
(MDT045) SU7 Truck Inventory Rating	ton
(MDT042) SU6 Truck Inventory Rating	ton
(MDT091) EV2 Truck Inventory Rating	ton

STRUCTURE INSPECTION REPORT

Structure # 05904

WEST FORK GALLATIN RIVER - 2M E BIG SKY

(MDT092) EV3 Truck Inventory Rating	ton
(MDT066) Type 3 Truck Operating Rating	98 ton
(MDT072) Type 3S2 Truck Operating Rating	118 ton
(MDT069) Type 3-3 Truck Operating Rating	130 ton
(MDT037) SU4 Truck Operating Rating	ton
(MDT040) SU5 Truck Operating Rating	ton
(MDT043) SU6 Truck Operating Rating	ton
(MDT046) SU7 Truck Operating Rating	ton
(MDT093) EV2 Truck Operating Rating	ton
(MDT094) EV3 Truck Operating Rating	ton
(MDT079) Truck Type 3 LRFR Rating	ton
(MDT081) Truck Type 3S2 LRFR Rating	ton
(MDT080) Truck Type 3-3 LRFR Rating	ton
(MDT082) Truck Type SU4 LRFR Rating	ton
(MDT083) Truck Type SU5 LRFR Rating	ton
(MDT084) Truck Type SU6 LRFR Rating	ton
(MDT085) Truck Type SU7 LRFR Rating	ton
(MDT095) Truck Type EV2 LRFR Rating	ton
(MDT096) Truck Type EV3 LRFR Rating	ton
(MDT124) Truck Type 3 Safe Posting Load (tons)	
(MDT125) Truck Type 3S2 Safe Posting Load (tons)	
(MDT126) Truck Type 3-3 Safe Posting Load	
(MDT127) SU4 Safe Posting Load	
(MDT128) SU5 Safe Posting Load	
(MDT129) SU6 Safe Posting Load	
(MDT130) SU7 Safe Posting Load	
(MDT133) Bridge Within Reasonable Access of Interstate	
(MDT131) EV2 Safe Posting Load (ton)	
(MDT132) EV3 Safe Posting Load	

M - General Facility Data	
(5A) Inventory Route-Record Type	1 Route carried `on` the structure
(5C) Designated Level of Service	1 Mainline
(5B) Route Signing Prefix	2 U.S. numbered highway
(5D) Route Number	00191

STRUCTURE INSPECTION REPORT

Structure # 05904

WEST FORK GALLATIN RIVER - 2M E BIG SKY

(5E) Directional Suffix	2 East
(12) Base Highway Network	1 On Base Network
(13A) LRS Number	C000050N
(13B) Inventory Route, Subroute Number-Subroute Number	00
(19) Bypass|Detour Length	180 mi
(MDT009) Detour Speed	-1 mi/hr
(104) NHS Indicator	1 On the NHS
(MDT030) Posted speed limit (MPH)	70 mi/hr
(MDT035) Road Name	
(11) Accumulated Miles	48.251 mi
(MDT087) Decimal Mile Post	47.99
(MDT113) Mile Post	47+0.990 mi
(MDT075) Roadway System	
General Roadway Notes	

N - Base Network Data	
(28B) Lanes Under the Structure	0
(32) Approach Roadway Width	68.2 ft
(51) Bridge Roadway Width Curb-To-Curb	68.2 ft
(72) Approach Roadway Alignment	8 Equal Desirable Crit
(28A) Lanes on the Structure	3

O - Other NetWork Data	
(20) Toll	3 On Free Road
(100) STRAHNET Highway Designation	0 Not a STRAHNET route
(105) Federal Lands Highways	2 Forest Highway (FH)
(110) National Truck Network	1 Part of National Truck Network
(MDT048) School Bus Route	0 Not on School Bus Route

P - Roadway Size and Clearance Data	
(10) Minimum Vertical Clearance	99.99 ft
(47) Total Horizontal Clearance	68.2 ft
(102) Direction of Traffic	2 2-way traffic
(MDT007) Departmental Route	P00050
(MDT002) Both|South|West Direction	0 Both Directions
(MDT003) Both|South|West Vertical Distance	99.990 ft
(MDT051) South|West Horizontal Distance	68.241

STRUCTURE INSPECTION REPORT

Structure # 05904

WEST FORK GALLATIN RIVER - 2M E BIG SKY

(MDT024) North|East Direction	
(MDT026) North|East Vertical Distance	ft
(MDT025) North|East Horizontal Distance	ft

Q - Traffic Data	
(26) Functional Classification	02 Rural, Principal Arterial - Other
(MDT060) Traffic Volume Class	05
(29) Average Daily Traffic	6760
(30) Year of Average Daily Traffic	2018
(109) Average Daily Truck Traffic (%)	6
(114) Future Average Daily Traffic	7943
(115) Year Of Future Avg Daily Traffic	2038

General Bridge Notes

STRUCTURE INSPECTION REPORT

Structure # 05904
2M E BIG SKY - WEST FORK GALLATIN RIVER

Inspection Information

Responsible Person	Name	Signature
Inspector	John Jackson	
QC	Jason Johnson	

User	Begin	End	Comments
John Jackson	06-08-2019 11:00 am	06-08-2019 12:00 pm	On-site. Assisted by John Ransone

Day	Weather	Temperature	Comments
06-08-2019 12:00 - 12:00	Sunny	60	

R- Inspection	Current Value	Previous Value
(36A) Traffic Safety Features - Bridge Railings	0	1
(36B) Traffic Safety Features - Transitions	1	1
(36C) Traffic Safety Features - Approach guardrail	0	N
(36D) Traffic Safety Features - Approach guardrail Ends	1	1
(41) Structure Open, Posted, or Closed to Traffic	A	A
(58) Deck Rating	6	5
(59) Superstructure	7	7
(60) Substructure	7	7
(MDT061) Type 1 Underwater Inspection Required	N	
(61) Channel	8	8
(62) Culvert	N	N
(67) Structural Evaluation	7	7
(68) Deck Geometry	9	9
(69) Underclear, Vertical and Horizontal	N	N
(71) Waterway Adequacy	8	8
(MDT077) Structure Condition	3	
(MDT090) Climbing Inspection Required	N	
(92C-1b) Special Inspection Required	N	
(MDT118) Type 2 Underwater Consultant		
(MDT121) Functional Needs		

Inspection Hours and Dates	Current Value	Previous Values
(MDT005) Date Last QA	2000-01-01	

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

(MDT010) FC Inspection Details	None	
FC Next Inspection Date		
(MDT016) Load Rating Date	2009-10-13	
(MDT023) Next Inspection Date	2021-06-07	2019-06-07
(MDT028) Other Inspection Details	none	
Other Inspection Next Date		
(MDT034) Request Review of Load rating	0	
(MDT050) Snooper Required	N	
Special Inspection Next Date		
(MDT058) FHWA Bridge Condition	2	2
(MDT061) Type 1 Underwater Inspection Required	N	
Type 1 Underwater Inspection Date		
Type 1 Underwater Inspection Frequency (months)		
(MDT064) Type 1 Underwater Inspection Next Date		
(MDT074) Underwater Inspection Details	N	
Type 2 Underwater Next Inspection Date		
(90) Inspection Date	2019-06-08	2017-06-07
(91) Regular Inspection Frequency (Months)	24	24.00
(92A-1) FC Inspection Required	N	N
FC Inspection Frequency (Months)		
(92B-1) Type 2 Underwater Inspection Required	N	N
Type 2 Underwater Inspection Frequency (Months)		
(92C-1a) Other Inspection Required	N	N
(92C-1b) Special Inspection Required	N	
Other Inspection Frequency (Months)		
Special Inspection Frequency (months)		
FC Inspection Date		
Special Inspection Date		

General Inspection Notes
Added:951 RC Approach Rail at Abut 1 LT and RT and Abut 2 RT915 Other Retaining Wall - aggergate filled wire baskets

Repair Suggestions:					
Repair ID	**Date Requested**	**Type**	**Status**	**Priority**	**Comments**

General Bridge Photos	
Photo #:superstructure looking south Location: , Comments:	
Photo #:profile View looking east Location: , Comments:	

STRUCTURE INSPECTION REPORT

Structure # 05904
2M E BIG SKY - WEST FORK GALLATIN RIVER

Photo #: Approach looking north Location: , Comments:	
Photo #: Downstream looking East Location: , Comments:	

Generated by: MDT on 6/18/2019

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Photo #:upstream looking west
Location: , Comments:

Element Inspection Data

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
12		Reinforced Concrete Deck (SF)	Area	7567	63.0	37.0	0.0	0.0
12		1190 - Abrasion/Wear (PSC|RC)	Area	7567	0.0	10.0	0.0	0.0
12		1130 - Cracking (RC and Other)	Area	7567	0.0	27.0	0.0	0.0
12		1120 - Efflorescence/Rust Staining	Area	7567	0.0	7.0	0.0	0.0

Previous Inspection Notes:

st2 cracking along deck transferring to soffit. Condition State 2 : 15
st3 transverse and diagonal cracking along deck surface photo. Condition State 3 : 30
st2 efflorscence along soffit from surface cracking. Condition State 2 : 15

Current Inspection Notes:

Approx 530 ft of efflorescence on soffit
Approx 2040 ft of transverse and longitudinal CS2 cracking on deck surface
Includes cracks incorrectly reported as CS3 in previous inspection
Approx 760 sqft of CS2 abrasion in wheel paths of main travel lanes

Generated by: MDT on 6/18/2019

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:abrasions in wheel path

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

Photo #:cs2 cracking and effloresence on soffit

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
109		Prestressed Concrete Girder| Beam (LF)	Length	761	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
no defects found Condition State 1 : 100								
Current Inspection Notes:								
No apparent defects								

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
215		Reinforced Concrete Abutment (LF)	Length	177	96.4	1.1	2.5	0.0
215		1130 - Cracking (RC and Other)	Length	177	0.0	1.1	0.0	0.0
215		1120 - Efflorescence/Rust Staining	Length	177	0.0	0.0	0.5	0.0
215		1080 - Delamination/Spall/Patched Area	Length	177	0.0	0.0	2.0	0.0

Previous Inspection Notes:

2 st3 spalls along abutment1 and 2 ne corners photo abutment1. Condition State 3 : 1

Current Inspection Notes:

CS3 spalling on abut 2 right - 18" long
CS3 spalling on abut 2 left - 18" long
CS3 spalling on abut 1 right 16"x5"x1"
CS3 efforescence in CS2 crack near Abut 1 CL-see photo
Random hairline cracking
Abut 2 CS2 full height crack at CL
Abut 1 CS2 crack with CS3 efforesence at CL

Photo #:Abut 2 LT CS3 spalling

Location:

Comments:

Element:215 - Reinforced Concrete Abutment (LF)

Photo #:Abut 2 RT corner CS3 spall

Location:

Comments:

Element:215 - Reinforced Concrete Abutment (LF)

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:CS3 Efflorescence - Abut 1 Location: Comments: Element:215 - Reinforced Concrete Abutment (LF)	

Photo #:Abut 1 RT CS3 spall Location: Comments: Element:215 - Reinforced Concrete Abutment (LF)	

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
330		Steel Bridge Rail (LF) - pedestrian rail on left	Length	95	97.9	2.1	0.0	0.0
330		1000 - Corrosion	Length	95	0.0	2.1	0.0	0.0

Previous Inspection Notes:
pedestrian rail in good condition Condition State 1 : 100
Previous Inspection Notes:
rail on top of left concrete barrier rail in good condition. Condition State 1 : 100
Current Inspection Notes:
2ft of surface corrosion on rail

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
331		Reinforced Concrete Bridge Rail (LF)	Length	194	0.0	100.0	0.0	0.0
331		1190 - Abrasion/Wear (PSC|RC)	Length	194	0.0	100.0	0.0	0.0
331		1130 - Cracking (RC and Other)	Length	194	0.0	100.0	0.0	0.0

Previous Inspection Notes:

st2 vertical and map pattern cracking throughout rail Condition State 2 : 50

Current Inspection Notes:

full length CS2 scaling from chemicals and water damage
CS2 vertical and pattern cracking throughout rail

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
515	330	Steel Protective Coating (SF)	Area	225	99.9	0.0	0.0	0.1
515	330	3440 - Effectiveness (Steel Protective Coatings)	Area	225	0.0	0.0	0.0	0.1

Previous Inspection Notes:

fully effective protective coating of pedestrian rail. Condition State 1 : 100
fully effective protective coating. Condition State 1 : 100

Current Inspection Notes:

Paint failure with rusting of exposed base metal

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
915		Other Non-Structural Retaining Wall	Length	59	100.0	0.0	0.0	0.0
915		1220 - Deterioration (Other)	Length	59	100.0	0.0	0.0	0.0

Current Inspection Notes:

Abut 2 RT retaining wall covered by timber wall for aesthetic purposes and in not visible for inspection
areas of minor rust formation

Photo #:retaining wall

Location:

Comments: good condition with small defects noted

Element:915 - Other Non-Structural Retaining Wall

Generated by: MDT on 6/18/2019

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
950		Steel Approach Guardrail	Length	100	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
good condition Condition State 1 : 100								
Current Inspection Notes:								
No apparent defects								

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
951		Reinforced Concrete Approach Guardrail	Length	90	0.0	100.0	0.0	0.0
951		1190 - Abrasion/Wear (PSC|RC)	Length	90	0.0	100.0	0.0	0.0
Current Inspection Notes:								
Full length CS2 surface scaling from chemical and water damage								

Photo #:concrete approach guardrail scaling

Location:

Comments:

Element:951 - Reinforced Concrete Approach Guardrail

STRUCTURE INSPECTION REPORT

Structure # 05904

2M E BIG SKY - WEST FORK GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
960		Steel Approach Guardrail Ends	Each	4	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
good condition Condition State 1 : 100								
Current Inspection Notes:								
No apparent defects								

General Inspection Notes	
Previous Inspection Notes	
Current Inspection Notes	

STRUCTURE INSPECTION REPORT

Structure # 05905

GALLATIN RIVER - 4M NE BIG SKY

Bridge Inventory Information

Bridge Inspection Date: 01/16/2019

General Location Data	
(22) Owner	01 State Highway Agency
(6A) Feature Intersected	GALLATIN RIVER
(8) NBI Structure Number	P00050049+08111
(9) Location	4M NE BIG SKY
(MDT058) Structurally Deficient|Functionally Obsolete	2 Functionally Obsolete
(MDT076) Deck Condition	Fair-2
(MDT077) Structure Condition	Good
(SR) Sufficiency Rating	59.0

A- Location Data	
(MDT001) Agency structure name	none
(1) State Code	308
(MDT027) On|Off System	1 On System
(2) MDT Inspection District	02 BUTTE
(MDT115) MDT Administrative District	2 Butte
(MDT116) MDT Financial District	2 Butte
(MDT020) MDT Maintenance Division	22 BOZEMAN
(MDT078) MDT Maintenance Section	22-06 Big Sky
(3) County Code	031 GALLATIN
(MDT117) Border Bridge - Neighboring County Code	000 NONE
(4) Place Code	00000 Rural Area
(7) Facility Carried by Structure	US 191 FH 42
(21) Maintenance Responsibility	01 State Highway Agency
(MDT031) Railroad Over/Underpass	0 Not Applicable
(MDT032) Railroad Owner	NA Not Applicable
(MDT014) Interchange Indicator	0 Not an Interchange
(MDT015) Interstate Ramp Indicator	0 Not a Ramp
(MDT114) MPO	not in MPO boundary
(112) Nbis Bridge Length	Y Long Enough
(MDT120) Environment	

STRUCTURE INSPECTION REPORT

Structure # 05905

GALLATIN RIVER - 4M NE BIG SKY

B- Construction Data	
(27) Year Built	1952
(106) Year Reconstructed	
(MDT102) Years Rehabilitated	
(MDT019) MDT Original Drawing Number	11874
(MDT103) MDT Rehab Drawing Numbers	
(MDT097) Plans in SMS?	
(MDT098) Shop Drawings in SMS	
(MDT017) MDT Original Construction Project Number	FHP 42 J 2
(MDT099) MDT Rehab Project Numbers	
(MDT018) MDT Original Construction Station	640+00
(MDT100) MDT Rehab Stations	
(MDT021) MDT UPN	
(MDT101) MDT Rehab UPNs	
(MDT119) Date Bridge Opened|Re-Opened to Traffic	

C- Improvement Cost Data	
(75A) Type of Work Proposed	31 31 Repl-Load Capacity
(75B) Work to be Completed by	1 1 Contract
(76) Length Of Structure Improvement	193.5 ft
(94) Bridge Improvement Cost	317000
(95) Roadway Improvement Cost	158500
(96) Total Project Cost	475500
(97) Year Of Improvement Cost Estimate	2009

D- Border State Data	
(98A-1) Border Bridge-Neighboring State Code	
(98A-2) Border Bridge - Neighboring FHWA Region Code	
(98B) Border Bridge-Percent Responsibility	
(99) Border Bridge Structure Number	

E- Historical Structure Data	
(37) Historical Significance	5 5 Not eligible for NRHP

F - Bridge Location	
(16) Latitude (DMS)	451654.72
(17) Longitude (DMS)	1111332.19

G - Span and Dimensional Data	
(33) Bridge Median	0 0 No median
(34) Skew	15 %
(35) Structure Flared	0 0 No flare
(42A) Type of Service on Bridge	1 Highway
(48) Length Of Maximum Span	60 ft
(49) Structure Length	160 ft
(53) Min Vert Clear Over Bridge Roadway	99.99 ft
(101) Parallel Structure Designation	N No parallel structure exists
(103) Temporary Structure Designation	
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(39) Navigation Vertical Clearance	000 ft
(40) Navigation Horizontal Clearance	0000 ft
(116) Minimum Navigation Vertical Clearance	ft

H - Main Span	
(43A) Main Span Material	2 Concrete continuous
(43B) Main Span Design Type	04 Tee Beam
(45) Number Of Spans In Main Unit	3

I - Approach Span	
(44A) Approach Span Material	0 Not Applicable
(44B) Approach Span Design Type	00 Not Applicable
(46) Number Of Approach Spans	0

J - Deck Data	
(50A) Left Curb|Sidewalk Width	0 ft
(50B) Right Curb|Sidewalk Width	0 ft
(52) Out-to-Out Deck Width	33.3 ft
(MDT006) Deck Area	5325 Area
(107) Deck Structure Type	1 Concrete Cast-in-Place
(108A) Type of Wearing Surface	0 None (no additional concrete thickness or wearing surface is included in the bridge deck)
(108B) Type of Membrane	0 None
(108C) Deck Protection	0 None
(MDT104) Bridge Deck Seal	

(MDT105) Polymer Overlay	
(MDT106) Mill and Overlay	
(MDT107) New Bridge Deck	
(MDT108) Experimental Deck	

K - Under Bridge Service	
(42B) Type of Service under	5 Waterway
(54A) Minimum Vertical Underclearance-Reference Feature	N Feature not a highway or railroad
(54B) Minimum Vertical Underclearance	0 ft
(55A) Min Lateral Underclear On Right-Reference Feature	N Feature not a highway or railroad
(55B) Minimum Lateral Underclearance on Right	0 ft
(56) Min Lateral Underclear On Left	0 ft
(111) Pier|abutment Protection	
(113) Scour Critical Status	5 Bridge foundations determined to be stable for calculated scour conditions.
(116) Minimum Navigation Vertical Clearance	ft
(69) Underclear, Vertical and Horizontal	N Not applicable
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(40) Navigation Horizontal Clearance	0000 ft
(39) Navigation Vertical Clearance	000 ft

L - Load and Rating Data	
(MDT016) Load Rating Date	
(MDT022) Name of Load Rater	-1
(31) Design load - Live load for which the structure was designed	5 MS 18 (HS 20)
(66) Inventory Rating	36.0 ton
(65) Method Used To Determine Inventory Rating	B Assigned rating based on Allowable Stress Design (ASD)
(64) Operating Rating	52.9 ton
(63) Method Used to Determine Operating Rating	B Assigned rating based on Allowable Stress Design (ASD)
(70) Legal Load Status	5 Equal to or above legal loads
(MDT110) Bridge being Rated by Consultant	
(MDT112) Completed Rating Model?	
(MDT065) Type 3 Truck Inventory Rating	ton
(MDT071) Type 3S2 Truck Inventory Rating	ton

(MDT068) Type 3-3 Truck Inventory Rating	ton
(MDT036) SU4 Truck Inventory Rating	ton
(MDT039) SU5 Truck Inventory Rating	ton
(MDT045) SU7 Truck Inventory Rating	ton
(MDT042) SU6 Truck Inventory Rating	ton
(MDT091) EV2 Truck Inventory Rating	ton
(MDT092) EV3 Truck Inventory Rating	ton
(MDT066) Type 3 Truck Operating Rating	ton
(MDT072) Type 3S2 Truck Operating Rating	ton
(MDT069) Type 3-3 Truck Operating Rating	90 ton
(MDT037) SU4 Truck Operating Rating	ton
(MDT040) SU5 Truck Operating Rating	ton
(MDT043) SU6 Truck Operating Rating	ton
(MDT046) SU7 Truck Operating Rating	ton
(MDT093) EV2 Truck Operating Rating	ton
(MDT094) EV3 Truck Operating Rating	ton
(MDT079) Truck Type 3 LRFR Rating	ton
(MDT081) Truck Type 3S2 LRFR Rating	ton
(MDT080) Truck Type 3-3 LRFR Rating	ton
(MDT082) Truck Type SU4 LRFR Rating	ton
(MDT083) Truck Type SU5 LRFR Rating	ton
(MDT084) Truck Type SU6 LRFR Rating	ton
(MDT085) Truck Type SU7 LRFR Rating	ton
(MDT095) Truck Type EV2 LRFR Rating	ton
(MDT096) Truck Type EV3 LRFR Rating	ton

M - General Facility Data	
(5A) Inventory Route-Record Type	1 Route carried `on` the structure
(5C) Designated Level of Service	1 Mainline
(5B) Route Signing Prefix	2 U.S. numbered highway
(5D) Route Number	00191
(5E) Directional Suffix	2 East
(12) Base Highway Network	1 On Base Network
(13A) LRS Number	C000050N
(13B) Inventory Route, Subroute Number-Subroute Number	00
(19) Bypass|Detour Length	124 mi

STRUCTURE INSPECTION REPORT

Structure # 05905
GALLATIN RIVER - 4M NE BIG SKY

(MDT009) Detour Speed	-1 mi/hr
(104) NHS Indicator	1 On the NHS
(MDT030) Posted speed limit (MPH)	70 mi/hr
(MDT035) Road Name	
(11) Accumulated Miles	50.067 mi
(MDT087) Decimal Mile Post	49.81
(MDT113) Mile Post	49+0.810 mi
(MDT075) Roadway System	
General Roadway Notes	

N - Base Network Data	
(28B) Lanes Under the Structure	0
(32) Approach Roadway Width	28 ft
(51) Bridge Roadway Width Curb-To-Curb	28 ft
(72) Approach Roadway Alignment	6 Equal Min Criteria
(28A) Lanes on the Structure	2

O - Other NetWork Data	
(20) Toll	3 On Free Road
(100) STRAHNET Highway Designation	0 Not a STRAHNET route
(105) Federal Lands Highways	2 Forest Highway (FH)
(110) National Truck Network	1 Part of National Truck Network
(MDT048) School Bus Route	1 On School Bus Route

P - Roadway Size and Clearance Data	
(10) Minimum Vertical Clearance	99.99 ft
(47) Total Horizontal Clearance	28 ft
(102) Direction of Traffic	2 2-way traffic
(MDT007) Departmental Route	P00050
(MDT002) Both|South|West Direction	0 Both Directions
(MDT003) Both|South|West Vertical Distance	99.990 ft
(MDT051) South|West Horizontal Distance	27.999
(MDT024) North|East Direction	
(MDT026) North|East Vertical Distance	ft
(MDT025) North|East Horizontal Distance	ft

Q - Traffic Data	
(26) Functional Classification	02 Rural, Principal Arterial - Other

STRUCTURE INSPECTION REPORT

Structure # 05905

GALLATIN RIVER - 4M NE BIG SKY

(MDT060) Traffic Volume Class	05
(29) Average Daily Traffic	6412
(30) Year of Average Daily Traffic	2017
(109) Average Daily Truck Traffic (%)	5
(114) Future Average Daily Traffic	7534
(115) Year Of Future Avg Daily Traffic	2037

General Bridge Notes

STRUCTURE INSPECTION REPORT

Structure # 05905
4M NE BIG SKY - GALLATIN RIVER

Inspection Information

Responsible Person	Name	Signature
Inspector	John Jackson	
QC	Wayne Halvorsen	Wayne Halvorsen

User	Begin	End	Comments
John Jackson	01-16-2019 01:00 pm	01-16-2019 02:30 pm	On-site.

Day	Weather	Temperature	Comments
01-16-2019 01:00 - 02:30	Sunny	28	

R- Inspection	Current Value	Previous Value
(36A) Traffic Safety Features - Bridge Railings	0	1
(36B) Traffic Safety Features - Transitions	0	1
(36C) Traffic Safety Features - Approach guardrail	N	1
(36D) Traffic Safety Features - Approach guardrail Ends	1	1
(41) Structure Open, Posted, or Closed to Traffic	A	A
(58) Deck Rating	5	5
(59) Superstructure	7	6
(60) Substructure	7	6
(MDT061) Type 1 Underwater Inspection Required	Y	
(61) Channel	6	6
(62) Culvert	N	N
(67) Structural Evaluation	7	7
(68) Deck Geometry	2	2
(69) Underclear, Vertical and Horizontal	N	N
(71) Waterway Adequacy	8	8
(MDT090) Climbing Inspection Required	N	
(92C-1b) Special Inspection Required	N	
(MDT118) Type 2 Underwater Consultant		
(MDT121) Functional Needs		

Inspection Hours and Dates	Current Value	Previous Values
(MDT005) Date Last QA	2000-01-01	
(MDT010) FC Inspection Details	None	

STRUCTURE INSPECTION REPORT

Structure # 05905
4M NE BIG SKY - GALLATIN RIVER

FC Next Inspection Date		
(MDT023) Next Inspection Date	2021-01-01	2019-01-01
(MDT028) Other Inspection Details	none	
Other Inspection Next Date		
(MDT034) Request Review of Load rating	0	
(MDT050) Snooper Required	N	
Special Inspection Next Date		
(MDT058) Structurally Deficient|Functionally Obsolete	2	2
(MDT061) Type 1 Underwater Inspection Required	Y	
Type 1 Underwater Inspection Date		
(MDT063) Type 1 Underwater Inspection Frequency (months)	48	
(MDT064) Type 1 Underwater Inspection Next Date	2019-1-14	
(MDT074) Underwater Inspection Details	N	
Type 2 Underwater Next Inspection Date		
(90) Inspection Date	2019-01-16	2017-10-9
(91) Regular Inspection Frequency (Months)	24	24.00
(92A-1) FC Inspection Required	N	N
FC Inspection Frequency (Months)		
(92B-1) Type 2 Underwater Inspection Required	N	N
Type 2 Underwater Inspection Frequency (Months)		
(92C-1a) Other Inspection Required	N	N
(92C-1b) Special Inspection Required	N	
Other Inspection Frequency (Months)		
Special Inspection Frequency (months)		
FC Inspection Date		
Special Inspection Date		

General Inspection Notes

Repair Suggestions:					
Repair ID	**Date Requested**	**Type**	**Status**	**Priority**	**Comments**

General Bridge Photos

Photo #: Approach - North Bound Location: , Comments:

Photo #: Profile - North West Location: , Comments:

Photo #: Profile - South East Location: , Comments:	
Photo #: Superstructure - Span 2 - Pier 3 Location: , Comments:	

STRUCTURE INSPECTION REPORT

Structure # 05905

4M NE BIG SKY - GALLATIN RIVER

Photo #: Approach - South Bound Location: , Comments:

Element Inspection Data

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
12		Reinforced Concrete Deck (SF)	Area	5328	43.3	55.0	1.7	0.0
12		1190 - Abrasion/Wear (PSC|RC)	Area	5328	0.0	50.0	0.0	0.0
12		1130 - Cracking (RC and Other)	Area	5328	0.0	9.4	0.0	0.0
12		1120 - Efflorescence/Rust Staining	Area	5328	0.0	1.9	1.5	0.0
12		1090 - Exposed Rebar	Area	5328	0.0	0.0	0.1	0.0
12		1080 - Delamination/Spall/Patched Area	Area	5328	0.0	0.2	0.2	0.0

Previous Inspection Notes:

10 - 1 ft. diameter spalls with up to 1 in. of penetration. Condition State 3 : .19
Span 2: 28sf. of transverse cracking with light efflorescence build-up.
Span 3: 49sf. of transverse cracking with light efflorescence build-up. Condition State 2 : 1.45
Span 1: 35sf. of transverse cracking with efflorescence build-up and rust staining.
Span 2: 35sf. of transverse cracking with efflorescence build-up and rust staining. Condition State 3 : 1.31
Approximently 50% of the deck had exposed aggregate, primarily in the vehicle wheel paths. Condition State 2 : 50
2sf. of exposed reinforcing steel due to a lack of concrete cover in the northbound lane. Condition State 2 : .04
10 moderate width, full length transverse cracks along the top surface of the bridge deck. Condition State 2 : 6.57

Current Inspection Notes:

Generated by: MDT on 1/23/2019

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

CS2 abrasion over approximately 50 % of the deck, especially in the wheel paths.
Moderate width transverse cracks totaling approx 500 ft.
Included those erroneously reported as CS3 in previous MDT inspection
Approx 100 ft of transverse cracks with light efflorescence in soffit, mostly in Spans 2 and 3
Adjusted for defect overlap - delamination, cracking, abrasion and spalls overlap to some extent
Approx 2 ft of exposed rebar with corrosion in Northbound lane.
Appears to be from insufficient concrete cover.
Approx 5 ft of exposed rebar in CS3 spalls
10 spalls of approximately 1 sqft each
Approx 80 ft of transverse soffit cracks with efflorescence and rust staining, mostly in Spans 1 and 2 and over piers
Small spalls throughout deck surface totalling approx 10 sqft

Photo #:Rebar Exposed in CS3 Spall

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

Photo #:Typical CS3 Spall with Exposed Rebar

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

Photo #:Efflorescence Build up Over Pier 2 LT

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Deck Spalling Location: Comments: Element:12 - Reinforced Concrete Deck (SF)	
Photo #:Efflorescence with Rust Staining over Pier 2 RT Location: Comments: Element:12 - Reinforced Concrete Deck (SF)	
Photo #:Rebar Exposed by Insufficient Concrete Cover Location: Comments: Element:12 - Reinforced Concrete Deck (SF)	

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Typical Rust Staining in Soffit Crack

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

STRUCTURE INSPECTION REPORT

Structure # 05905

4M NE BIG SKY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
110		Reinforced Concrete Open Girder|Beam (LF)	Length	640	99.8	0.0	0.2	0.0
110		1130 - Cracking (RC and Other)	Length	640	10.0	0.0	0.0	0.0
110		1080 - Delamination/Spall/Patched Area	Length	640	0.0	0.0	0.2	0.0

Previous Inspection Notes:

Span 3, Girder 3 had a 6in. diameter spall with 1in. of penetration on the bottom west edge. Condition State 2 : .16
Vertical hairline cracking along the length of all girders. Condition State 1 : 10

Current Inspection Notes:

CS3 spall approx 7" x 7" x 1" deep on lower corner of Span 3 Girder 3
Hairline cracks on vertical and horizontal faces of all girders

Photo #:Span 3 G3 Spall

Location:

Comments:

Element:110 - Reinforced Concrete Open Girder|Beam (LF)

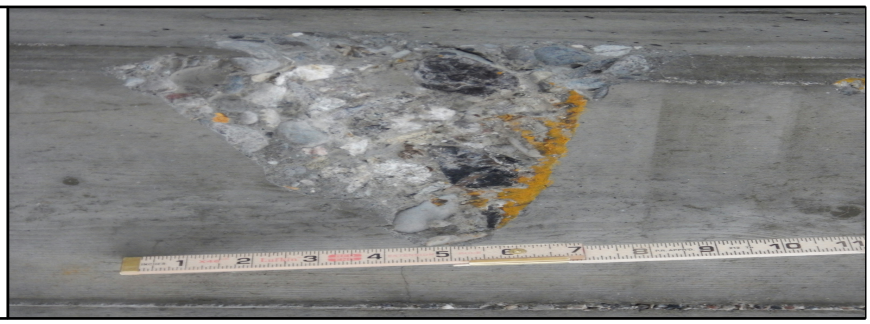

Photo #:Span 3 G3 Spall

Location:

Comments:

Element:110 - Reinforced Concrete Open Girder|Beam (LF)

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STRUCTURE INSPECTION REPORT

Structure # 05905
4M NE BIG SKY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
210		Reinforced Concrete Pier Wall (LF)	Length	56	98.2	1.8	0.0	0.0
210		1130 - Cracking (RC and Other)	Length	56	0.0	1.8	0.0	0.0

Previous Inspection Notes:

South Pier: Vertical hairline crack at mid-point. Condition State 1 : 1.79

Current Inspection Notes:

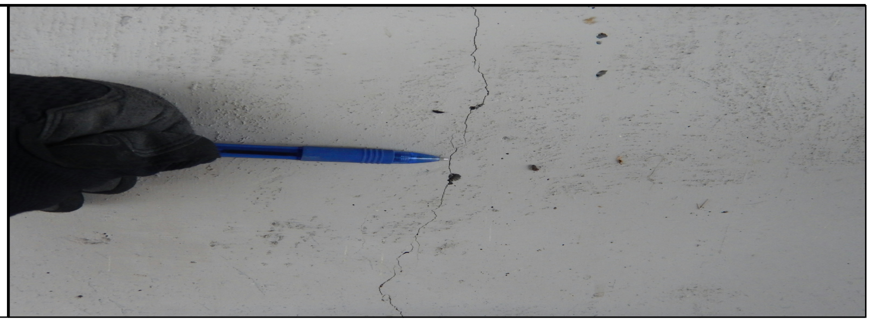
Vertical CS2 crack near CL of Pier 2.
Did not see cracks previously reproted in Pier 3

Photo #:Pier 2 Crack

Location:

Comments:

Element:210 - Reinforced Concrete Pier Wall (LF)



Generated by: MDT on 1/23/2019

STRUCTURE INSPECTION REPORT

Structure # 05905
4M NE BIG SKY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
215		Reinforced Concrete Abutment (LF)	Length	79	94.3	5.7	0.0	0.0
215		1130 - Cracking (RC and Other)	Length	79	0.0	5.7	0.0	0.0
215		1120 - Efflorescence/Rust Staining	Length	79	0.0	4.4	0.0	0.0
Previous Inspection Notes:								
North abutment: 1ft. of vertical cracking with light efflorescence build-up between Girders 1 and 2. South abutment: 1ft. of vertical cracking with light efflorescence build-up between Girders 3 and 4. Condition State 2 : 2.53								
Current Inspection Notes:								
Abut 1: 1 vertical cracks with light efflorescence between G1 and G2, 1.5 ft horizontal crack under Abut 1 LT deck overhang Abut 4: 1 vertical cracks with light efflorescence between G3 and G4; 1 vertical crack without efflorescence between G2 and G3 Efflorescence in 2 abutment cracks. Efflorescence at deck/backwall joint on Abut 1 LT overhang								

Photo #:Abut 4 Crack and Efflorescence Location: Comments: Element:215 - Reinforced Concrete Abutment (LF)	

Photo #:Abut 1 LT Crack and Efflorescence Location: Comments: Element:215 - Reinforced Concrete Abutment (LF)	

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Abut 1 Crack and Efflorescence

Location:

Comments:

Element:215 - Reinforced Concrete Abutment (LF)

STRUCTURE INSPECTION REPORT

Structure # 05905

4M NE BIG SKY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
331		Reinforced Concrete Bridge Rail (LF)	Length	322	41.9	8.1	50.0	0.0
331		1130 - Cracking (RC and Other)	Length	322	0.0	8.1	0.0	0.0
331		1090 - Exposed Rebar	Length	322	0.0	0.0	50.0	0.0

Previous Inspection Notes:

161ft. of exposed rebar with corrosion along the base of the concrete bridge rail due to insufficent concrete cover.
Condition State 3 : 50
East rail: 11ft. of vertical cracking.
West rail: 15ft. of vertical cracking. Condition State 2 : 8.07

Current Inspection Notes:

26 vertical S2 cracks in rail
Exposed corroded rebar along rail base as reported in previous inspection. Could not see on this inspection due to snow and ice build up along rail

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
950		Steel Approach Guardrail	Length	100	74.0	26.0	0.0	0.0
950		7000 - Damage	Length	100	0.0	26.0	0.0	0.0

Previous Inspection Notes:

The northwest guardrail had impact damage leading up to the bridge deck. Condition State 2 : 25

Current Inspection Notes:

Minor damage to rail connection at Abut 1 LT.
25 ft of damage with tearing of metal to LT rail past Abut 4

Photo #:Abut 1 LT Raill Connection Damage

Location:

Comments:

Element:950 - Steel Approach Guardrail

Photo #:Rail Damage Near Abut 4 LT

Location:

Comments:

Element:950 - Steel Approach Guardrail

STRUCTURE INSPECTION REPORT

Structure # 05905
4M NE BIG SKY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
960		Steel Approach Guardrail Ends	Each	4	100.0	0.0	0.0	0.0
Current Inspection Notes:								
No apparent defects								

General Inspection Notes	
Previous Inspection Notes	
Current Inspection Notes	

STRUCTURE INSPECTION REPORT

Structure # 05907

SWAN CREEK - 12M NE BIG SKY

Bridge Inventory Information

Bridge Inspection Date: 06/08/2019

General Location Data	
(22) Owner	01 State Highway Agency
(6A) Feature Intersected	SWAN CREEK
(8) NBI Structure Number	P00050057+02881
(9) Location	12M NE BIG SKY
(MDT058) FHWA Bridge Condition	2 Fair
(MDT076) Deck Condition	Fair-1
(MDT077) Structure Condition	3 Candidate for Preservation
(SR) Sufficiency Rating	80.0

A- Location Data	
(MDT001) Agency structure name	none
(1) State Code	308
(MDT027) On|Off System	1 On System
(2) MDT Inspection District	02 BUTTE
(MDT115) MDT Administrative District	2 Butte
(MDT116) MDT Financial District	2 Butte
(MDT020) MDT Maintenance Division	22 BOZEMAN
(MDT078) MDT Maintenance Section	22-06 Big Sky
(3) County Code	031 GALLATIN
(MDT117) Border Bridge - Neighboring County Code	000 NONE
(4) Place Code	00000 Rural Area
(7) Facility Carried by Structure	US 191 FH 42
(21) Maintenance Responsibility	01 State Highway Agency
(MDT031) Railroad Over/Underpass	0 Not Applicable
(MDT032) Railroad Owner	NA Not Applicable
(MDT014) Interchange Indicator	0 Not an Interchange
(MDT015) Interstate Ramp Indicator	0 Not a Ramp
(MDT114) MPO	not in MPO boundary
(112) Nbis Bridge Length	Y Long Enough
(MDT120) Environment	
Bridge within a Reservation Boundary	

STRUCTURE INSPECTION REPORT

Structure # 05907
SWAN CREEK - 12M NE BIG SKY

B- Construction Data	
(27) Year Built	2009
(106) Year Reconstructed	
(MDT102) Years Rehabilitated	
(MDT019) MDT Original Drawing Number	20049
(MDT103) MDT Rehab Drawing Numbers	
(MDT097) Plans in SMS?	
(MDT098) Shop Drawings in SMS	
(MDT017) MDT Original Construction Project Number	NH-HSIP50-1(17)
(MDT099) MDT Rehab Project Numbers	
(MDT018) MDT Original Construction Station	106+76
(MDT100) MDT Rehab Stations	
(MDT021) MDT UPN	
(MDT101) MDT Rehab UPNs	
(MDT119) Date Bridge Opened|Re-Opened to Traffic	

C- Improvement Cost Data	
(75A) Type of Work Proposed	31 31 Repl-Load Capacity
(75B) Work to be Completed by	1 1 Contract
(76) Length Of Structure Improvement	75.4 ft
(94) Bridge Improvement Cost	113000
(95) Roadway Improvement Cost	56500
(96) Total Project Cost	169500
(97) Year Of Improvement Cost Estimate	2009

D- Border State Data	
(98A-1) Border Bridge-Neighboring State Code	
(98A-2) Border Bridge - Neighboring FHWA Region Code	
(98B) Border Bridge-Percent Responsibility	
(99) Border Bridge Structure Number	

E- Historical Structure Data	
(37) Historical Significance	5 5 Not eligible for NRHP

F - Bridge Location	
(16) Latitude (DMS)	452217.89
(17) Longitude (DMS)	1111028.94

STRUCTURE INSPECTION REPORT

Structure # 05907
SWAN CREEK - 12M NE BIG SKY

G - Span and Dimensional Data	
(33) Bridge Median	0 0 No median
(34) Skew (degrees)	10
(35) Structure Flared	0 0 No flare
(42A) Type of Service on Bridge	1 Highway
(48) Length Of Maximum Span	55.8 ft
(49) Structure Length	58 ft
(53) Min Vert Clear Over Bridge Roadway	99.99 ft
(101) Parallel Structure Designation	N No parallel structure exists
(103) Temporary Structure Designation	
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(39) Navigation Vertical Clearance	000 ft
(40) Navigation Horizontal Clearance	0000 ft
(116) Minimum Navigation Vertical Clearance	ft

H - Main Span	
(43A) Main Span Material	5 Prestressed concrete
(43B) Main Span Design Type	02 Stringer|Multi-beam or Girder
(45) Number Of Spans In Main Unit	1

I - Approach Span	
(44A) Approach Span Material	0 Not Applicable
(44B) Approach Span Design Type	00 Not Applicable
(46) Number Of Approach Spans	0

J - Deck Data	
(50A) Left Curb|Sidewalk Width	0 ft
(50B) Right Curb|Sidewalk Width	0 ft
(52) Out-to-Out Deck Width	53.3 ft
(MDT006) Deck Area	3091 Area
(107) Deck Structure Type	1 Concrete Cast-in-Place
(108A) Type of Wearing Surface	0 None (no additional concrete thickness or wearing surface is included in the bridge deck)
(108B) Type of Membrane	0 None
(108C) Deck Protection	1 Epoxy Coated Reinforcing
(MDT104) Bridge Deck Seal	
(MDT105) Polymer Overlay	

(MDT106) Mill and Overlay	
(MDT107) New Bridge Deck	
(MDT108) Experimental Deck	

K - Under Bridge Service	
(42B) Type of Service under	5 Waterway
(54A) Minimum Vertical Underclearance-Reference Feature	N Feature not a highway or railroad
(54B) Minimum Vertical Underclearance	0 ft
(55A) Min Lateral Underclear On Right-Reference Feature	N Feature not a highway or railroad
(55B) Minimum Lateral Underclearance on Right	0 ft
(56) Min Lateral Underclear On Left	0 ft
(111) Pier|abutment Protection	
(113) Scour Critical Status	8 Brdg. foundations stable for asses. or cal. conditions. Cal. scour is above top of footing.
(69) Underclear, Vertical and Horizontal	N Not applicable

L - Load and Rating Data	
(MDT016) Load Rating Date	10/13/2009
(MDT022) Name of Load Rater	AKJ
(31) Design load - Live load for which the structure was designed	6 MS 18+Mod (HS 20+Mod)
(66) Inventory Rating	40.2 ton
(65) Method Used To Determine Inventory Rating	3 Load and Resistance Factor (LRFR) reported in tons
(64) Operating Rating	61.6 ton
(63) Method Used to Determine Operating Rating	3 Load and Resistance Factor (LRFR) reported in tons
(70) Legal Load Status	5 Equal to or above legal loads
(MDT110) Bridge being Rated by Consultant	No
(MDT112) Completed Rating Model?	
(MDT065) Type 3 Truck Inventory Rating	47 ton
(MDT071) Type 3S2 Truck Inventory Rating	70 ton
(MDT068) Type 3-3 Truck Inventory Rating	83 ton
(MDT036) SU4 Truck Inventory Rating	ton
(MDT039) SU5 Truck Inventory Rating	ton
(MDT045) SU7 Truck Inventory Rating	ton
(MDT042) SU6 Truck Inventory Rating	ton
(MDT091) EV2 Truck Inventory Rating	ton
(MDT092) EV3 Truck Inventory Rating	ton

STRUCTURE INSPECTION REPORT

Structure # 05907

SWAN CREEK - 12M NE BIG SKY

(MDT066) Type 3 Truck Operating Rating	72 ton
(MDT072) Type 3S2 Truck Operating Rating	106 ton
(MDT069) Type 3-3 Truck Operating Rating	127 ton
(MDT037) SU4 Truck Operating Rating	ton
(MDT040) SU5 Truck Operating Rating	ton
(MDT043) SU6 Truck Operating Rating	ton
(MDT046) SU7 Truck Operating Rating	ton
(MDT093) EV2 Truck Operating Rating	ton
(MDT094) EV3 Truck Operating Rating	ton
(MDT079) Truck Type 3 LRFR Rating	ton
(MDT081) Truck Type 3S2 LRFR Rating	ton
(MDT080) Truck Type 3-3 LRFR Rating	ton
(MDT082) Truck Type SU4 LRFR Rating	ton
(MDT083) Truck Type SU5 LRFR Rating	ton
(MDT084) Truck Type SU6 LRFR Rating	ton
(MDT085) Truck Type SU7 LRFR Rating	ton
(MDT095) Truck Type EV2 LRFR Rating	ton
(MDT096) Truck Type EV3 LRFR Rating	ton
(MDT124) Truck Type 3 Safe Posting Load (tons)	
(MDT125) Truck Type 3S2 Safe Posting Load (tons)	
(MDT126) Truck Type 3-3 Safe Posting Load	
(MDT127) SU4 Safe Posting Load	
(MDT128) SU5 Safe Posting Load	
(MDT129) SU6 Safe Posting Load	
(MDT130) SU7 Safe Posting Load	
(MDT133) Bridge Within Reasonable Access of Interstate	
(MDT131) EV2 Safe Posting Load (ton)	
(MDT132) EV3 Safe Posting Load	

M - General Facility Data	
(5A) Inventory Route-Record Type	1 Route carried `on` the structure
(5C) Designated Level of Service	1 Mainline
(5B) Route Signing Prefix	2 U.S. numbered highway
(5D) Route Number	00191
(5E) Directional Suffix	2 East

STRUCTURE INSPECTION REPORT

Structure # 05907
SWAN CREEK - 12M NE BIG SKY

(12) Base Highway Network	1 On Base Network
(13A) LRS Number	C000050N
(13B) Inventory Route, Subroute Number-Subroute Number	00
(19) Bypass|Detour Length	124 mi
(MDT009) Detour Speed	-1 mi/hr
(104) NHS Indicator	1 On the NHS
(MDT030) Posted speed limit (MPH)	70 mi/hr
(MDT035) Road Name	
(11) Accumulated Miles	57.544 mi
(MDT087) Decimal Mile Post	57.28
(MDT113) Mile Post	57+0.280 mi
(MDT075) Roadway System	
General Roadway Notes	

N - Base Network Data	
(28B) Lanes Under the Structure	0
(32) Approach Roadway Width	50.5 ft
(51) Bridge Roadway Width Curb-To-Curb	50.5 ft
(72) Approach Roadway Alignment	8 Equal Desirable Crit
(28A) Lanes on the Structure	2

O - Other NetWork Data	
(20) Toll	3 On Free Road
(100) STRAHNET Highway Designation	0 Not a STRAHNET route
(105) Federal Lands Highways	2 Forest Highway (FH)
(110) National Truck Network	1 Part of National Truck Network
(MDT048) School Bus Route	1 On School Bus Route

P - Roadway Size and Clearance Data	
(10) Minimum Vertical Clearance	99.99 ft
(47) Total Horizontal Clearance	30.1 ft
(102) Direction of Traffic	2 2-way traffic
(MDT007) Departmental Route	P00050
(MDT002) Both|South|West Direction	0 Both Directions
(MDT003) Both|South|West Vertical Distance	99.990 ft
(MDT051) South|West Horizontal Distance	30.098
(MDT024) North|East Direction	

STRUCTURE INSPECTION REPORT

Structure # 05907
SWAN CREEK - 12M NE BIG SKY

(MDT026) North|East Vertical Distance	ft
(MDT025) North|East Horizontal Distance	ft

Q - Traffic Data	
(26) Functional Classification	02 Rural, Principal Arterial - Other
(MDT060) Traffic Volume Class	05
(29) Average Daily Traffic	6760
(30) Year of Average Daily Traffic	2018
(109) Average Daily Truck Traffic (%)	6
(114) Future Average Daily Traffic	7943
(115) Year Of Future Avg Daily Traffic	2038

General Bridge Notes

Inspection Information

Responsible Person	Name	Signature
Inspector	John Jackson	
QC	Jason Johnson	

User	Begin	End	Comments
John Jackson	06-08-2019 09:00 am	06-08-2019 10:00 am	On-site. Assisted by John Ransone

Day	Weather	Temperature	Comments
06-08-2019 12:00 - 12:00	Cloudy	60	

R- Inspection	Current Value	Previous Value
(36A) Traffic Safety Features - Bridge Railings	1	1
(36B) Traffic Safety Features - Transitions	0	1
(36C) Traffic Safety Features - Approach guardrail	1	1
(36D) Traffic Safety Features - Approach guardrail Ends	1	1
(41) Structure Open, Posted, or Closed to Traffic	A	A
(58) Deck Rating	6	7
(59) Superstructure	6	7
(60) Substructure	6	7
(MDT061) Type 1 Underwater Inspection Required	N	
(61) Channel	7	8
(62) Culvert	N	N
(67) Structural Evaluation	6	6
(68) Deck Geometry	9	9
(69) Underclear, Vertical and Horizontal	N	N
(71) Waterway Adequacy	8	8
(MDT077) Structure Condition	3	
(MDT090) Climbing Inspection Required	N	
(92C-1b) Special Inspection Required	N	
(MDT118) Type 2 Underwater Consultant		
(MDT121) Functional Needs		

Inspection Hours and Dates	Current Value	Previous Values
(MDT005) Date Last QA	2000-01-01	

STRUCTURE INSPECTION REPORT

Structure # 05907
12M NE BIG SKY - SWAN CREEK

(MDT010) FC Inspection Details	None	
FC Next Inspection Date		
(MDT016) Load Rating Date	2009-10-13	
(MDT023) Next Inspection Date	2021-06-06	2019-06-06
(MDT028) Other Inspection Details	none	
Other Inspection Next Date		
(MDT034) Request Review of Load rating	0	
(MDT050) Snooper Required	N	
Special Inspection Next Date		
(MDT058) FHWA Bridge Condition	2	2
(MDT061) Type 1 Underwater Inspection Required	N	
Type 1 Underwater Inspection Date		
Type 1 Underwater Inspection Frequency (months)		
(MDT064) Type 1 Underwater Inspection Next Date		
(MDT074) Underwater Inspection Details	N	
Type 2 Underwater Next Inspection Date		
(90) Inspection Date	2019-06-08	2017-06-06
(91) Regular Inspection Frequency (Months)	24	24.00
(92A-1) FC Inspection Required	N	N
FC Inspection Frequency (Months)		
(92B-1) Type 2 Underwater Inspection Required	N	N
Type 2 Underwater Inspection Frequency (Months)		
(92C-1a) Other Inspection Required	N	N
(92C-1b) Special Inspection Required	N	
Other Inspection Frequency (Months)		
Special Inspection Frequency (months)		
FC Inspection Date		
Special Inspection Date		

General Inspection Notes
Added:915 Other Retaining Wall - aggergate filled wire baskets951 RC Approach Rail at all 4 corners

Repair Suggestions:					
Repair ID	**Date Requested**	**Type**	**Status**	**Priority**	**Comments**

General Bridge Photos	
Photo #: Profile View looking West Location: , Comments:	
Photo #: Approach looking south Location: , Comments:	

STRUCTURE INSPECTION REPORT

Structure # 05907
12M NE BIG SKY - SWAN CREEK

Photo #: Downstream Location: , Comments: Looking West	
Photo #: Upstream Location: , Comments: Looking East	

STRUCTURE INSPECTION REPORT

Structure # 05907
12M NE BIG SKY - SWAN CREEK

Photo #: Superstructure Location: , Comments: looking South	

Element Inspection Data

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
12		Reinforced Concrete Deck (SF)	Area	3089	97.7	2.3	0.0	0.0
12		1130 - Cracking (RC and Other)	Area	3089	0.0	1.1	0.0	0.0
12		1120 - Efflorescence/Rust Staining	Area	3089	0.0	1.1	0.0	0.0
Previous Inspection Notes:								
16 ft2 of CS2 efflorescence cracks in the soffit corners. Condition State 2 : .5 16 ft2 of CS3 cracks in the corners.See photo. Condition State 3 : .5								
Current Inspection Notes:								
55 ft of CS2 efflorescence in soffit matching surface cracks 55 ft of CS2 cracking in corners of the deck - reported incorrectly as CS3 cracking in previous inspection 16 ft^2 of cs3 cracks in the corners on top of deck - photo attatched								

STRUCTURE INSPECTION REPORT

Structure # 05907
12M NE BIG SKY - SWAN CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
Photo #:Efflorescence in soffit cracks Location: Comments: Element:12 - Reinforced Concrete Deck (SF)								

STRUCTURE INSPECTION REPORT

Structure # 05907
12M NE BIG SKY - SWAN CREEK

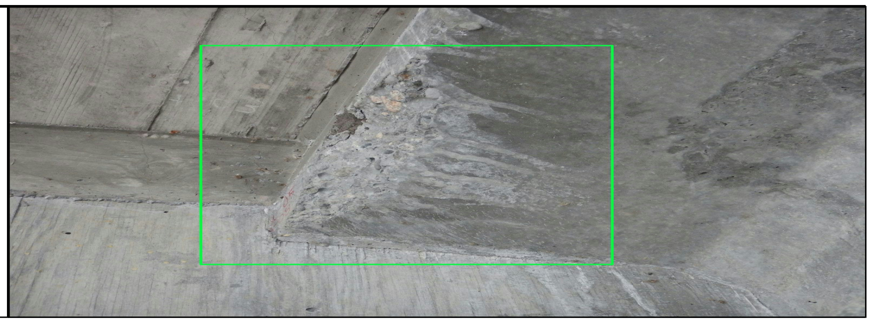
Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
109		Prestressed Concrete Girder|Beam (LF)	Length	390	99.7	0.0	0.3	0.0
109		1080 - Delamination/Spall/Patched Area	Length	390	0.0	0.0	0.3	0.0
Previous Inspection Notes:								
1 CS3 spall on G5 abutment 2. See photo. Condition State 3 : .3								
Current Inspection Notes:								
1 CS3 spall on G5 top flange at Abut 1 end (12" long and 1.5" deep) - photo								

Photo #:CS3 spall at Abut 1 end of G5

Location:

Comments:

Element:109 - Prestressed Concrete Girder|Beam (LF)



Generated by: MDT on 6/18/2019

STRUCTURE INSPECTION REPORT

Structure # 05907

12M NE BIG SKY - SWAN CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
215		Reinforced Concrete Abutment (LF)	Length	125	99.2	0.8	0.0	0.0
215		1080 - Delamination/Spall/Patched Area	Length	125	0.0	0.8	0.0	0.0

Previous Inspection Notes:
1 CS2 spall on SE corner. Condition State 2 : 1
Current Inspection Notes:
CS2 spalling on Abut 1 RT corner

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
331		Reinforced Concrete Bridge Rail (LF)	Length	115	0.0	100.0	0.0	0.0
331		1130 - Cracking (RC and Other)	Length	115	0.0	100.0	0.0	0.0

Previous Inspection Notes:

CS2 map and vertical cracking the entire length. Condition State 2 : 100

Current Inspection Notes:

CS2 map and vertical cracking the entire length of the element

STRUCTURE INSPECTION REPORT

Structure # 05907
12M NE BIG SKY - SWAN CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
915		Other Non-Structural Retaining Wall	Length	100	90.0	10.0	0.0	0.0
915		1900 - Distortion	Length	100	0.0	10.0	0.0	0.0

Current Inspection Notes:

wire basket is distorted and bulging along Abut 1 LT side in top 3 ft of basket

Photo #:wire basket deformation Location: Comments: top of basket is bulging outwards Element:915 - Other Non-Structural Retaining Wall	

STRUCTURE INSPECTION REPORT

Structure # 05907

12M NE BIG SKY - SWAN CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
950		Steel Approach Guardrail	Height	100	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
Good condition. Condition State 1 : 100								
Current Inspection Notes:								
No apparent defects								

STRUCTURE INSPECTION REPORT

Structure # 05907
12M NE BIG SKY - SWAN CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
951		Reinforced Concrete Approach Guardrail	Length	120	0.0	90.0	10.0	0.0
951		1190 - Abrasion/Wear (PSC|RC)	Length	120	0.0	90.0	10.0	0.0

Current Inspection Notes:

CS2 abrasion and scaling along entire length of element from water and chemical damage
CS3 abrasion, probably from snow removal
cs2 suraface abrasion damage from chemicals and water

Photo #:approach guardrail abrasions

Location:

Comments:

Element:951 - Reinforced Concrete Approach Guardrail

Photo #:concrete appraoch abrasions

Location:

Comments:

Element:951 - Reinforced Concrete Approach Guardrail

Generated by: MDT on 6/18/2019

STRUCTURE INSPECTION REPORT

Structure # 05907
12M NE BIG SKY - SWAN CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
960		Steel Approach Guardrail Ends	Each	2	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
Good condition. Condition State 1 : 100								
Current Inspection Notes:								
No apparent defects								

General Inspection Notes	
Previous Inspection Notes	
Current Inspection Notes	

STRUCTURE INSPECTION REPORT

Structure # 05908

GALLATIN RIVER - 14M S GALLATIN GATEWAY

Bridge Inventory Information

Bridge Inspection Date: 04/17/2019

General Location Data	
(22) Owner	01 State Highway Agency
(6A) Feature Intersected	GALLATIN RIVER
(8) NBI Structure Number	P00050061+03291
(9) Location	14M S GALLATIN GATEWAY
(MDT058) Structurally Deficient|Functionally Obsolete	0 Not Deficient
(MDT076) Deck Condition	Fair-2
(MDT077) Structure Condition	Good
(SR) Sufficiency Rating	47.0

A- Location Data	
(MDT001) Agency structure name	none
(1) State Code	308
(MDT027) On|Off System	1 On System
(2) MDT Inspection District	02 BUTTE
(MDT115) MDT Administrative District	2 Butte
(MDT116) MDT Financial District	2 Butte
(MDT020) MDT Maintenance Division	22 BOZEMAN
(MDT078) MDT Maintenance Section	22-06 Big Sky
(3) County Code	031 GALLATIN
(MDT117) Border Bridge - Neighboring County Code	000 NONE
(4) Place Code	00000 Rural Area
(7) Facility Carried by Structure	US 191 FH 42
(21) Maintenance Responsibility	01 State Highway Agency
(MDT031) Railroad Over/Underpass	0 Not Applicable
(MDT032) Railroad Owner	NA Not Applicable
(MDT014) Interchange Indicator	0 Not an Interchange
(MDT015) Interstate Ramp Indicator	0 Not a Ramp
(MDT114) MPO	not in MPO boundary
(112) Nbis Bridge Length	Y Long Enough
(MDT120) Environment	

STRUCTURE INSPECTION REPORT

Structure # 05908

GALLATIN RIVER - 14M S GALLATIN GATEWAY

Bridge within a Reservation Boundary	

B- Construction Data	
(27) Year Built	1950
(106) Year Reconstructed	
(MDT102) Years Rehabilitated	
(MDT019) MDT Original Drawing Number	11881
(MDT103) MDT Rehab Drawing Numbers	
(MDT097) Plans in SMS?	
(MDT098) Shop Drawings in SMS	
(MDT017) MDT Original Construction Project Number	FHP 42 C 2
(MDT099) MDT Rehab Project Numbers	
(MDT018) MDT Original Construction Station	573+37
(MDT100) MDT Rehab Stations	
(MDT021) MDT UPN	2544
(MDT101) MDT Rehab UPNs	
(MDT119) Date Bridge Opened|Re-Opened to Traffic	

C- Improvement Cost Data	
(75A) Type of Work Proposed	
(75B) Work to be Completed by	
(76) Length Of Structure Improvement	ft
(94) Bridge Improvement Cost	
(95) Roadway Improvement Cost	
(96) Total Project Cost	
(97) Year Of Improvement Cost Estimate	

D- Border State Data	
(98A-1) Border Bridge-Neighboring State Code	
(98A-2) Border Bridge - Neighboring FHWA Region Code	
(98B) Border Bridge-Percent Responsibility	
(99) Border Bridge Structure Number	

E- Historical Structure Data	
(37) Historical Significance	5 5 Not eligible for NRHP

STRUCTURE INSPECTION REPORT

Structure # 05908

GALLATIN RIVER - 14M S GALLATIN GATEWAY

F - Bridge Location	
(16) Latitude (DMS)	452427.25
(17) Longitude (DMS)	1111334.72

G - Span and Dimensional Data	
(33) Bridge Median	0 0 No median
(34) Skew (degrees)	0
(35) Structure Flared	0 0 No flare
(42A) Type of Service on Bridge	1 Highway
(48) Length Of Maximum Span	78 ft
(49) Structure Length	233.9 ft
(53) Min Vert Clear Over Bridge Roadway	99.99 ft
(101) Parallel Structure Designation	N No parallel structure exists
(103) Temporary Structure Designation	
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(39) Navigation Vertical Clearance	000 ft
(40) Navigation Horizontal Clearance	0000 ft
(116) Minimum Navigation Vertical Clearance	ft

H - Main Span	
(43A) Main Span Material	4 Steel continuous
(43B) Main Span Design Type	02 Stringer|Multi-beam or Girder
(45) Number Of Spans In Main Unit	5

I - Approach Span	
(44A) Approach Span Material	0 Not Applicable
(44B) Approach Span Design Type	00 Not Applicable
(46) Number Of Approach Spans	0

J - Deck Data	
(50A) Left Curb|Sidewalk Width	0 ft
(50B) Right Curb|Sidewalk Width	0 ft
(52) Out-to-Out Deck Width	34 ft
(MDT006) Deck Area	7951 Area
(107) Deck Structure Type	1 Concrete Cast-in-Place
(108A) Type of Wearing Surface	0 None (no additional concrete thickness or wearing surface is included in the bridge deck)
(108B) Type of Membrane	0 None

(108C) Deck Protection	0 None
(MDT104) Bridge Deck Seal	
(MDT105) Polymer Overlay	
(MDT106) Mill and Overlay	
(MDT107) New Bridge Deck	
(MDT108) Experimental Deck	

K - Under Bridge Service	
(42B) Type of Service under	5 Waterway
(54A) Minimum Vertical Underclearance-Reference Feature	N Feature not a highway or railroad
(54B) Minimum Vertical Underclearance	0 ft
(55A) Min Lateral Underclear On Right-Reference Feature	N Feature not a highway or railroad
(55B) Minimum Lateral Underclearance on Right	0 ft
(56) Min Lateral Underclear On Left	0 ft
(111) Pier|abutment Protection	1 Navigation protection not required
(113) Scour Critical Status	5 Bridge foundations determined to be stable for calculated scour conditions.
(69) Underclear, Vertical and Horizontal	N Not applicable

L - Load and Rating Data	
(MDT016) Load Rating Date	
(MDT022) Name of Load Rater	-1
(31) Design load - Live load for which the structure was designed	5 MS 18 (HS 20)
(66) Inventory Rating	36.0 ton
(65) Method Used To Determine Inventory Rating	B Assigned rating based on Allowable Stress Design (ASD)
(64) Operating Rating	52.9 ton
(63) Method Used to Determine Operating Rating	B Assigned rating based on Allowable Stress Design (ASD)
(70) Legal Load Status	5 Equal to or above legal loads
(MDT110) Bridge being Rated by Consultant	Forsgren
(MDT112) Completed Rating Model?	
(MDT065) Type 3 Truck Inventory Rating	ton
(MDT071) Type 3S2 Truck Inventory Rating	ton
(MDT068) Type 3-3 Truck Inventory Rating	ton
(MDT036) SU4 Truck Inventory Rating	ton
(MDT039) SU5 Truck Inventory Rating	ton
(MDT045) SU7 Truck Inventory Rating	ton

(MDT042) SU6 Truck Inventory Rating	ton
(MDT091) EV2 Truck Inventory Rating	ton
(MDT092) EV3 Truck Inventory Rating	ton
(MDT066) Type 3 Truck Operating Rating	ton
(MDT072) Type 3S2 Truck Operating Rating	ton
(MDT069) Type 3-3 Truck Operating Rating	99 ton
(MDT037) SU4 Truck Operating Rating	ton
(MDT040) SU5 Truck Operating Rating	ton
(MDT043) SU6 Truck Operating Rating	ton
(MDT046) SU7 Truck Operating Rating	ton
(MDT093) EV2 Truck Operating Rating	ton
(MDT094) EV3 Truck Operating Rating	ton
(MDT079) Truck Type 3 LRFR Rating	ton
(MDT081) Truck Type 3S2 LRFR Rating	ton
(MDT080) Truck Type 3-3 LRFR Rating	ton
(MDT082) Truck Type SU4 LRFR Rating	ton
(MDT083) Truck Type SU5 LRFR Rating	ton
(MDT084) Truck Type SU6 LRFR Rating	ton
(MDT085) Truck Type SU7 LRFR Rating	ton
(MDT095) Truck Type EV2 LRFR Rating	ton
(MDT096) Truck Type EV3 LRFR Rating	ton
(MDT124) Truck Type 3 Safe Posting Load (tons)	
(MDT125) Truck Type 3S2 Safe Posting Load (tons)	
(MDT126) Truck Type 3-3 Safe Posting Load	
(MDT127) SU4 Safe Posting Load	
(MDT128) SU5 Safe Posting Load	
(MDT129) SU6 Safe Posting Load	
(MDT130) SU7 Safe Posting Load	
(MDT133) Bridge Within Reasonable Access of Interstate	
(MDT131) EV2 Safe Posting Load (ton)	
(MDT132) EV3 Safe Posting Load	

M - General Facility Data	
(5A) Inventory Route-Record Type	1 Route carried `on` the structure
(5C) Designated Level of Service	1 Mainline

STRUCTURE INSPECTION REPORT

Structure # 05908
GALLATIN RIVER - 14M S GALLATIN GATEWAY

(5B) Route Signing Prefix	2 U.S. numbered highway
(5D) Route Number	00191
(5E) Directional Suffix	2 East
(12) Base Highway Network	1 On Base Network
(13A) LRS Number	C000050N
(13B) Inventory Route, Subroute Number-Subroute Number	00
(19) Bypass|Detour Length	124 mi
(MDT009) Detour Speed	-1 mi/hr
(104) NHS Indicator	1 On the NHS
(MDT030) Posted speed limit (MPH)	70 mi/hr
(MDT035) Road Name	
(11) Accumulated Miles	61.645 mi
(MDT087) Decimal Mile Post	61.32
(MDT113) Mile Post	61+0.320 mi
(MDT075) Roadway System	
General Roadway Notes	

N - Base Network Data	
(28B) Lanes Under the Structure	0
(32) Approach Roadway Width	28 ft
(51) Bridge Roadway Width Curb-To-Curb	28 ft
(72) Approach Roadway Alignment	4 Minimum Tolerable
(28A) Lanes on the Structure	2

O - Other NetWork Data	
(20) Toll	3 On Free Road
(100) STRAHNET Highway Designation	0 Not a STRAHNET route
(105) Federal Lands Highways	2 Forest Highway (FH)
(110) National Truck Network	1 Part of National Truck Network
(MDT048) School Bus Route	1 On School Bus Route

P - Roadway Size and Clearance Data	
(10) Minimum Vertical Clearance	99.99 ft
(47) Total Horizontal Clearance	28 ft
(102) Direction of Traffic	2 2-way traffic
(MDT007) Departmental Route	P00050
(MDT002) Both|South|West Direction	0 Both Directions

STRUCTURE INSPECTION REPORT

Structure # 05908

GALLATIN RIVER - 14M S GALLATIN GATEWAY

(MDT003) Both|South|West Vertical Distance	99.990 ft
(MDT051) South|West Horizontal Distance	27.999
(MDT024) North|East Direction	
(MDT026) North|East Vertical Distance	ft
(MDT025) North|East Horizontal Distance	ft

Q - Traffic Data	
(26) Functional Classification	02 Rural, Principal Arterial - Other
(MDT060) Traffic Volume Class	05
(29) Average Daily Traffic	6412
(30) Year of Average Daily Traffic	2017
(109) Average Daily Truck Traffic (%)	5
(114) Future Average Daily Traffic	7534
(115) Year Of Future Avg Daily Traffic	2037

General Bridge Notes

Inspection Information

Responsible Person	Name	Signature
Inspector	Jason Johnson	
QC	John Jackson	

User	Begin	End	Comments
Wayne Halvorsen	04-17-2019 09:00 am	04-17-2019 11:00 am	On-site. Inspection of steel componets only.
Jason Johnson	04-17-2019 09:00 am	04-17-2019 11:00 am	On-site. inspector of substructure components and deck

Day	Weather	Temperature	Comments
04-17-2019 09:00 - 11:00	Rain	30	
04-17-2019 09:00 - 11:00	Snow	30	inspector of substructure components and deck

R- Inspection	Current Value	Previous Value
(36A) Traffic Safety Features - Bridge Railings	0	1
(36B) Traffic Safety Features - Transitions	0	1
(36C) Traffic Safety Features - Approach guardrail	N	1
(36D) Traffic Safety Features - Approach guardrail Ends	0	1
(41) Structure Open, Posted, or Closed to Traffic	A	A
(58) Deck Rating	5	6
(59) Superstructure	5	5
(60) Substructure	6	7
(MDT061) Type 1 Underwater Inspection Required	Y	N
(61) Channel	8	8
(62) Culvert	N	N
(67) Structural Evaluation	5	5
(68) Deck Geometry	4	4
(69) Underclear, Vertical and Horizontal	N	N
(71) Waterway Adequacy	8	8
(MDT090) Climbing Inspection Required	N	
(MDT118) Type 2 Underwater Consultant		
(MDT121) Functional Needs		

STRUCTURE INSPECTION REPORT

Structure # 05908
14M S GALLATIN GATEWAY - GALLATIN RIVER

Inspection Hours and Dates	Current Value	Previous Values
(MDT005) Date Last QA	2018-7-17	2018-7-16
(MDT010) FC Inspection Details	None	
FC Next Inspection Date		
(MDT023) Next Inspection Date	2021-04-17	2019-04-20
(MDT028) Other Inspection Details	pinhng	
(MDT029) Other Inspection Next Date	2021-04-02	2017-04-02
(MDT034) Request Review of Load rating	0	1
(MDT050) Snooper Required	Y	
Special Inspection Next Date		
(MDT058) Structurally Deficient|Functionally Obsolete	0	0
(MDT061) Type 1 Underwater Inspection Required	Y	N
Type 1 Underwater Inspection Date		
(MDT063) Type 1 Underwater Inspection Frequency (months)	48	
(MDT064) Type 1 Underwater Inspection Next Date	2019-4-10	
(MDT074) Underwater Inspection Details	2	1
Type 2 Underwater Next Inspection Date		
(90) Inspection Date	2019-04-17	2017-04-25
(91) Regular Inspection Frequency (Months)	24	24.00
(92A-1) FC Inspection Required	N	N
FC Inspection Frequency (Months)		
(92B-1) Type 2 Underwater Inspection Required	N	Y
(92B-2) Type 2 Underwater Inspection Frequency (Months)		48
(92C-1a) Other Inspection Required	Y	Y48
(92C-2a) Other Inspection Frequency (Months)	48	
Special Inspection Frequency (months)		
Special Inspection Required		
FC Inspection Date		
Special Inspection Date		

General Inspection Notes
Surface corrosion full length of exteriors on both flange edges and random areas on websInterior girders have areas of surface rust adjacent to leaking deck joints and at random areas on the webs.Corrosion scaling and pack rust on girder ends under leaking deck joints at Pin and Hanger connections - Approx 5ft at each connection. PhotosRandom areas of corrosion scaling on top flanges under deck cracksPack rust with distortion between lower flange plates- Approx 30 ft. PhotoAreas of interior girders withoutNo change in crack at web stiffener

Repair Suggestions:					
Repair ID	**Date Requested**	**Type**	**Status**	**Priority**	**Comments**

General Bridge Photos

Photo #:profile east Location: , Comments:	
Photo #:exposed rebar in deck spall Location: , Comments:	

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Photo #:approach north Location: , Comments:	
Photo #:substructure Location: , Comments:	

Element Inspection Data

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
12		Reinforced Concrete Deck (SF)	Area	7955	0.0	91.8	8.2	0.0
12		1190 - Abrasion/Wear (PSC|RC)	Area	7955	0.0	60.0	0.0	0.0

Generated by: MDT on 4/25/2019

MONTANA MDT DEPARTMENT OF TRANSPORTATION

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
12		1130 - Cracking (RC and Other)	Area	7955	0.0	10.0	8.0	0.0
12		1120 - Efflorescence/Rust Staining	Area	7955	0.0	18.0	0.0	0.0
12		1090 - Exposed Rebar	Area	7955	0.0	0.1	0.0	0.0
12		1080 - Delamination/Spall/Patched Area	Area	7955	0.0	40.0	0.2	0.0

Previous Inspection Notes:

1 ft 2 of CS3 spall on deck edge.See photo. Condition State 3 : .01
4 full width CS3 cracks. See photo. Condition State 3 : 1.7
3978 ft 2 of CS2 abrasion. Condition State 2 : 50
3977 ft of repaired ares.
400 ft 2 of CS2 delamination. Condition State 2 : 50
20 full width CS2 efflorescence cracking on soffit. Condition State 2 : 8.5

Current Inspection Notes:

st2 efflorescence along soffit matching deck cracking
exposed rebar without measurable section loss in st3 spalls
st3 deck spalling throughout, Approx 16 sqft
deck abrasion not associated with patched areas
sound patched areas with delamination around patches and adjacent to joints and bridge ends
st3 transverse cracking approximatley 480 ft , 12 full width or 8%
st2 cracking throughout deck

Photo #:st3 deck crack

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
Photo #:st3 deck spall Location: Comments: Element:12 - Reinforced Concrete Deck (SF)								

STRUCTURE INSPECTION REPORT

Structure # 05908
14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
107		Steel Girder| Beam (LF)	Length	935	0.0	88.8	11.2	0.0
107		1020 - Connection	Length	935	0.0	0.0	3.2	0.0
107		1010 - Cracking	Length	935	0.0	0.1	0.0	0.0
107		1000 - Corrosion	Length	935	0.0	88.8	11.2	0.0

Previous Inspection Notes:

Areas of interior girders without Condition State 1 : 35
Surface corrosion full length of exteriors on both flange edges and random areas on webs
Interior girders have areas of surface rust adjacent to leaking deck joints and at random areas on the webs. Condition State 2 : 53.8
Pack rust with distortion between lower flange plates- Approx 30 ft. Photo Condition State 3 : 3.2
No change in crack at web stiffener Condition State 2 : .1
Corrosion scaling and pack rust on girder ends under leaking deck joints at Pin and Hanger connections - Approx 5 ft at each connection. Photos
Random areas of corrosion scaling on top flanges under deck cracks Condition State 3 : 8

Current Inspection Notes:

CS3 corrosion scaling on girder ends under leaking deck joints at Pin and Hanger connections - Approx See photos
No change in crack at web stiffener.
Some CS3 packrust along girders and under leaking joints at pin and hangers. See photo
Surface corrosion full length of exteriors on both flange edges and random areas on webs.
Interior girders have areas of surface rust adjacent to leaking deck joints and at random areas on the webs.
No change at the minor cracking at the web stiffiners,

Photo #:PACK RUST

Location:

Comments:

Element:107 - Steel Girder|Beam (LF)

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:CONDITION 3 CORROSION.

Location:

Comments:

Element:107 - Steel Girder|Beam (LF)

Photo #:PACK RUST.

Location:

Comments:

Element:107 - Steel Girder|Beam (LF)

Photo #:CONDITION 3 CORROSION.

Location:

Comments:

Element:107 - Steel Girder|Beam (LF)

Photo #:CONDITION 3 CORROSION.

Location:

Comments:

Element:107 - Steel Girder|Beam (LF)

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:CONDITION 3 CORROSION.

Location:

Comments:

Element:107 - Steel Girder|Beam (LF)

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
161		Steel Pin, Pin and Hanger Assembly, or Both (EA)	Each	16	0.0	100.0	0.0	0.0
161		1000 - Corrosion	Each	16	0.0	100.0	0.0	0.0

Previous Inspection Notes:

No significant abnormalities detected during consultant NDT inspection Condition State 2 : 50
Surface rust present on all hanger assemblies Condition State 2 : 50

Current Inspection Notes:

No significant abromalties detected durings consulttants NDT inspection. See report
Freckled rust. Corrosion has started at each pin and hanger

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
205		Reinforced Concrete Column (EA)	Each	6	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
Minor cracking. Condition State 1 : 100								
Current Inspection Notes:								
minor insignificant cracking and scaling								

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
215		Reinforced Concrete Abutment (LF)	Length	69	96.5	3.5	0.0	0.0
215		1130 - Cracking (RC and Other)	Length	69	0.0	3.0	0.0	0.0
215		1080 - Delamination/Spall/Patched Area	Length	69	0.0	0.5	0.0	0.0

Previous Inspection Notes:

1 ft of CS2 on north abutment. Condition State 2 : 1.44
1ft of CS2 vertical crack on north abutment. Condition State 2 : 1.44

Current Inspection Notes:

small st2 spall nw abutment corner
st2 vertical cracking 1 per abutment

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
234		Reinforced Concrete Cap (LF)	Length	138	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
Minor cracking. Condition State 1 : 100								
Current Inspection Notes:								
minor hairline map cracking along cap ends								

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
302		Compression Joint (LF)	Length	69	0.0	70.0	30.0	0.0
302		2370 - Metal Deterioration or Damage	Length	69	0.0	0.0	30.0	0.0
302		2360 - Adjacent Deck or Header	Length	69	0.0	25.0	0.0	0.0
302		2350 - Debris Impaction	Length	69	0.0	100.0	0.0	0.0
302		2310 - Leakage	Length	69	0.0	100.0	0.0	0.0

Previous Inspection Notes:

10 ft of missing joint on bent 2.See photo. Condition State 4 : 14.5
Full of debris. Condition State 2 : 100
52 FTof CS2 leeakage. Condition State 2 : 75
52 FT of CS2 LEAKAGE. Condition State 3 :
3 ft of adjacent repair. Condition State 2 : 4.4
17 FTof CS3 leakage. Condition State 3 : 25

Current Inspection Notes:

joints full of debris still allowing free movement
delamination along joint edges
approximately 20ft of joint damage 10ft missing of bent2 NB lane and 10 ft of impacts along bent3 joint-photos
10ft st3 joint damage over bent 2 NB lane
st2 leakage dripping through both joints contributing to rusted girders and bearings

Photo #:bent2 joint damage

Location:

Comments:

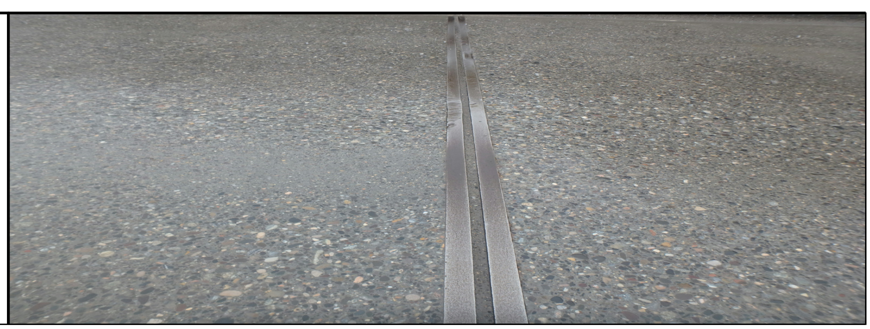
Element:302 - Compression Joint (LF)

Photo #:bent 3 joint impacts

Location:

Comments:

Element:302 - Compression Joint (LF)



STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
311		Movable Bearing (roller, sliding, etc.) (EA)	Each	16	0.0	100.0	0.0	0.0
311		2220 - Alignment	Each	16	0.0	50.0	0.0	0.0
311		1000 - Corrosion	Each	16	0.0	100.0	0.0	0.0

Previous Inspection Notes:

Ben2 t bearings rocked past neutral position. Condition State 2 : 50
Freckled rust. Corrosion has started at each bearing. Condition State 2 : 100

Current Inspection Notes:

Freckled rust. Corrosion has started at each bearing.
Bent 2 rocked past neutral axis

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
313		Fixed Bearing (EA)	Each	8	0.0	100.0	0.0	0.0
313		1000 - Corrosion	Each	8	0.0	100.0	0.0	0.0

Previous Inspection Notes:

Freckled rust. Corrosion has started at each bearing. Condition State 2 : 100

Current Inspection Notes:

Freckled rust. Corrosion has started at each bearing.

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
331		Reinforced Concrete Bridge Rail (LF)	Length	469	88.3	10.5	1.2	0.0
331		1130 - Cracking (RC and Other)	Length	469	0.0	10.0	0.2	0.0
331		1090 - Exposed Rebar	Length	469	0.0	0.5	0.0	0.0
331		1080 - Delamination/Spall/Patched Area	Length	469	0.0	0.0	1.0	0.0

Previous Inspection Notes:

10 ft of CS2 vertical cracking. Condition State 2 : 2.1
5ft of CS2 exposed rebar. Condition State 2 : 1.1
4 ft of CS2 delamination. Condition State 2 : .8
30 ft of CS3 vertical cracking.See photo. Condition State 3 : 6.5

Current Inspection Notes:

exposed rebar found in some rail spalls
5 st3 spalls along south bridge rail
st3 diagonal crack from impact nw corner
st2 vertical cracking throughout both rail edges

Photo #:bridge rail spall

Location:

Comments:

Element:331 - Reinforced Concrete Bridge Rail (LF)

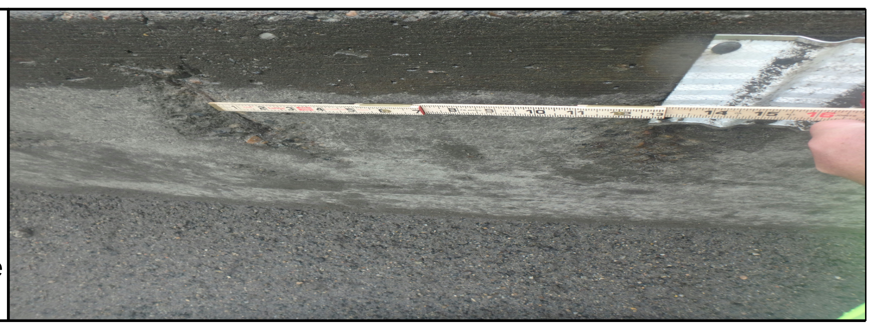
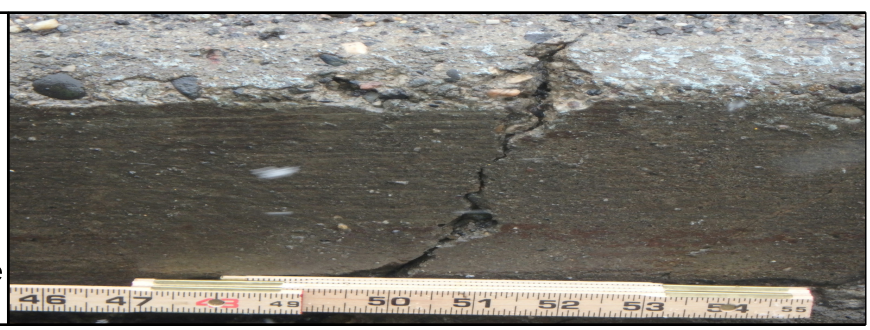


Photo #:st3 rail crack

Location:

Comments:

Element:331 - Reinforced Concrete Bridge Rail (LF)



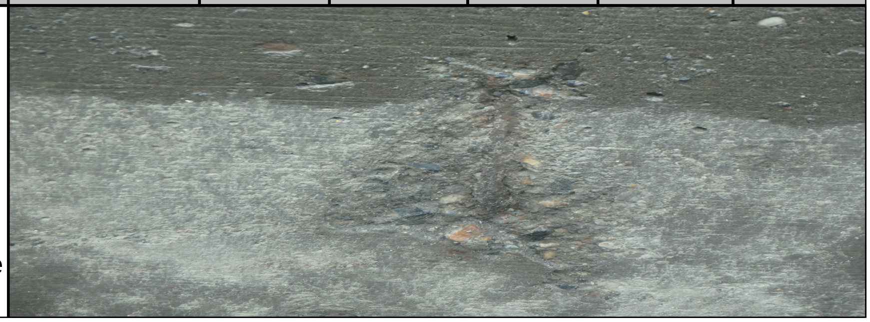
Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:exposed rebar

Location:

Comments:

Element:331 - Reinforced Concrete Bridge Rail (LF)



Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
515	107	Steel Protective Coating (SF)	Area	10285	90.0	0.0	5.0	5.0
515	313	3440 - Effectiveness (Steel Protective Coatings)	Area	8	0.0	0.0	5.0	5.0
515	311	3440 - Effectiveness (Steel Protective Coatings)	Area	16	0.0	0.0	5.0	5.0
515	161	3440 - Effectiveness (Steel Protective Coatings)	Area	16	0.0	0.0	37.5	37.5
515	161	3410 - Chalking (Steel Protective Coatings)	Area	16	0.0	25.0	0.0	0.0
515	107	3440 - Effectiveness (Steel Protective Coatings)	Area	10285	0.0	0.0	5.0	5.0
515	161	Steel Protective Coating (SF)	Area	16	0.0	25.0	37.5	37.5
515	311	Steel Protective Coating (SF)	Area	16	90.0	0.0	5.0	5.0
515	313	Steel Protective Coating (SF)	Area	8	90.0	0.0	5.0	5.0

Previous Inspection Notes:

All remaining paint is chalking Condition State 2 : 90
Remaining paint chalking Condition State 2 : 25
Paint failure Condition State 4 : 5
Paint failure Condition State 4 : 37.5
Paint deterioration with limited effectiveness Condition State 3 : 5
Paint deterioration with limited effectiveness Condition State 3 : 37.5
NDT testing by consultants. No serious defects observed. See NDT report Condition State 2 : 25
Bare metal with surface corrosion. Condition State 4 : 10

Current Inspection Notes:

Bare metal with surface corrosion.
Bare metal with surface corrosion
Some PC with limited efectiviness
Some PC with limited efectiviness.
Some of the PC is chalking
Some PC with limited effectiveness
Some PC with limited effectiviness.

STRUCTURE INSPECTION REPORT

Structure # 05908

14M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
950		Steel Approach Guardrail	Length	100	95.0	0.0	5.0	0.0
950		7000 - Damage	Length	100	0.0	0.0	5.0	0.0
950		1900 - Distortion	Length	100	0.0	0.0	5.0	0.0

Previous Inspection Notes:

50 ft of damage. Condition State 2 : 50

Current Inspection Notes:

5ft st3 damage to SB departure rail section
distortion to ne departure rail from impact damage

Photo #:rail damage

Location:

Comments:

Element:950 - Steel Approach Guardrail

Generated by: MDT on 4/25/2019

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
960		Steel Approach Guardrail Ends	Each	3	66.7	0.0	0.0	33.3
960		7000 - Damage	Each	3	66.7	0.0	0.0	33.3

Previous Inspection Notes:

Good conditions. Condition State 1 : 100

Current Inspection Notes:

severe damage to SB approach end
good condition

Photo #:NE approach terminal end

Location:

Comments:

Element:960 - Steel Approach Guardrail Ends

General Inspection Notes	
Previous Inspection Notes	
Current Inspection Notes	

STRUCTURE INSPECTION REPORT

Structure # 05909

SPANISH CREEK - 7M S GALLATIN GATEWAY

Bridge Inventory Information

Bridge Inspection Date: 07/31/2019

General Location Data	
(22) Owner	01 State Highway Agency
(6A) Feature Intersected	SPANISH CREEK
(8) NBI Structure Number	P00050068+02171
(9) Location	7M S GALLATIN GATEWAY
(MDT058) FHWA Bridge Condition	2 Fair
(MDT076) Deck Condition	2 Candidate for Resurfacing
(MDT077) Structure Condition	2 Candidate for Repair
(SR) Sufficiency Rating	41.1

A- Location Data	
(MDT001) Agency structure name	none
(1) State Code	308
(MDT027) On|Off System	1 On System
(2) MDT Inspection District	02 BUTTE
(MDT115) MDT Administrative District	2 Butte
(MDT116) MDT Financial District	2 Butte
(MDT020) MDT Maintenance Division	22 BOZEMAN
(MDT078) MDT Maintenance Section	22-01 Bozeman
(3) County Code	031 GALLATIN
(MDT117) Border Bridge - Neighboring County Code	000 NONE
(4) Place Code	00000 Rural Area
(7) Facility Carried by Structure	US 191 FH 42
(21) Maintenance Responsibility	01 State Highway Agency
(MDT031) Railroad Over/Underpass	0 Not Applicable
(MDT032) Railroad Owner	NA Not Applicable
(MDT014) Interchange Indicator	0 Not an Interchange
(MDT015) Interstate Ramp Indicator	0 Not a Ramp
(MDT114) MPO	not in MPO boundary
(112) Nbis Bridge Length	Y Long Enough
(MDT120) Environment	

STRUCTURE INSPECTION REPORT

Structure # 05909
SPANISH CREEK - 7M S GALLATIN GATEWAY

Bridge within a Reservation Boundary	

B- Construction Data	
(27) Year Built	1931
(106) Year Reconstructed	1955
(MDT102) Years Rehabilitated	
(MDT019) MDT Original Drawing Number	RECORDS
(MDT103) MDT Rehab Drawing Numbers	
(MDT097) Plans in SMS?	Y Yes
(MDT098) Shop Drawings in SMS	
(MDT017) MDT Original Construction Project Number	FHP 42 A 2
(MDT099) MDT Rehab Project Numbers	
(MDT018) MDT Original Construction Station	933+65
(MDT100) MDT Rehab Stations	
(MDT021) MDT UPN	
(MDT101) MDT Rehab UPNs	
(MDT119) Date Bridge Opened|Re-Opened to Traffic	

C- Improvement Cost Data	
(75A) Type of Work Proposed	31 31 Repl-Load Capacity
(75B) Work to be Completed by	1 1 Contract
(76) Length Of Structure Improvement	95.1 ft
(94) Bridge Improvement Cost	255000
(95) Roadway Improvement Cost	127500
(96) Total Project Cost	382500
(97) Year Of Improvement Cost Estimate	2009

D- Border State Data	
(98A-1) Border Bridge-Neighboring State Code	
(98A-2) Border Bridge - Neighboring FHWA Region Code	
(98B) Border Bridge-Percent Responsibility	
(99) Border Bridge Structure Number	

E- Historical Structure Data	
(37) Historical Significance	5 5 Not eligible for NRHP

STRUCTURE INSPECTION REPORT

Structure # 05909
SPANISH CREEK - 7M S GALLATIN GATEWAY

F - Bridge Location	
(16) Latitude (DMS)	452938.02
(17) Longitude (DMS)	1111619.60

G - Span and Dimensional Data	
(33) Bridge Median	0 0 No median
(34) Skew (degrees)	0
(35) Structure Flared	0 0 No flare
(42A) Type of Service on Bridge	1 Highway
(48) Length Of Maximum Span	30 ft
(49) Structure Length	70 ft
(53) Min Vert Clear Over Bridge Roadway	99.99 ft
(101) Parallel Structure Designation	N No parallel structure exists
(103) Temporary Structure Designation	
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(39) Navigation Vertical Clearance	000 ft
(40) Navigation Horizontal Clearance	0000 ft
(116) Minimum Navigation Vertical Clearance	ft

H - Main Span	
(43A) Main Span Material	1 Concrete
(43B) Main Span Design Type	04 Tee Beam
(45) Number Of Spans In Main Unit	3

I - Approach Span	
(44A) Approach Span Material	0 Not Applicable
(44B) Approach Span Design Type	00 Not Applicable
(46) Number Of Approach Spans	0

J - Deck Data	
(50A) Left Curb|Sidewalk Width	0 ft
(50B) Right Curb|Sidewalk Width	0 ft
(52) Out-to-Out Deck Width	33.3 ft
(MDT006) Deck Area	2330 Area
(107) Deck Structure Type	1 Concrete Cast-in-Place
(108A) Type of Wearing Surface	6 Bituminous
(108B) Type of Membrane	0 None

(108C) Deck Protection	0 None
(MDT104) Bridge Deck Seal	
(MDT105) Polymer Overlay	
(MDT106) Mill and Overlay	
(MDT107) New Bridge Deck	
(MDT108) Experimental Deck	

K - Under Bridge Service	
(42B) Type of Service under	5 Waterway
(54A) Minimum Vertical Underclearance-Reference Feature	N Feature not a highway or railroad
(54B) Minimum Vertical Underclearance	0 ft
(55A) Min Lateral Underclear On Right-Reference Feature	N Feature not a highway or railroad
(55B) Minimum Lateral Underclearance on Right	0 ft
(56) Min Lateral Underclear On Left	0 ft
(111) Pier|abutment Protection	
(113) Scour Critical Status	5 Bridge foundations determined to be stable for calculated scour conditions.
(69) Underclear, Vertical and Horizontal	N Not applicable

L - Load and Rating Data	
(MDT016) Load Rating Date	
(MDT022) Name of Load Rater	-1
(31) Design load - Live load for which the structure was designed	2 M 13.5 (H 15)
(66) Inventory Rating	22.9 ton
(65) Method Used To Determine Inventory Rating	2 Allowable Stress (AS) reported in tons
(64) Operating Rating	57 ton
(63) Method Used to Determine Operating Rating	2 Allowable Stress (AS) reported in tons
(70) Legal Load Status	5 Equal to or above legal loads
(MDT110) Bridge being Rated by Consultant	Removed from Contract - Internal Follow-up Needed
(MDT112) Completed Rating Model?	
(MDT065) Type 3 Truck Inventory Rating	ton
(MDT071) Type 3S2 Truck Inventory Rating	ton
(MDT068) Type 3-3 Truck Inventory Rating	ton
(MDT036) SU4 Truck Inventory Rating	ton
(MDT039) SU5 Truck Inventory Rating	ton
(MDT045) SU7 Truck Inventory Rating	ton

(MDT042) SU6 Truck Inventory Rating	ton
(MDT091) EV2 Truck Inventory Rating	ton
(MDT092) EV3 Truck Inventory Rating	ton
(MDT066) Type 3 Truck Operating Rating	ton
(MDT072) Type 3S2 Truck Operating Rating	ton
(MDT069) Type 3-3 Truck Operating Rating	99 ton
(MDT037) SU4 Truck Operating Rating	ton
(MDT040) SU5 Truck Operating Rating	ton
(MDT043) SU6 Truck Operating Rating	ton
(MDT046) SU7 Truck Operating Rating	ton
(MDT093) EV2 Truck Operating Rating	ton
(MDT094) EV3 Truck Operating Rating	ton
(MDT079) Truck Type 3 LRFR Rating	ton
(MDT081) Truck Type 3S2 LRFR Rating	ton
(MDT080) Truck Type 3-3 LRFR Rating	ton
(MDT082) Truck Type SU4 LRFR Rating	ton
(MDT083) Truck Type SU5 LRFR Rating	ton
(MDT084) Truck Type SU6 LRFR Rating	ton
(MDT085) Truck Type SU7 LRFR Rating	ton
(MDT095) Truck Type EV2 LRFR Rating	ton
(MDT096) Truck Type EV3 LRFR Rating	ton
(MDT124) Truck Type 3 Safe Posting Load (tons)	
(MDT125) Truck Type 3S2 Safe Posting Load (tons)	
(MDT126) Truck Type 3-3 Safe Posting Load	
(MDT127) SU4 Safe Posting Load	
(MDT128) SU5 Safe Posting Load	
(MDT129) SU6 Safe Posting Load	
(MDT130) SU7 Safe Posting Load	
(MDT133) Bridge Within Reasonable Access of Interstate	
(MDT131) EV2 Safe Posting Load (ton)	
(MDT132) EV3 Safe Posting Load	

M - General Facility Data	
(5A) Inventory Route-Record Type	1 Route carried \`on\` the structure
(5C) Designated Level of Service	1 Mainline

STRUCTURE INSPECTION REPORT

Structure # 05909

SPANISH CREEK - 7M S GALLATIN GATEWAY

(5B) Route Signing Prefix	2 U.S. numbered highway
(5D) Route Number	00191
(5E) Directional Suffix	2 East
(12) Base Highway Network	1 On Base Network
(13A) LRS Number	C000050N
(13B) Inventory Route, Subroute Number-Subroute Number	00
(19) Bypass|Detour Length	124 mi
(MDT009) Detour Speed	-1 mi/hr
(104) NHS Indicator	1 On the NHS
(MDT030) Posted speed limit (MPH)	70 mi/hr
(MDT035) Road Name	
(11) Accumulated Miles	68.45 mi
(MDT087) Decimal Mile Post	68.21
(MDT113) Mile Post	68+0.210 mi
(MDT075) Roadway System	
General Roadway Notes	

N - Base Network Data	
(28B) Lanes Under the Structure	0
(32) Approach Roadway Width	28 ft
(51) Bridge Roadway Width Curb-To-Curb	28 ft
(72) Approach Roadway Alignment	8 Equal Desirable Crit
(28A) Lanes on the Structure	2

O - Other NetWork Data	
(20) Toll	3 On Free Road
(100) STRAHNET Highway Designation	0 Not a STRAHNET route
(105) Federal Lands Highways	2 Forest Highway (FH)
(110) National Truck Network	1 Part of National Truck Network
(MDT048) School Bus Route	0 Not on School Bus Route

P - Roadway Size and Clearance Data	
(10) Minimum Vertical Clearance	99.99 ft
(47) Total Horizontal Clearance	28.2 ft
(102) Direction of Traffic	2 2-way traffic
(MDT007) Departmental Route	P00050
(MDT002) Both|South|West Direction	0 Both Directions

STRUCTURE INSPECTION REPORT

Structure # 05909

SPANISH CREEK - 7M S GALLATIN GATEWAY

(MDT003) Both|South|West Vertical Distance	99.990 ft
(MDT051) South|West Horizontal Distance	28.199
(MDT024) North|East Direction	
(MDT026) North|East Vertical Distance	ft
(MDT025) North|East Horizontal Distance	ft

Q - Traffic Data	
(26) Functional Classification	02 Rural, Principal Arterial - Other
(MDT060) Traffic Volume Class	05
(29) Average Daily Traffic	6760
(30) Year of Average Daily Traffic	2018
(109) Average Daily Truck Traffic (%)	6
(114) Future Average Daily Traffic	7943
(115) Year Of Future Avg Daily Traffic	2038

General Bridge Notes

Inspection Information

Responsible Person	Name	Signature
Inspector	John Jackson	
QC	Jason Johnson	

User	Begin	End	Comments
John Jackson	07-31-2019 11:30 am	07-31-2019 01:30 pm	On-site. Assisted by Tim Welter

Day	Weather	Temperature	Comments
07-31-2019 11:30 - 01:30	Sunny	75	

R- Inspection	Current Value	Previous Value
(36A) Traffic Safety Features - Bridge Railings	0	1
(36B) Traffic Safety Features - Transitions	1	1
(36C) Traffic Safety Features - Approach guardrail	N	1
(36D) Traffic Safety Features - Approach guardrail Ends	1	1
(41) Structure Open, Posted, or Closed to Traffic	A	A
(58) Deck Rating	5	6
(59) Superstructure	5	6
(60) Substructure	5	5
(MDT061) Type 1 Underwater Inspection Required	Y	
(61) Channel	6	6
(62) Culvert	N	N
(67) Structural Evaluation	5	5
(68) Deck Geometry	2	2
(69) Underclear, Vertical and Horizontal	N	N
(71) Waterway Adequacy	8	6
(MDT076) Deck Condition	2	
(MDT077) Structure Condition	2	
(MDT090) Climbing Inspection Required	N	
(92C-1b) Special Inspection Required	N	
(MDT118) Type 2 Underwater Consultant		
(MDT121) Functional Needs		
(MDT134) UBIV Frequency (months)		

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Inspection Hours and Dates	Current Value	Previous Values
(MDT005) Date Last QA	2000-01-01	
(MDT010) FC Inspection Details	None	
FC Next Inspection Date		
(MDT023) Next Inspection Date	2021-07-29	2019-7-29
(MDT028) Other Inspection Details	none	
Other Inspection Next Date		
(MDT034) Request Review of Load rating	0	
(MDT050) UBIV Required	N	
Special Inspection Next Date		
(MDT058) FHWA Bridge Condition	2	2
(MDT061) Type 1 Underwater Inspection Required	Y	
(MDT062) Type 1 Underwater Inspection Date	2019-7-31	
(MDT063) Type 1 Underwater Inspection Frequency (months)	48	
(MDT064) Type 1 Underwater Inspection Next Date		
(MDT074) Underwater Inspection Details	1	N
Type 2 Underwater Next Inspection Date		
(90) Inspection Date	2019-07-31	2019-01-29
(91) Regular Inspection Frequency (Months)	24	24.00
(92A-1) FC Inspection Required	N	N
FC Inspection Frequency (Months)		
(92B-1) Type 2 Underwater Inspection Required	N	N
Type 2 Underwater Inspection Frequency (Months)		
(92C-1a) Other Inspection Required	N	N
(92C-1b) Special Inspection Required	N	
Other Inspection Frequency (Months)		
Special Inspection Frequency (months)		
FC Inspection Date		
Special Inspection Date		

General Inspection Notes
Main channel flow is across the face of Pier 2 with fast flowing water up to 3 ft deep.Woody debris lodges against Pier 2 deflects more flow across the face of the columnsA Type 1 UW was performed.

Repair Suggestions:					
Repair ID	**Date Requested**	**Type**	**Status**	**Priority**	**Comments**
#Error	07-31-2019	Repair suggestion	Open	Low	Woody debris lodged against Pier 2 should be removed

General Bridge Photos	
Photo #: Superstructure - Span 2 -Pier 2 Location: , Comments:	

Photo #: Approach looking South Location: , Comments:	
Photo #: View Upstream looking West Location: , Comments:	

Photo #: Profile looking East Location: , Comments:

Photo #: View Downstream looking East Location: , Comments:

Element Inspection Data

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
16		Reinforced Concrete Top Flange (SF)	Area	2336	78.7	12.0	9.3	0.0
16		1190 - Abrasion/Wear (PSC|RC)	Area	2336	0.0	0.9	0.0	0.0

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
16		1130 - Cracking (RC and Other)	Area	2336	0.0	11.1	0.0	0.0
16		1120 - Efflorescence/Rust Staining	Area	2336	0.0	11.1	6.3	0.0
16		1090 - Exposed Rebar	Area	2336	0.0	0.0	0.9	0.0
16		1080 - Delamination/Spall/Patched Area	Area	2336	0.0	0.0	3.0	0.0

Previous Inspection Notes:

50 ft of CS3 spalls along LT edge of deck.
10 ft of CS3 delamination along LT deck edge Condition State 3 : 2.57
Ten ft of CS2 delaminations along LT deck edge Condition State 2 : .43
Scaling from moiture damge along RT overhang soffit - Approx 20 sqft Condition State 2 : .86
Heavy efflorescence build up with areas of rust staining and stalactites up to 4 inches long in soffit of LT deck overhang region in all spans. Approx 140 sqft
Span 2 Bay 1 - approx 5 sqft of CS3 efflorescence in transverse cracks
Span 3 RT overhang - 2 ft crack with CS3 efflorescence Condition State 3 : 6.29
Efflorescence in Span 2 Bay 1 and Bay 4 cracks. Photos in 1130 Condition State 2 : 7.28
Approx 20 ft of exposed corroded rebar in LT deck edge spalls Condition State 3 : .86
Approx 160 sqft of map cracking with CS2 effloresccence in Span 2 Bay 1 soffit
10 ft of transverse cracks with CS2 efflorescence in Span 2 Bay 4 soffit Condition State 2 : 7.28

Current Inspection Notes:

CS2 efflorescence in soffit cracks: Span 1 bay 1, Span 2 Bays 1, 2 and 4 Photos in 1130
Scaling from moiture damage along RT overhang soffit - Approx 20 sqft
50 ft of CS3 spalls along LT edge of deck.
20 ft of CS3 delamination along LT deck edge
10" x 8" x 2.5"deep spall in LT deck overhang neat Abut 1
Heavy efflorescence build up with areas of rust staining and stalactites up to 4 inches long in soffit of LT deck overhang region in all spans. Approx 140 sqft
Span 2 Bay 1 - approx 5 sqft of CS3 efflorescence in transverse cracks
Span 3 RT overhang - 2 ft crack with CS3 efflorescence
Hairline map cracking throughout most of soffit
Approx 160 sqft of map cracking with CS2 effloresccence in Span 2 Bay 1 soffit
Approx 75 sqft of map cracking and CS2 efflorescence in Span 1 Bay 1 soffit
Approx 15 sqft of map cracking and CS2 efflorrescence in Span 2 Bay2
10 ft of transverse cracks with CS2 efflorescence in Span 2 Bay 4 soffit
Approx 20 ft of exposed corroded rebar in LT deck edge spalls

STRUCTURE INSPECTION REPORT

Structure # 05909
7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Span 2 Bay 1 soffit efflorescence

Location:

Comments:

Element:16 - Reinforced Concrete Top Flange (SF)

Photo #:CS3 efflorescence and rust staining

Location:

Comments:

Element:16 - Reinforced Concrete Top Flange (SF)

Photo #:LT deck edge CS3 spalling and delamination

Location:

Comments:

Element:16 - Reinforced Concrete Top Flange (SF)

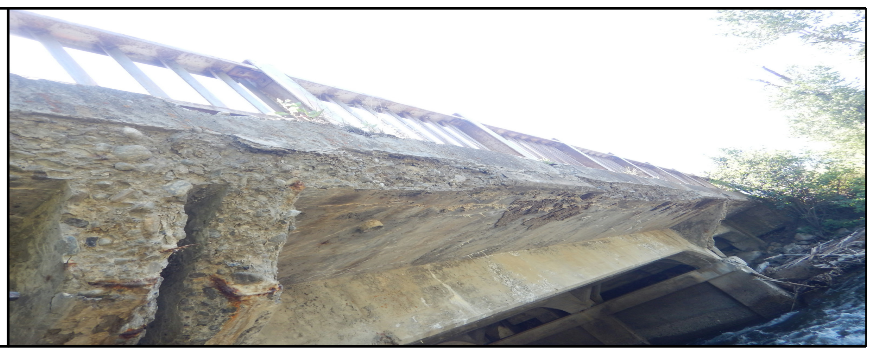


Photo #:Exposed rebar LT deck edge

Location:

Comments:

Element:16 - Reinforced Concrete Top Flange (SF)

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:CS3 spall in LT deck overhang region Location: Comments: Element:16 - Reinforced Concrete Top Flange (SF)	

Photo #:LT deck edge CS3 spalling and delamination Location: Comments: Element:16 - Reinforced Concrete Top Flange (SF)	

Photo #:LT deck edge CS3 spalling Location: Comments: Element:16 - Reinforced Concrete Top Flange (SF)	

Photo #:CS3 efflorescence - LT deck edge Location: Comments: Element:16 - Reinforced Concrete Top Flange (SF)	

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:CS3 efflorescence and rust staining

Location:

Comments:

Element:16 - Reinforced Concrete Top Flange (SF)

Photo #:CS3 efflorescence in RT OH

Location:

Comments:

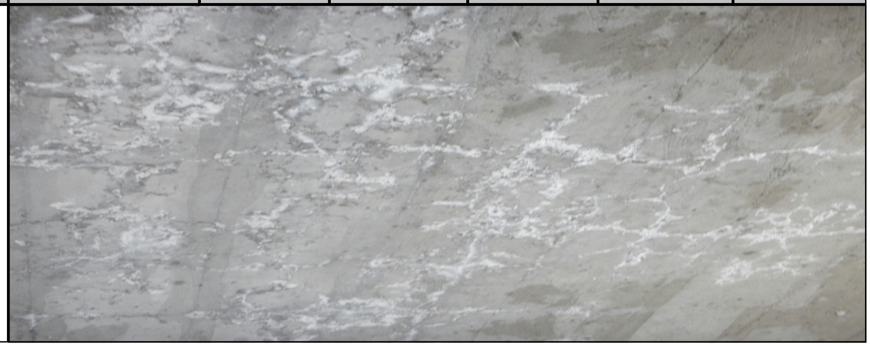
Element:16 - Reinforced Concrete Top Flange (SF)

Photo #:Efflorescence stalactites

Location:

Comments:

Element:16 - Reinforced Concrete Top Flange (SF)

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
Photo #:Soffit efflorescence and map cracking Location: Comments: Element:16 - Reinforced Concrete Top Flange (SF)								

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
110		Reinforced Concrete Open Girder|Beam (LF)	Length	348	70.0	27.6	2.4	0.0
110		1190 - Abrasion/Wear (PSC|RC)	Length	348	0.0	2.3	0.0	0.0
110		1130 - Cracking (RC and Other)	Length	348	20.0	21.0	0.0	0.0
110		1120 - Efflorescence/Rust Staining	Length	348	0.0	23.0	1.1	0.0
110		1090 - Exposed Rebar	Length	348	0.0	0.0	0.6	0.0
110		1080 - Delamination/Spall/Patched Area	Length	348	0.0	0.6	3.6	0.0

Previous Inspection Notes:

CS3 efflorescence in G1 Span 2 vertical cracks Condition State 3 : 1.15
Two ft of delamination adjacent to G4 Span 2 spall
Delamination associated with exposed rebar on G4 exterior face Condition State 2 : .6
Three ft of scaling on exterior face of G5 Span 2 Condition State 2 : .9
Random hairline vertical and map cracking in all girders Condition State 1 : 20
G1 Span 2 has 4 vertical cracks with heavy efflorescence.
G1 has CS2 map cracking through most of length, approx 60 ft
G2 Span 2 has a sheer type diagonal crack 3 ft from the Pier 3 end.
G2 Span 3 has a 1 ft crack in the haunch area at Pier 3 end.
G3 Span 2 has 2 vertical cracks on LT side approx 2 and 6 ft from Pier 3 end and a diagonal sheer type crack on th RT side approx 3 ft from P3 end
CS2 pattern cracking in haunch area of Pier 3 ends of G2 and G3, 2 ft each Condition State 2 : 21
G1 Span 2 - 6" x 6" x 1.5" deep spall
G5 Span 2 - 12" x 3" x 1" deep spall with exposed corroded rebar on lower edge approx 4.5 ft from Pier 3 end Condition State 3 : .6
G1 Span 1 - 2 ft of CS3 cracking in haunch area over Pier 2 Condition State 3 : .6
Exposed corroded rebar in G5 spall.
Exposed rebar in delamiation on G5 exterior face Condition State 3 : .3
Efflorescence full length of G1 in all spans, most prevalent on interior face.
Areas of efflorescence on lower surface of G5 Span 2 Condition State 2 : 23

Current Inspection Notes:

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

G1 Span 2 - 6" x 6" x 1.5" deep spall
G4 Span 2 - 12" x 6" x 3" deep spall on top edge, probably associated with bridge widening in 1955
G5 Span 2 - 24" x 3" x 1" deep spall with exposed corroded rebar on lower edge approx 4.5 ft from Pier 3 end
Seven ft of CS3 delamination adjacent to G5 spall
G1 Span 1 - 2 ft of wide craking and delamination in haunch area over Pier 2
Exposed corroded rebar in G5 spall.
Exposed rebar in delamiation on G5 exterior face.
See photos in CS3 spall defect
Delamination associated with exposed rebar on G5 exterior face
Vertical CS2 cracking:
Span 1: G2 - 3, G3 - 4, G4 - 3, G5 - 3
Span 2: G1 - 5, G2 - 4, G3 - 4, G5 - 4
Span 3: G1 - 3, G2 - 3, G4 - 3, G5 - 4
G1 Span 2 has 4 vertical cracks with heavy efflorescence.
G1 has CS2 map cracking through most of length, approx 60 ft
G2 Span 2 has a sheer type diagonal crack 3 ft from the Pier 3 end.
G2 Span 3 has a 1 ft crack in the haunch area at Pier 3 end.
G3 Span 2 has a shear type crack on th3 RT side approx 3 ft from P3 end
CS2 pattern cracking in haunch area of Pier 3 ends of G2 and G3, 2 ft each
Random hairline vertical and map cracking in all girders
CS3 efflorescence in G1 Span 2 vertical cracks
Efflorescence full length of G1 in all spans, most prevalent on interior face.
Areas of efflorescence on lower surface of G5 Span 2
Scaling on G5 exterior girder faces over piers - approx 8 ft

Photo #:G1 Span 2 spall

Location:

Comments:

Element:110 - Reinforced Concrete Open Girder|Beam (LF)

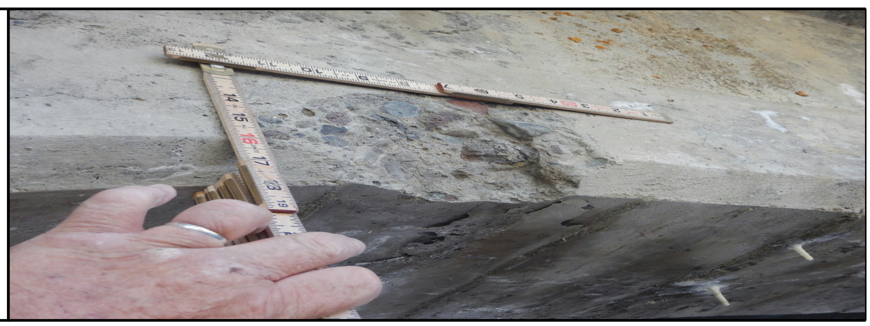


Photo #:CS3 efflorescence in G1 Span 2 cracks

Location:

Comments:

Element:110 - Reinforced Concrete Open Girder|Beam (LF)

Generated by: MDT on 8/7/2019

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Typical G1 Efflorescence

Location:

Comments:

Element:110 - Reinforced Concrete Open Girder|Beam (LF)

Photo #:CS3 efflorescence in G1 Span 2 cracks

Location:

Comments:

Element:110 - Reinforced Concrete Open Girder|Beam (LF)

Photo #:DSCN4228

Location:

Comments:

Element:110 - Reinforced Concrete Open Girder|Beam (LF)

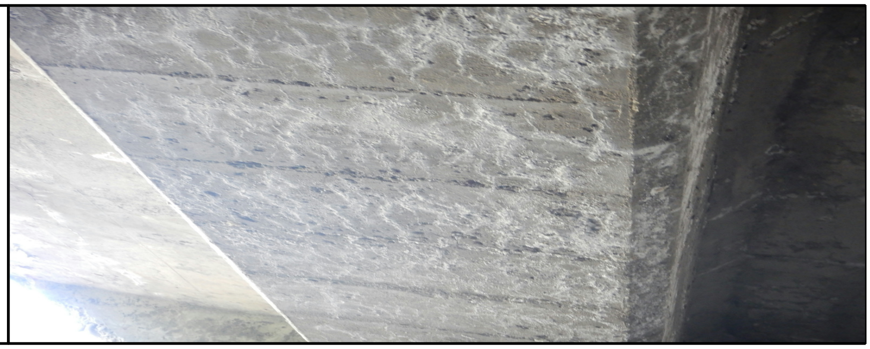
Photo #:G5 Span 2 CS3 spall and exposed rebar

Location:

Comments:

Element:110 - Reinforced Concrete Open Girder|Beam (LF)

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Efflorescence in cracks on lower edge od G1 Location: Comments: Element:110 - Reinforced Concrete Open Girder|Beam (LF)	
Photo #:G5 Span 2 CS3 spall and exposed rebar Location: Comments: Element:110 - Reinforced Concrete Open Girder|Beam (LF)	
Photo #:Deep delamination adjacent to G5 Span 2 spall Location: Comments: Element:110 - Reinforced Concrete Open Girder|Beam (LF)	

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
205		Reinforced Concrete Column (EA)	Each	16	43.7	37.5	18.8	0.0
205		1190 - Abrasion/Wear (PSC|RC)	Each	16	0.0	56.3	0.0	0.0
205		1120 - Efflorescence/Rust Staining	Each	16	0.0	25.0	12.5	0.0
205		1090 - Exposed Rebar	Each	16	0.0	0.0	12.5	0.0
205		1080 - Delamination/Spall/Patched Area	Each	16	0.0	56.3	18.8	0.0

Previous Inspection Notes:

CS2 abrasion/scaling on Abut 1 column 3 and Pier 3 RT column.
Both have small areas of exposed reinforcing due to insufficient concrete cover Condition State 2 : 12.5
Exposed corroded rebar in Pier 2 RT and Pier 3 LT column spalls. See spall photos Condition State 3 : 12.5
CS3 spalls and adjacent delamination on Pier 2 LT and RT and Pier 3 LT columns Condition State 3 : 18.75

Current Inspection Notes:

CS2 efflorescence on Pier 2 and 3 exterior columns
Heavy CS3 efflorescence on Pier 2 and 3 LT exterior columns
CS3 spalls and adjacent delamination on Pier 2 LT and RT and Pier 3 LT exterior columns
CS3 delamination on edge of Pier 2 RT exterior
Small areas of exposed reinforcing due to insufficient concrete cover
CS2 abrasion/scaling on Abut 1 column 3 and all Pier 2 and Pier 3 columns.
Exposed corroded rebar in Pier 2 RT and Pier 3 LT column spalls. See spall photos

Photo #:Pier 2 RT Column spalls with exposed rebar

Location:

Comments:

Element:205 - Reinforced Concrete Column (EA)

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:CS3 efflorescence Pier 3 LT column

Location:

Comments:

Element:205 - Reinforced Concrete Column (EA)

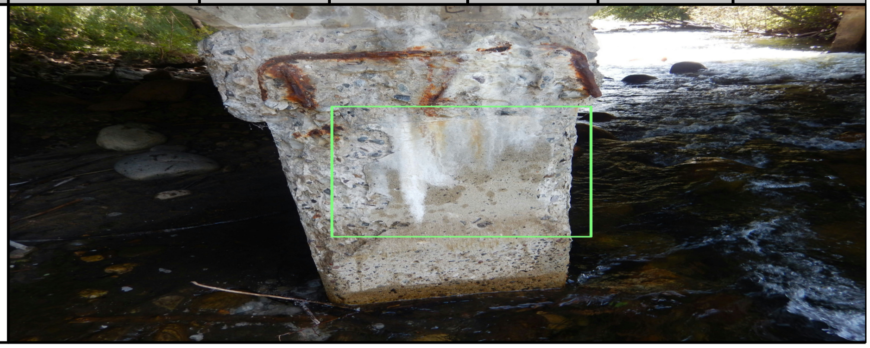


Photo #:CS3 delamination o Pier 3 RT exterior

Location:

Comments:

Element:205 - Reinforced Concrete Column (EA)

Photo #:Pier 2 LT Column spalls with exposed rebar

Location:

Comments: Mostly obscured by woody debris

Element:205 - Reinforced Concrete Column (EA)

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:CS3 efflorescence Pier 2 LT column

Location:

Comments:

Element:205 - Reinforced Concrete Column (EA)

Photo #:Pier 3 LT Column and cap spalls with exposed rebar

Location:

Comments:

Element:205 - Reinforced Concrete Column (EA)

Photo #:Pier 3 LT Column and cap spalls with exposed rebar

Location:

Comments:

Element:205 - Reinforced Concrete Column (EA)

Photo #:Pier 2 RT Column spalls with exposed rebar

Location:

Comments:

Element:205 - Reinforced Concrete Column (EA)

Generated by: MDT on 8/7/2019

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
215		Reinforced Concrete Abutment (LF)	Length	72	88.9	1.3	9.8	0.0
215		1130 - Cracking (RC and Other)	Length	72	0.0	6.9	0.0	0.0
215		1120 - Efflorescence/Rust Staining	Length	72	0.0	0.0	6.9	0.0
215		1080 - Delamination/Spall/Patched Area	Length	72	0.0	0.0	4.2	0.0

Previous Inspection Notes:

CS3 spalls on corners aof Abut 1 and Abut 4 LT wingwalls Condition State 3 : 4.2
Random hairline cracking in backwall Condition State 1 : 88.9
Five ft of pattern cracking Abut 1 LT Condition State 2 : 6.9
Efflorescence and some rust staining in Abut 1 LT cracking Condition State 3 : 5.6

Current Inspection Notes:

CS3 spalls on corners of Abut 1 and Abut 4 LT wingwalls
Five ft of pattern cracking Abut 1 LT
Efflorescence and some rust staining in Abut 1 LT cracking.
Heavy efflorescence deposits along lower edge
Random hairline cracking in backwall

Photo #:Abut 1 LT wingwall spall

Location:

Comments:

Element:215 - Reinforced Concrete Abutment (LF)

Photo #:CS3 efflorescence and rust staining on Abut 1 LT wingwall

Location:

Comments:

Element:215 - Reinforced Concrete Abutment (LF)

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Abut 4 LT wingwall spall Location: Comments: Element:215 - Reinforced Concrete Abutment (LF)	

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
234		Reinforced Concrete Cap (LF)	Length	56	71.4	14.3	14.3	0.0
234		1190 - Abrasion/Wear (PSC|RC)	Length	56	0.0	8.9	0.0	0.0
234		1130 - Cracking (RC and Other)	Length	56	0.0	8.9	0.0	0.0
234		1120 - Efflorescence/Rust Staining	Length	56	0.0	0.0	7.1	0.0
234		1080 - Delamination/Spall/Patched Area	Length	56	0.0	0.0	14.3	0.0

Previous Inspection Notes:

Pier 2 cap: 2 ft CS3 spall in LT end, 10" spall under G2, 16" spall under G3, 10" and 12" spalls near RT end
Pier 3 cap: 2 ft CS3 spall with exposed corroded rebar on LT end Condition State 3 : 12.5
Scaling from moisture damage on RT end of Pier 2 cap.
Four ft of scaling/abrasion on Pier 2 cap opposite CS3 spalling near RT end Condition State 2 : 8.9
Random cracks across top surface of both caps Condition State 2 : 8.9

Current Inspection Notes:

Random cracks across top surface of both caps
CS3 efflorescence associated withPpier 2 and 3 LT cap end spalls.
See in spall photos
Pier 2 cap: 2 ft CS3 spall in LT end, 10" spall under G2, 16" spall under G3, 10" and 12" spalls on Far Face between G3 and G4
Pier 3 cap: 2 ft CS3 spall with exposed corroded rebar on LT end
Scaling from moisture damage on RT end of Pier 2 cap.
Four ft of scaling/abrasion on Pier 2 cap Near Face opposite CS3 spalling near RT end

Photo #:Pier 2 Spalls between G3 and G4

Location:

Comments:

Element:234 - Reinforced Concrete Cap (LF)

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Pier 2 - Spall under G2

Location:

Comments:

Element:234 - Reinforced Concrete Cap (LF)

Photo #:Pier 2 - Spall unger G3

Location:

Comments:

Element:234 - Reinforced Concrete Cap (LF)

Photo #:CS3 spall with exposed rebar Pier 3 LT cap end

Location:

Comments:

Element:234 - Reinforced Concrete Cap (LF)

Photo #:CS3 spall Pier 2 LT cap end

Location:

Comments:

Element:234 - Reinforced Concrete Cap (LF)

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
331		Reinforced Concrete Bridge Rail (LF)	Length	141	92.9	7.1	0.0	0.0
331		1130 - Cracking (RC and Other)	Length	141	0.0	7.1	0.0	0.0

Previous Inspection Notes:
Ten vertical CS2 cracks Condition State 2 : 7.1
Current Inspection Notes:
Ten vertical CS2 cracks

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
510	16	Wearing Surfaces (SF)	Area	1960	97.1	0.0	2.9	0.0
510	16	3220 - Crack (Wearing Surface)	Area	1960	0.0	0.0	2.9	0.0

Previous Inspection Notes:

Some minor wear Condition State 1 : 97.14
Wide cracks in AC surfacing over both piers Condition State 3 : 2.86

Current Inspection Notes:

Some minor wear
Wide cracks in AC surfacing over both piers

Photo #:Wide crack in wearing surface

Location:

Comments:

Element:510 - Wearing Surfaces (SF)

Photo #:Wearing Surface crack over pier

Location:

Comments:

Element:510 - Wearing Surfaces (SF)

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
950		Steel Approach Guardrail	Length	100	100.0	0.0	0.0	0.0

Previous Inspection Notes:
No apparent defects Condition State 1 : 100
Current Inspection Notes:
No apparent defects

STRUCTURE INSPECTION REPORT

Structure # 05909

7M S GALLATIN GATEWAY - SPANISH CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
960		Steel Approach Guardrail Ends	Each	4	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
No apparent defects Condition State 1 : 100								
Current Inspection Notes:								
No apparent defects								

General Inspection Notes	
Previous Inspection Notes	
Current Inspection Notes	

STRUCTURE INSPECTION REPORT

Structure # 05910

GALLATIN RIVER - 5M S GALLATIN GATEWAY

Bridge Inventory Information

Bridge Inspection Date: 04/17/2019

General Location Data	
(22) Owner	01 State Highway Agency
(6A) Feature Intersected	GALLATIN RIVER
(8) NBI Structure Number	P00050070+04611
(9) Location	5M S GALLATIN GATEWAY
(MDT058) Structurally Deficient|Functionally Obsolete	0 Not Deficient
(MDT076) Deck Condition	Fair-1
(MDT077) Structure Condition	Good
(SR) Sufficiency Rating	63.0

A- Location Data	
(MDT001) Agency structure name	none
(1) State Code	308
(MDT027) On|Off System	1 On System
(2) MDT Inspection District	02 BUTTE
(MDT115) MDT Administrative District	2 Butte
(MDT116) MDT Financial District	2 Butte
(MDT020) MDT Maintenance Division	22 BOZEMAN
(MDT078) MDT Maintenance Section	22-06 Big Sky
(3) County Code	031 GALLATIN
(MDT117) Border Bridge - Neighboring County Code	000 NONE
(4) Place Code	00000 Rural Area
(7) Facility Carried by Structure	US 191 FH 42
(21) Maintenance Responsibility	01 State Highway Agency
(MDT031) Railroad Over/Underpass	0 Not Applicable
(MDT032) Railroad Owner	NA Not Applicable
(MDT014) Interchange Indicator	0 Not an Interchange
(MDT015) Interstate Ramp Indicator	0 Not a Ramp
(MDT114) MPO	not in MPO boundary
(112) Nbis Bridge Length	Y Long Enough
(MDT120) Environment	

STRUCTURE INSPECTION REPORT

Bridge within a Reservation Boundary	

B- Construction Data	
(27) Year Built	1958
(106) Year Reconstructed	
(MDT102) Years Rehabilitated	
(MDT019) MDT Original Drawing Number	3867
(MDT103) MDT Rehab Drawing Numbers	
(MDT097) Plans in SMS?	
(MDT098) Shop Drawings in SMS	
(MDT017) MDT Original Construction Project Number	F 76(4)
(MDT099) MDT Rehab Project Numbers	
(MDT018) MDT Original Construction Station	13+92
(MDT100) MDT Rehab Stations	
(MDT021) MDT UPN	
(MDT101) MDT Rehab UPNs	
(MDT119) Date Bridge Opened|Re-Opened to Traffic	

C- Improvement Cost Data	
(75A) Type of Work Proposed	
(75B) Work to be Completed by	
(76) Length Of Structure Improvement	ft
(94) Bridge Improvement Cost	
(95) Roadway Improvement Cost	
(96) Total Project Cost	
(97) Year Of Improvement Cost Estimate	

D- Border State Data	
(98A-1) Border Bridge-Neighboring State Code	
(98A-2) Border Bridge - Neighboring FHWA Region Code	
(98B) Border Bridge-Percent Responsibility	
(99) Border Bridge Structure Number	

E- Historical Structure Data	
(37) Historical Significance	5 5 Not eligible for NRHP

STRUCTURE INSPECTION REPORT

Structure # 05910

GALLATIN RIVER - 5M S GALLATIN GATEWAY

F - Bridge Location	
(16) Latitude (DMS)	453119.21
(17) Longitude (DMS)	1111501.21

G - Span and Dimensional Data	
(33) Bridge Median	0 0 No median
(34) Skew (degrees)	40
(35) Structure Flared	0 0 No flare
(42A) Type of Service on Bridge	1 Highway
(48) Length Of Maximum Span	100 ft
(49) Structure Length	265.9 ft
(53) Min Vert Clear Over Bridge Roadway	99.99 ft
(101) Parallel Structure Designation	N No parallel structure exists
(103) Temporary Structure Designation	
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(39) Navigation Vertical Clearance	000 ft
(40) Navigation Horizontal Clearance	0000 ft
(116) Minimum Navigation Vertical Clearance	ft

H - Main Span	
(43A) Main Span Material	4 Steel continuous
(43B) Main Span Design Type	02 Stringer|Multi-beam or Girder
(45) Number Of Spans In Main Unit	3

I - Approach Span	
(44A) Approach Span Material	0 Not Applicable
(44B) Approach Span Design Type	00 Not Applicable
(46) Number Of Approach Spans	0

J - Deck Data	
(50A) Left Curb|Sidewalk Width	0 ft
(50B) Right Curb|Sidewalk Width	0 ft
(52) Out-to-Out Deck Width	31.7 ft
(MDT006) Deck Area	8428 Area
(107) Deck Structure Type	1 Concrete Cast-in-Place
(108A) Type of Wearing Surface	0 None (no additional concrete thickness or wearing surface is included in the bridge deck)
(108B) Type of Membrane	0 None

(108C) Deck Protection	0 None
(MDT104) Bridge Deck Seal	
(MDT105) Polymer Overlay	
(MDT106) Mill and Overlay	
(MDT107) New Bridge Deck	
(MDT108) Experimental Deck	

K - Under Bridge Service	
(42B) Type of Service under	5 Waterway
(54A) Minimum Vertical Underclearance-Reference Feature	N Feature not a highway or railroad
(54B) Minimum Vertical Underclearance	0 ft
(55A) Min Lateral Underclear On Right-Reference Feature	N Feature not a highway or railroad
(55B) Minimum Lateral Underclearance on Right	0 ft
(56) Min Lateral Underclear On Left	0 ft
(111) Pier|abutment Protection	1 Navigation protection not required
(113) Scour Critical Status	5 Bridge foundations determined to be stable for calculated scour conditions.
(69) Underclear, Vertical and Horizontal	N Not applicable

L - Load and Rating Data	
(MDT016) Load Rating Date	
(MDT022) Name of Load Rater	-1
(31) Design load - Live load for which the structure was designed	5 MS 18 (HS 20)
(66) Inventory Rating	36.0 ton
(65) Method Used To Determine Inventory Rating	B Assigned rating based on Allowable Stress Design (ASD)
(64) Operating Rating	77.9 ton
(63) Method Used to Determine Operating Rating	B Assigned rating based on Allowable Stress Design (ASD)
(70) Legal Load Status	5 Equal to or above legal loads
(MDT110) Bridge being Rated by Consultant	Forsgren
(MDT112) Completed Rating Model?	
(MDT065) Type 3 Truck Inventory Rating	ton
(MDT071) Type 3S2 Truck Inventory Rating	ton
(MDT068) Type 3-3 Truck Inventory Rating	ton
(MDT036) SU4 Truck Inventory Rating	ton
(MDT039) SU5 Truck Inventory Rating	ton
(MDT045) SU7 Truck Inventory Rating	ton

(MDT042) SU6 Truck Inventory Rating	ton
(MDT091) EV2 Truck Inventory Rating	ton
(MDT092) EV3 Truck Inventory Rating	ton
(MDT066) Type 3 Truck Operating Rating	ton
(MDT072) Type 3S2 Truck Operating Rating	ton
(MDT069) Type 3-3 Truck Operating Rating	99 ton
(MDT037) SU4 Truck Operating Rating	ton
(MDT040) SU5 Truck Operating Rating	ton
(MDT043) SU6 Truck Operating Rating	ton
(MDT046) SU7 Truck Operating Rating	ton
(MDT093) EV2 Truck Operating Rating	ton
(MDT094) EV3 Truck Operating Rating	ton
(MDT079) Truck Type 3 LRFR Rating	ton
(MDT081) Truck Type 3S2 LRFR Rating	ton
(MDT080) Truck Type 3-3 LRFR Rating	ton
(MDT082) Truck Type SU4 LRFR Rating	ton
(MDT083) Truck Type SU5 LRFR Rating	ton
(MDT084) Truck Type SU6 LRFR Rating	ton
(MDT085) Truck Type SU7 LRFR Rating	ton
(MDT095) Truck Type EV2 LRFR Rating	ton
(MDT096) Truck Type EV3 LRFR Rating	ton
(MDT124) Truck Type 3 Safe Posting Load (tons)	
(MDT125) Truck Type 3S2 Safe Posting Load (tons)	
(MDT126) Truck Type 3-3 Safe Posting Load	
(MDT127) SU4 Safe Posting Load	
(MDT128) SU5 Safe Posting Load	
(MDT129) SU6 Safe Posting Load	
(MDT130) SU7 Safe Posting Load	
(MDT133) Bridge Within Reasonable Access of Interstate	
(MDT131) EV2 Safe Posting Load (ton)	
(MDT132) EV3 Safe Posting Load	

M - General Facility Data	
(5A) Inventory Route-Record Type	1 Route carried `on` the structure
(5C) Designated Level of Service	1 Mainline

STRUCTURE INSPECTION REPORT

Structure # 05910

GALLATIN RIVER - 5M S GALLATIN GATEWAY

(5B) Route Signing Prefix	2 U.S. numbered highway
(5D) Route Number	00191
(5E) Directional Suffix	2 East
(12) Base Highway Network	1 On Base Network
(13A) LRS Number	C000050N
(13B) Inventory Route, Subroute Number-Subroute Number	00
(19) Bypass|Detour Length	124 mi
(MDT009) Detour Speed	-1 mi/hr
(104) NHS Indicator	1 On the NHS
(MDT030) Posted speed limit (MPH)	70 mi/hr
(MDT035) Road Name	
(11) Accumulated Miles	70.707 mi
(MDT087) Decimal Mile Post	70.46
(MDT113) Mile Post	70+0.460 mi
(MDT075) Roadway System	
General Roadway Notes	

N - Base Network Data	
(28B) Lanes Under the Structure	0
(32) Approach Roadway Width	28 ft
(51) Bridge Roadway Width Curb-To-Curb	29.3 ft
(72) Approach Roadway Alignment	8 Equal Desirable Crit
(28A) Lanes on the Structure	2

O - Other NetWork Data	
(20) Toll	3 On Free Road
(100) STRAHNET Highway Designation	0 Not a STRAHNET route
(105) Federal Lands Highways	2 Forest Highway (FH)
(110) National Truck Network	1 Part of National Truck Network
(MDT048) School Bus Route	0 Not on School Bus Route

P - Roadway Size and Clearance Data	
(10) Minimum Vertical Clearance	99.99 ft
(47) Total Horizontal Clearance	29.3 ft
(102) Direction of Traffic	2 2-way traffic
(MDT007) Departmental Route	P00050
(MDT002) Both|South|West Direction	0 Both Directions

STRUCTURE INSPECTION REPORT

Structure # 05910

GALLATIN RIVER - 5M S GALLATIN GATEWAY

(MDT003) Both|South|West Vertical Distance	99.990 ft
(MDT051) South|West Horizontal Distance	29.298
(MDT024) North|East Direction	
(MDT026) North|East Vertical Distance	ft
(MDT025) North|East Horizontal Distance	ft

Q - Traffic Data	
(26) Functional Classification	02 Rural, Principal Arterial - Other
(MDT060) Traffic Volume Class	05
(29) Average Daily Traffic	7789
(30) Year of Average Daily Traffic	2017
(109) Average Daily Truck Traffic (%)	7
(114) Future Average Daily Traffic	9152
(115) Year Of Future Avg Daily Traffic	2037

General Bridge Notes
Profile East

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Inspection Information

Responsible Person	Name	Signature
Inspector	Jason Johnson	
QC	John Jackson	

User	Begin	End	Comments
Wayne Halvorsen	04-17-2019 12:00 pm	04-17-2019 02:00 pm	On-site. Inpector of steel and bearings with snooper truuck.
Jason Johnson	04-17-2019 12:00 pm	04-17-2019 02:00 pm	On-site. inspector of deck, rail and substructure components

Day	Weather	Temperature	Comments
04-17-2019 12:00 - 02:00	Cloudy	40	
04-17-2019 12:00 - 02:00	Cloudy	40	inspector of deck, rail and substructure components

R- Inspection	Current Value	Previous Value
(36A) Traffic Safety Features - Bridge Railings	N	1
(36B) Traffic Safety Features - Transitions	1	1
(36C) Traffic Safety Features - Approach guardrail	N	1
(36D) Traffic Safety Features - Approach guardrail Ends	1	1
(41) Structure Open, Posted, or Closed to Traffic	A	A
(58) Deck Rating	6	6
(59) Superstructure	6	6
(60) Substructure	7	7
(MDT061) Type 1 Underwater Inspection Required	N	
(61) Channel	8	8
(62) Culvert	N	N
(67) Structural Evaluation	6	6
(68) Deck Geometry	4	4
(69) Underclear, Vertical and Horizontal	N	N
(71) Waterway Adequacy	8	8
(MDT090) Climbing Inspection Required	N	
(92C-1b) Special Inspection Required	N	
(MDT118) Type 2 Underwater Consultant		
(MDT121) Functional Needs		

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Inspection Hours and Dates	Current Value	Previous Values
(MDT005) Date Last QA	2000-01-01	
(MDT010) FC Inspection Details	None	
FC Next Inspection Date		
(MDT023) Next Inspection Date	2021-04-17	2019-04-19
(MDT028) Other Inspection Details	none	
Other Inspection Next Date		
(MDT034) Request Review of Load rating	0	
(MDT050) Snooper Required	Y	
Special Inspection Next Date		
(MDT058) Structurally Deficient|Functionally Obsolete	0	0
(MDT061) Type 1 Underwater Inspection Required	N	
Type 1 Underwater Inspection Date		
Type 1 Underwater Inspection Frequency (months)		
(MDT064) Type 1 Underwater Inspection Next Date		
(MDT074) Underwater Inspection Details	N	
Type 2 Underwater Next Inspection Date		
(90) Inspection Date	2019-04-17	2017-04-25
(91) Regular Inspection Frequency (Months)	24	24.00
(92A-1) FC Inspection Required	N	N
FC Inspection Frequency (Months)		
(92B-1) Type 2 Underwater Inspection Required	N	N
Type 2 Underwater Inspection Frequency (Months)		
(92C-1a) Other Inspection Required	N	N
(92C-1b) Special Inspection Required	N	
Other Inspection Frequency (Months)		
Special Inspection Frequency (months)		
FC Inspection Date		
Special Inspection Date		

General Inspection Notes

Repair Suggestions:

Repair ID	Date Requested	Type	Status	Priority	Comments

General Bridge Photos	
Photo #:profile east Location: , Comments:	
Photo #:approach north Location: , Comments:	

Element Inspection Data

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
12		Reinforced Concrete Deck (SF)	Area	8428	0.0	79.5	20.5	0.0
12		1190 - Abrasion/Wear (PSC|RC)	Area	8428	0.0	60.0	0.0	0.0
12		1130 - Cracking (RC and Other)	Area	8428	0.0	40.0	20.0	0.0
12		1120 - Efflorescence/Rust Staining	Area	8428	0.0	20.0	0.0	0.0
12		1080 - Delamination/Spall/Patched Area	Area	8428	0.0	15.0	0.5	0.0

Previous Inspection Notes:

1680 ft of st3 full width cracks approx 1 every 4 ft see photo. Condition State 3 : 20
st3 deck edge spall ne corner see photo and st3 spall on west edge see photo and st3 spall on soffit mid span see photo Condition State 3 : .05
st2 efflorscence in st3 cracks transfering from deck cracks to soffit. Condition State 2 : 10
sound patched areas. Condition State 2 : 40
exposed rebar in st3 spalls with minor section loss see spall photos. Condition State 3 : .02
abrasion exposing coarse aggregate in wheel paths and other areas. Condition State 2 : 60

Current Inspection Notes:

st2 transverse cracking approximately 1 per 4ft or 3370ft
exposed rebar within soffit spall bay 3 span 3
st2 efflorescence transferring from st3 deck cracking to soffit
st3 transverse cracking approximately 1 per 8ft or 1686ft
abrasion exposing coarse aggregrate mostly along wheel paths
st3 spall bay 3 span 3 of soffit in addition to random spalling along deck surface-photos
approximately 1000 sq ft of sound patched areas with 300 sq ft of delamination

Photo #:st3 deck crack

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:soffit spall

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

Photo #:deck spall

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

Photo #:exposed rebar in soffit spall

Location:

Comments:

Element:12 - Reinforced Concrete Deck (SF)

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
107		Steel Girder| Beam (LF)	Length	1063	10.0	86.0	4.0	0.0
107		1020 - Connection	Length	1063	0.0	0.0	2.0	0.0
107		1000 - Corrosion	Length	1063	0.0	86.0	2.0	0.0

Previous Inspection Notes:

Both exterior girders with surface rust full length of flanges and at random locations on webs.
Interior giders with areas of surface rust on webs and flanges Condition State 2 : 84
Sp1G4 - 20 ft of corrosion scaling and pack rust mid-span
Surface corrosion and pack rust under open deck joints and adjacent to some deck cracks
 Condition State 3 : 6.1
Pack rust with some distortion between lower flange plates Condition State 3 : 2.8

Current Inspection Notes:

Pack rust with some distortion between lower flange plates. See photo
Sp1G4 - 20 ft of corrosion scaling and pack rust mid-span
Freckled rust. Corrosion has started full length along flanges on exterior girders.
Interior giders with areas of surface rust on webs and flanges

Photo #:CS3 CORROSION

Location:

Comments:

Element:107 - Steel Girder|Beam (LF)

Photo #:PACK RUST.

Location:

Comments:

Element:107 - Steel Girder|Beam (LF)

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
205		Reinforced Concrete Column (EA)	Each	4	0.0	100.0	0.0	0.0
205		1190 - Abrasion/Wear (PSC|RC)	Each	4	0.0	100.0	0.0	0.0

Previous Inspection Notes:

Abrasion along all four columns at waterline and aggregate remains secure. Condition State 2 : 100
insignificant hairline cracking throughout. Condition State 1 : 100

Current Inspection Notes:

st2 abrasion along waterline

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
215		Reinforced Concrete Abutment (LF)	Length	98	80.0	20.0	0.0	0.0
215		1190 - Abrasion/Wear (PSC|RC)	Length	98	0.0	20.0	0.0	0.0

Previous Inspection Notes:

10ft of abrasion along both abutments from joint leakage. Condition State 2 : 10
minor insignificant vertical cracking in random locations. Condition State 1 : 100

Current Inspection Notes:

10ft of abrasion per abutment from joint leakage
minor insignificant vertical cracking good condition

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
234		Reinforced Concrete Cap (LF)	Length	82	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
Minor scaling along top of cap from joint leakage over the years. Condition State 1 : 100								
Current Inspection Notes:								
minor insignificant scaling along top of cap from earlier joint leakage good condition								

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
304		Open Joint (LF)	Length	79	100.0	0.0	0.0	0.0

Previous Inspection Notes:

Good condition Condition State 1 : 100

Current Inspection Notes:

good condition of joints
4ft adjacent spall of bent 1 joint NB lane-photo

Photo #:adjacent joint spalling

Location:

Comments:

Element:304 - Open Joint (LF)

Generated by: MDT on 5/1/2019

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
305		Assembly Joint Without Seal (LF)	Length	39	0.0	90.0	10.0	0.0
305		2370 - Metal Deterioration or Damage	Length	39	0.0	100.0	0.0	0.0
305		2360 - Adjacent Deck or Header	Length	39	0.0	100.0	10.0	0.0
305		2350 - Debris Impaction	Length	39	0.0	100.0	0.0	0.0

Previous Inspection Notes:

Approx 10 ft of the joint in SB lane has broken loose from fasteners and in banging under traffic Condition State 3 : 25.6
Surface rust full length Condition State 2 :
Sound patched over approx half the joint length.
Two ft of small spalls and delaminations Condition State 2 : 50

Current Inspection Notes:

NB driving lane at Bent 1 making an banging sound heard from below but not loose when sounding on deck.
Reported loose in previous inspection found not to be loose.
freckled rust along both joints
4ft adjacent spall of bent 1 joint NB lane-photo
debris impaction full length although allowing free movement

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
311		Movable Bearing (roller, sliding, etc.) (EA)	Each	12	0.0	100.0	0.0	0.0
311		1000 - Corrosion	Each	12	0.0	100.0	0.0	0.0

Previous Inspection Notes:
Surface rust on all Condition State 2 : 100
Current Inspection Notes:
Freckled rust. Corrosion has started at each bearing.

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
313		Fixed Bearing (EA)	Each	4	0.0	100.0	0.0	0.0
313		1000 - Corrosion	Each	4	0.0	100.0	0.0	0.0

Previous Inspection Notes:

All with surface rust Condition State 2 : 100

Current Inspection Notes:

Freckled rust. Corrosion has started at each bearing.

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
331		Reinforced Concrete Bridge Rail (LF)	Length	531	88.8	11.0	0.2	0.0
331		1130 - Cracking (RC and Other)	Length	531	0.0	11.0	0.0	0.0
331		1080 - Delamination/Spall/Patched Area	Length	531	0.0	0.0	0.2	0.0

Previous Inspection Notes:

40 st2 vertical cracks. Condition State 2 : 7.5

Current Inspection Notes:

st 3 spall NE corner of concrete bridge rail bent 4 rt-photo
st2 vertical cracking along both East and West concrete rail

Photo #:bridge rail spall

Location:

Comments:

Element:331 - Reinforced Concrete Bridge Rail (LF)

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
515	107	Steel Protective Coating (SF)	Area	12750	80.0	15.0	5.0	0.0
515	313	3440 - Effectiveness (Steel Protective Coatings)	Area	4	0.0	0.0	85.0	15.0
515	311	3440 - Effectiveness (Steel Protective Coatings)	Area	12	0.0	0.0	85.0	15.0
515	107	3440 - Effectiveness (Steel Protective Coatings)	Area	12750	80.0	15.0	5.0	0.0
515	313	Steel Protective Coating (SF)	Area	4	0.0	0.0	85.0	15.0
515	311	Steel Protective Coating (SF)	Area	12	0.0	0.0	85.0	15.0

Previous Inspection Notes:

Paint deterioration with limited effectiveness Condition State 3 : 15
Remaining paint chalking and dulling Condition State 2 : 80
Paint is deteriorated but has remaining effectiveness Condition State 2 : 35
Paint is deteriorated but has remaining effectiveness Condition State 2 : 25
Paint failure Condition State 4 : 5
Paint failure Condition State 4 : 15
Paint deterioration with limited effectiveness Condition State 3 : 60
Paint deterioration with limited effectiveness Condition State 3 : 50

Current Inspection Notes:

Bare metal with surface corrosion.
Limited effectiveness with areas of freckled rust formed.
Someof the PC is substatially effective.
Some PC with limited effectiveness.

STRUCTURE INSPECTION REPORT

Structure # 05910

5M S GALLATIN GATEWAY - GALLATIN RIVER

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
950		Steel Approach Guardrail	Length	100	75.0	0.0	0.0	25.0
950		7000 - Damage	Length	100	0.0	0.0	0.0	25.0

Previous Inspection Notes:
No found defects. Condition State 1 : 100
Current Inspection Notes:
SW guardrail approach section damaged photo in 960>1000

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
960		Steel Approach Guardrail Ends	Each	4	50.0	0.0	0.0	50.0
960		7000 - Damage	Each	4	0.0	0.0	0.0	50.0

Previous Inspection Notes:

Good condition Condition State 1 : 100

Current Inspection Notes:

SB driving lane approach terminal end and NB driving lane departure terminal ends have been impacted and severly damaged-photos

Photo #:damaged guardrail end

Location:

Comments:

Element:960 - Steel Approach Guardrail Ends

Photo #:damaged guardrail end 2

Location:

Comments:

Element:960 - Steel Approach Guardrail Ends

General Inspection Notes	
Previous Inspection Notes	
Current Inspection Notes	

STRUCTURE INSPECTION REPORT

Structure # 05911

SOUTH COTTONWOOD CREEK - GALLATIN GATEWAY

Bridge Inventory Information

Bridge Inspection Date: 03/05/2019

General Location Data	
(22) Owner	01 State Highway Agency
(6A) Feature Intersected	SOUTH COTTONWOOD CREEK
(8) NBI Structure Number	P00050076+07121
(9) Location	GALLATIN GATEWAY
(MDT058) Structurally Deficient|Functionally Obsolete	0 Not Deficient
(MDT076) Deck Condition	Fair-1
(MDT077) Structure Condition	Good
(SR) Sufficiency Rating	77.0

A- Location Data	
(MDT001) Agency structure name	none
(1) State Code	308
(MDT027) On|Off System	1 On System
(2) MDT Inspection District	02 BUTTE
(MDT115) MDT Administrative District	2 Butte
(MDT116) MDT Financial District	2 Butte
(MDT020) MDT Maintenance Division	22 BOZEMAN
(MDT078) MDT Maintenance Section	22-06 Big Sky
(3) County Code	031 GALLATIN
(MDT117) Border Bridge - Neighboring County Code	000 NONE
(4) Place Code	00000 Rural Area
(7) Facility Carried by Structure	US 191
(21) Maintenance Responsibility	01 State Highway Agency
(MDT031) Railroad Over/Underpass	0 Not Applicable
(MDT032) Railroad Owner	NA Not Applicable
(MDT014) Interchange Indicator	0 Not an Interchange
(MDT015) Interstate Ramp Indicator	0 Not a Ramp
(MDT114) MPO	not in MPO boundary
(112) Nbis Bridge Length	N Too Short
(MDT120) Environment	

STRUCTURE INSPECTION REPORT

Structure # 05911

SOUTH COTTONWOOD CREEK - GALLATIN GATEWAY

B- Construction Data	
(27) Year Built	1964
(106) Year Reconstructed	
(MDT102) Years Rehabilitated	
(MDT019) MDT Original Drawing Number	4114
(MDT103) MDT Rehab Drawing Numbers	
(MDT097) Plans in SMS?	
(MDT098) Shop Drawings in SMS	
(MDT017) MDT Original Construction Project Number	F 209-4
(MDT099) MDT Rehab Project Numbers	
(MDT018) MDT Original Construction Station	344+57
(MDT100) MDT Rehab Stations	
(MDT021) MDT UPN	
(MDT101) MDT Rehab UPNs	
(MDT119) Date Bridge Opened|Re-Opened to Traffic	

C- Improvement Cost Data	
(75A) Type of Work Proposed	
(75B) Work to be Completed by	
(76) Length Of Structure Improvement	ft
(94) Bridge Improvement Cost	
(95) Roadway Improvement Cost	
(96) Total Project Cost	
(97) Year Of Improvement Cost Estimate	

D- Border State Data	
(98A-1) Border Bridge-Neighboring State Code	
(98A-2) Border Bridge - Neighboring FHWA Region Code	
(98B) Border Bridge-Percent Responsibility	
(99) Border Bridge Structure Number	

E- Historical Structure Data	
(37) Historical Significance	5 5 Not eligible for NRHP

F - Bridge Location	
(16) Latitude (DMS)	453551.97
(17) Longitude (DMS)	1111147.69

STRUCTURE INSPECTION REPORT

Structure # 05911

SOUTH COTTONWOOD CREEK - GALLATIN GATEWAY

G - Span and Dimensional Data	
(33) Bridge Median	0 0 No median
(34) Skew (degrees)	0
(35) Structure Flared	0 0 No flare
(42A) Type of Service on Bridge	1 Highway
(48) Length Of Maximum Span	20 ft
(49) Structure Length	21.2 ft
(53) Min Vert Clear Over Bridge Roadway	99.99 ft
(101) Parallel Structure Designation	N No parallel structure exists
(103) Temporary Structure Designation	
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(39) Navigation Vertical Clearance	000 ft
(40) Navigation Horizontal Clearance	0000 ft
(116) Minimum Navigation Vertical Clearance	ft

H - Main Span	
(43A) Main Span Material	1 Concrete
(43B) Main Span Design Type	01 Slab
(45) Number Of Spans In Main Unit	1

I - Approach Span	
(44A) Approach Span Material	0 Not Applicable
(44B) Approach Span Design Type	00 Not Applicable
(46) Number Of Approach Spans	0

J - Deck Data	
(50A) Left Curb|Sidewalk Width	0 ft
(50B) Right Curb|Sidewalk Width	0 ft
(52) Out-to-Out Deck Width	41 ft
(MDT006) Deck Area	871 Area
(107) Deck Structure Type	1 Concrete Cast-in-Place
(108A) Type of Wearing Surface	0 None (no additional concrete thickness or wearing surface is included in the bridge deck)
(108B) Type of Membrane	0 None
(108C) Deck Protection	0 None

(MDT104) Bridge Deck Seal	
(MDT105) Polymer Overlay	
(MDT106) Mill and Overlay	
(MDT107) New Bridge Deck	
(MDT108) Experimental Deck	

K - Under Bridge Service	
(42B) Type of Service under	5 Waterway
(54A) Minimum Vertical Underclearance- Reference Feature	N Feature not a highway or railroad
(54B) Minimum Vertical Underclearance	0 ft
(55A) Min Lateral Underclear On Right- Reference Feature	N Feature not a highway or railroad
(55B) Minimum Lateral Underclearance on Right	0 ft
(56) Min Lateral Underclear On Left	0 ft
(111) Pier|abutment Protection	
(113) Scour Critical Status	5 Bridge foundations determined to be stable for calculated scour conditions.
(116) Minimum Navigation Vertical Clearance	ft
(69) Underclear, Vertical and Horizontal	N Not applicable
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(40) Navigation Horizontal Clearance	0000 ft
(39) Navigation Vertical Clearance	000 ft

L - Load and Rating Data	
(MDT016) Load Rating Date	
(MDT022) Name of Load Rater	-1
(31) Design load - Live load for which the structure was designed	5 MS 18 (HS 20)
(66) Inventory Rating	36.0 ton
(65) Method Used To Determine Inventory Rating	B Assigned rating based on Allowable Stress Design (ASD)
(64) Operating Rating	51.9 ton
(63) Method Used to Determine Operating Rating	B Assigned rating based on Allowable Stress Design (ASD)
(70) Legal Load Status	5 Equal to or above legal loads
(MDT110) Bridge being Rated by Consultant	
(MDT112) Completed Rating Model?	
(MDT065) Type 3 Truck Inventory Rating	ton

STRUCTURE INSPECTION REPORT

Structure # 05911
SOUTH COTTONWOOD CREEK - GALLATIN GATEWAY

(MDT071) Type 3S2 Truck Inventory Rating	ton
(MDT068) Type 3-3 Truck Inventory Rating	ton
(MDT036) SU4 Truck Inventory Rating	ton
(MDT039) SU5 Truck Inventory Rating	ton
(MDT045) SU7 Truck Inventory Rating	ton
(MDT042) SU6 Truck Inventory Rating	ton
(MDT091) EV2 Truck Inventory Rating	ton
(MDT092) EV3 Truck Inventory Rating	ton
(MDT066) Type 3 Truck Operating Rating	ton
(MDT072) Type 3S2 Truck Operating Rating	ton
(MDT069) Type 3-3 Truck Operating Rating	85 ton
(MDT037) SU4 Truck Operating Rating	ton
(MDT040) SU5 Truck Operating Rating	ton
(MDT043) SU6 Truck Operating Rating	ton
(MDT046) SU7 Truck Operating Rating	ton
(MDT093) EV2 Truck Operating Rating	ton
(MDT094) EV3 Truck Operating Rating	ton
(MDT079) Truck Type 3 LRFR Rating	ton
(MDT081) Truck Type 3S2 LRFR Rating	ton
(MDT080) Truck Type 3-3 LRFR Rating	ton
(MDT082) Truck Type SU4 LRFR Rating	ton
(MDT083) Truck Type SU5 LRFR Rating	ton
(MDT084) Truck Type SU6 LRFR Rating	ton
(MDT085) Truck Type SU7 LRFR Rating	ton
(MDT095) Truck Type EV2 LRFR Rating	ton
(MDT096) Truck Type EV3 LRFR Rating	ton

M - General Facility Data	
(5A) Inventory Route-Record Type	1 Route carried `on` the structure
(5C) Designated Level of Service	1 Mainline
(5B) Route Signing Prefix	2 U.S. numbered highway
(5D) Route Number	00191
(5E) Directional Suffix	2 East
(12) Base Highway Network	1 On Base Network
(13A) LRS Number	C000050N
(13B) Inventory Route, Subroute Number-Subroute Number	00

STRUCTURE INSPECTION REPORT

Structure # 05911

SOUTH COTTONWOOD CREEK - GALLATIN GATEWAY

(19) Bypass|Detour Length	124 mi
(MDT009) Detour Speed	-1 mi/hr
(104) NHS Indicator	1 On the NHS
(MDT030) Posted speed limit (MPH)	70 mi/hr
(MDT035) Road Name	
(11) Accumulated Miles	76.966 mi
(MDT087) Decimal Mile Post	76.71
(MDT113) Mile Post	76+0.710 mi
(MDT075) Roadway System	
General Roadway Notes	

N - Base Network Data	
(28B) Lanes Under the Structure	0
(32) Approach Roadway Width	36.1 ft
(51) Bridge Roadway Width Curb-To-Curb	38 ft
(72) Approach Roadway Alignment	8 Equal Desirable Crit
(28A) Lanes on the Structure	2

O - Other NetWork Data	
(20) Toll	3 On Free Road
(100) STRAHNET Highway Designation	0 Not a STRAHNET route
(105) Federal Lands Highways	0 Not applicable
(110) National Truck Network	1 Part of National Truck Network
(MDT048) School Bus Route	0 Not on School Bus Route

P - Roadway Size and Clearance Data	
(10) Minimum Vertical Clearance	99.99 ft
(47) Total Horizontal Clearance	38 ft
(102) Direction of Traffic	2 2-way traffic
(MDT007) Departmental Route	P00050
(MDT002) Both|South|West Direction	0 Both Directions
(MDT003) Both|South|West Vertical Distance	99.990 ft
(MDT051) South|West Horizontal Distance	37.999
(MDT024) North|East Direction	
(MDT026) North|East Vertical Distance	ft
(MDT025) North|East Horizontal Distance	ft

STRUCTURE INSPECTION REPORT

Structure # 05911
SOUTH COTTONWOOD CREEK - GALLATIN GATEWAY

Q - Traffic Data	
(26) Functional Classification	02 Rural, Principal Arterial - Other
(MDT060) Traffic Volume Class	05
(29) Average Daily Traffic	11409
(30) Year of Average Daily Traffic	2017
(109) Average Daily Truck Traffic (%)	5
(114) Future Average Daily Traffic	13406
(115) Year Of Future Avg Daily Traffic	2037

General Bridge Notes

STRUCTURE INSPECTION REPORT

Structure # 05911

GALLATIN GATEWAY - SOUTH COTTONWOOD CREEK

Inspection Information

Responsible Person	Name	Signature
Inspector	John Jackson	
QC	Jason Johnson	

User	Begin	End	Comments
John Jackson	02-26-2019 10:00 am	02-26-2019 10:30 am	On-site. Conditions too dangerous for inspection. See photo
John Jackson	03-05-2019 10:00 am	03-05-2019 11:00 am	On-site. Inspection completed

Day	Weather	Temperature	Comments
02-26-2019 10:00 - 10:30	Snow	5	
03-05-2019 10:00 - 11:00	Sunny	-10	

R- Inspection	Current Value	Previous Value
(36A) Traffic Safety Features - Bridge Railings	0	1
(36B) Traffic Safety Features - Transitions	0	1
(36C) Traffic Safety Features - Approach guardrail	N	1
(36D) Traffic Safety Features - Approach guardrail Ends	1	0
(41) Structure Open, Posted, or Closed to Traffic	A	A
(58) Deck Rating	6	7
(59) Superstructure	6	7
(60) Substructure	7	7
(MDT061) Type 1 Underwater Inspection Required	N	
(61) Channel	6	6
(62) Culvert	N	N
(67) Structural Evaluation	6	6
(68) Deck Geometry	4	4
(69) Underclear, Vertical and Horizontal	N	N
(71) Waterway Adequacy	8	8
(MDT090) Climbing Inspection Required	N	
(92C-1b) Special Inspection Required	N	
(MDT118) Type 2 Underwater Consultant		
(MDT121) Functional Needs		

STRUCTURE INSPECTION REPORT

Structure # 05911

GALLATIN GATEWAY - SOUTH COTTONWOOD CREEK

Inspection Hours and Dates	Current Value	Previous Values
(MDT005) Date Last QA	2000-01-01	
(MDT010) FC Inspection Details	None	
FC Next Inspection Date		
(MDT023) Next Inspection Date	2021-03-01	2019-03-01
(MDT028) Other Inspection Details	none	
Other Inspection Next Date		
(MDT034) Request Review of Load rating	0	
(MDT050) Snooper Required	N	
Special Inspection Next Date		
(MDT058) Structurally Deficient|Functionally Obsolete	0	0
(MDT061) Type 1 Underwater Inspection Required	N	
Type 1 Underwater Inspection Date		
Type 1 Underwater Inspection Frequency (months)		
(MDT064) Type 1 Underwater Inspection Next Date		
(MDT074) Underwater Inspection Details	N	
Type 2 Underwater Next Inspection Date		
(90) Inspection Date	2019-03-05	2017-03-01
(91) Regular Inspection Frequency (Months)	24	24.00
(92A-1) FC Inspection Required	N	N
FC Inspection Frequency (Months)		
(92B-1) Type 2 Underwater Inspection Required	N	N
Type 2 Underwater Inspection Frequency (Months)		
(92C-1a) Other Inspection Required	N	N
(92C-1b) Special Inspection Required	N	
Other Inspection Frequency (Months)		
Special Inspection Frequency (months)		
FC Inspection Date		
Special Inspection Date		

General Inspection Notes
02-26-2019 - Bozeman received about a ft of snow. Shoulders were either not plowed or in the process of being plowed.Roads are snow packed and icy with blowing and drifting with multiple slide offs and crashes in the area.There was no place to park to inspect the bridges without endangering myself and the traveling publicI will return later to complete the inspection.03-05-19: Inspection completed

Repair Suggestions:					
Repair ID	**Date Requested**	**Type**	**Status**	**Priority**	**Comments**

General Bridge Photos

Photo #: Profile - East Location: , Comments:

Photo #: Approach - North_3-5-19 Location: , Comments:

Photo #: Underside of slab Location: , Comments:	
Photo #:2-26-19 weather conditions Location: , Comments:	

STRUCTURE INSPECTION REPORT
Structure # 05911
GALLATIN GATEWAY - SOUTH COTTONWOOD CREEK

Photo #: Soffit and Abut 1 Location: , Comments:	
Photo #: Abut 2 Location: , Comments:	

Element Inspection Data

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
38		Reinforced Concrete Slab (SF)	Area	818	38.3	61.6	0.1	0.0
38		1190 - Abrasion/Wear (PSC|RC)	Area	818	0.0	61.6	0.0	0.0

STRUCTURE INSPECTION REPORT

Structure # 05911

GALLATIN GATEWAY - SOUTH COTTONWOOD CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
38		1130 - Cracking (RC and Other)	Area	818	0.0	7.7	0.0	0.0
38		1120 - Efflorescence/Rust Staining	Area	818	0.0	4.9	0.0	0.0
38		1080 - Delamination/Spall/Patched Area	Area	818	0.0	0.2	0.1	0.0

Previous Inspection Notes:

Abrasion with exposed coarse aggregate full with of both lanes Condition State 2 : 61.6
Full length longitudinal cracks down CL and in each lane Condition State 2 : 7.7
Efflorescence in soffit reflecting down from surface - approx 40 ft Condition State 2 : 4.9

Current Inspection Notes:

Damage to guard angle with shallow spalling of slab edge in south bound lane at Abut 1
Abrasion with exposed coarse aggregate full with of both lanes
CS3 spall on slab haunch at Abut 1 LT
Full length longitudinal CS2 cracks on CL and in each lane
Efflorescence in soffit cracks - approx 40 ft
Shoulders covered with snow and ice.
Total in previous inspection did not account for defect overlap.

Photo #:CS2 Abrasion

Location:

Comments:

Element:38 - Reinforced Concrete Slab (SF)

Photo #:Spall on slab haunch - Abut 1 LT

Location:

Comments:

Element:38 - Reinforced Concrete Slab (SF)

STRUCTURE INSPECTION REPORT

Structure # 05911

GALLATIN GATEWAY - SOUTH COTTONWOOD CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Damage to guard angle and spalling of slab edge

Location:

Comments:

Element:38 - Reinforced Concrete Slab (SF)

STRUCTURE INSPECTION REPORT

Structure # 05911

GALLATIN GATEWAY - SOUTH COTTONWOOD CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
215		Reinforced Concrete Abutment (LF)	Length	131	100.0	0.0	0.0	0.0

Previous Inspection Notes:
Hairline cracking in backwall - wingwall corners Condition State 1 : 100
Current Inspection Notes:
Hairline pattern cracking, especially at backwall - wingwall corners

Generated by: MDT on 3/6/2019

STRUCTURE INSPECTION REPORT

Structure # 05911

GALLATIN GATEWAY - SOUTH COTTONWOOD CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
331		Reinforced Concrete Bridge Rail (LF)	Length	39	100.0	0.0	0.0	0.0

Previous Inspection Notes:
Hairline vertical cracks Condition State 1 : 100
Current Inspection Notes:
Hairline vertical cracks

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
950		Steel Approach Guardrail	Length	100	90.0	10.0	0.0	0.0
950		7000 - Damage	Length	100	0.0	10.0	0.0	0.0
950		1900 - Distortion	Length	100	0.0	10.0	0.0	0.0

Previous Inspection Notes:

Minor distortion from traffic impacts Condition State 2 : 10
Traffic impacts Condition State 2 : 10

Current Inspection Notes:

Traffic impacts
Minor distortion from traffic impacts

STRUCTURE INSPECTION REPORT

Structure # 05911

GALLATIN GATEWAY - SOUTH COTTONWOOD CREEK

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
960		Steel Approach Guardrail Ends	Each	4	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
No apparent defects Condition State 1 : 100								
Current Inspection Notes:								
No apparent defects								

General Inspection Notes	
Previous Inspection Notes	
Current Inspection Notes	

STRUCTURE INSPECTION REPORT

Structure # 05912

FARMER`S CANAL - 1M N GALLATIN GATEWAY

Bridge Inventory Information

Bridge Inspection Date: 03/05/2019

General Location Data	
(22) Owner	01 State Highway Agency
(6A) Feature Intersected	FARMER`S CANAL
(8) NBI Structure Number	P00050077+06641
(9) Location	1M N GALLATIN GATEWAY
(MDT058) Structurally Deficient|Functionally Obsolete	0 Not Deficient
(MDT076) Deck Condition	Fair-1
(MDT077) Structure Condition	Good
(SR) Sufficiency Rating	77.0

A- Location Data	
(MDT001) Agency structure name	none
(1) State Code	308
(MDT027) On|Off System	1 On System
(2) MDT Inspection District	02 BUTTE
(MDT115) MDT Administrative District	2 Butte
(MDT116) MDT Financial District	2 Butte
(MDT020) MDT Maintenance Division	22 BOZEMAN
(MDT078) MDT Maintenance Section	22-06 Big Sky
(3) County Code	031 GALLATIN
(MDT117) Border Bridge - Neighboring County Code	000 NONE
(4) Place Code	00000 Rural Area
(7) Facility Carried by Structure	US 191
(21) Maintenance Responsibility	01 State Highway Agency
(MDT031) Railroad Over/Underpass	0 Not Applicable
(MDT032) Railroad Owner	NA Not Applicable
(MDT014) Interchange Indicator	0 Not an Interchange
(MDT015) Interstate Ramp Indicator	0 Not a Ramp
(MDT114) MPO	not in MPO boundary
(112) Nbis Bridge Length	N Too Short
(MDT120) Environment	

STRUCTURE INSPECTION REPORT

Structure # 05912

FARMER`S CANAL - 1M N GALLATIN GATEWAY

B- Construction Data	
(27) Year Built	1964
(106) Year Reconstructed	
(MDT102) Years Rehabilitated	
(MDT019) MDT Original Drawing Number	4117
(MDT103) MDT Rehab Drawing Numbers	
(MDT097) Plans in SMS?	
(MDT098) Shop Drawings in SMS	
(MDT017) MDT Original Construction Project Number	F 209-4
(MDT099) MDT Rehab Project Numbers	
(MDT018) MDT Original Construction Station	394+06
(MDT100) MDT Rehab Stations	
(MDT021) MDT UPN	
(MDT101) MDT Rehab UPNs	
(MDT119) Date Bridge Opened|Re-Opened to Traffic	

C- Improvement Cost Data	
(75A) Type of Work Proposed	
(75B) Work to be Completed by	
(76) Length Of Structure Improvement	ft
(94) Bridge Improvement Cost	
(95) Roadway Improvement Cost	
(96) Total Project Cost	
(97) Year Of Improvement Cost Estimate	

D- Border State Data	
(98A-1) Border Bridge-Neighboring State Code	
(98A-2) Border Bridge - Neighboring FHWA Region Code	
(98B) Border Bridge-Percent Responsibility	
(99) Border Bridge Structure Number	

E- Historical Structure Data	
(37) Historical Significance	5 5 Not eligible for NRHP

F - Bridge Location	
(16) Latitude (DMS)	453640.73
(17) Longitude (DMS)	1111146.13

STRUCTURE INSPECTION REPORT

Structure # 05912

FARMER`S CANAL - 1M N GALLATIN GATEWAY

G - Span and Dimensional Data	
(33) Bridge Median	0 0 No median
(34) Skew (degrees)	0
(35) Structure Flared	0 0 No flare
(42A) Type of Service on Bridge	1 Highway
(48) Length Of Maximum Span	20 ft
(49) Structure Length	21.2 ft
(53) Min Vert Clear Over Bridge Roadway	99.99 ft
(101) Parallel Structure Designation	N No parallel structure exists
(103) Temporary Structure Designation	
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(39) Navigation Vertical Clearance	000 ft
(40) Navigation Horizontal Clearance	0000 ft
(116) Minimum Navigation Vertical Clearance	ft

H - Main Span	
(43A) Main Span Material	1 Concrete
(43B) Main Span Design Type	01 Slab
(45) Number Of Spans In Main Unit	1

I - Approach Span	
(44A) Approach Span Material	0 Not Applicable
(44B) Approach Span Design Type	00 Not Applicable
(46) Number Of Approach Spans	0

J - Deck Data	
(50A) Left Curb|Sidewalk Width	0 ft
(50B) Right Curb|Sidewalk Width	0 ft
(52) Out-to-Out Deck Width	41.3 ft
(MDT006) Deck Area	877 Area
(107) Deck Structure Type	1 Concrete Cast-in-Place
(108A) Type of Wearing Surface	0 None (no additional concrete thickness or wearing surface is included in the bridge deck)
(108B) Type of Membrane	0 None
(108C) Deck Protection	0 None

STRUCTURE INSPECTION REPORT

Structure # 05912

FARMER`S CANAL - 1M N GALLATIN GATEWAY

(MDT104) Bridge Deck Seal	2012
(MDT105) Polymer Overlay	
(MDT106) Mill and Overlay	
(MDT107) New Bridge Deck	
(MDT108) Experimental Deck	

K - Under Bridge Service	
(42B) Type of Service under	5 Waterway
(54A) Minimum Vertical Underclearance-Reference Feature	N Feature not a highway or railroad
(54B) Minimum Vertical Underclearance	0 ft
(55A) Min Lateral Underclear On Right-Reference Feature	N Feature not a highway or railroad
(55B) Minimum Lateral Underclearance on Right	0 ft
(56) Min Lateral Underclear On Left	0 ft
(111) Pier|abutment Protection	
(113) Scour Critical Status	8 Brdg. foundations stable for asses. or cal. conditions. Cal. scour is above top of footing.
(116) Minimum Navigation Vertical Clearance	ft
(69) Underclear, Vertical and Horizontal	N Not applicable
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(40) Navigation Horizontal Clearance	0000 ft
(39) Navigation Vertical Clearance	000 ft

L - Load and Rating Data	
(MDT016) Load Rating Date	07/23/1973
(MDT022) Name of Load Rater	-1
(31) Design load - Live load for which the structure was designed	5 MS 18 (HS 20)
(66) Inventory Rating	36.0 ton
(65) Method Used To Determine Inventory Rating	B Assigned rating based on Allowable Stress Design (ASD)
(64) Operating Rating	52.9 ton
(63) Method Used to Determine Operating Rating	B Assigned rating based on Allowable Stress Design (ASD)
(70) Legal Load Status	5 Equal to or above legal loads
(MDT110) Bridge being Rated by Consultant	
(MDT112) Completed Rating Model?	
(MDT065) Type 3 Truck Inventory Rating	ton

STRUCTURE INSPECTION REPORT

Structure # 05912

FARMER`S CANAL - 1M N GALLATIN GATEWAY

(MDT071) Type 3S2 Truck Inventory Rating	ton
(MDT068) Type 3-3 Truck Inventory Rating	ton
(MDT036) SU4 Truck Inventory Rating	ton
(MDT039) SU5 Truck Inventory Rating	ton
(MDT045) SU7 Truck Inventory Rating	ton
(MDT042) SU6 Truck Inventory Rating	ton
(MDT091) EV2 Truck Inventory Rating	ton
(MDT092) EV3 Truck Inventory Rating	ton
(MDT066) Type 3 Truck Operating Rating	46 ton
(MDT072) Type 3S2 Truck Operating Rating	72 ton
(MDT069) Type 3-3 Truck Operating Rating	85 ton
(MDT037) SU4 Truck Operating Rating	ton
(MDT040) SU5 Truck Operating Rating	ton
(MDT043) SU6 Truck Operating Rating	ton
(MDT046) SU7 Truck Operating Rating	ton
(MDT093) EV2 Truck Operating Rating	ton
(MDT094) EV3 Truck Operating Rating	ton
(MDT079) Truck Type 3 LRFR Rating	ton
(MDT081) Truck Type 3S2 LRFR Rating	ton
(MDT080) Truck Type 3-3 LRFR Rating	ton
(MDT082) Truck Type SU4 LRFR Rating	ton
(MDT083) Truck Type SU5 LRFR Rating	ton
(MDT084) Truck Type SU6 LRFR Rating	ton
(MDT085) Truck Type SU7 LRFR Rating	ton
(MDT095) Truck Type EV2 LRFR Rating	ton
(MDT096) Truck Type EV3 LRFR Rating	ton

M - General Facility Data	
(5A) Inventory Route-Record Type	1 Route carried `on` the structure
(5C) Designated Level of Service	1 Mainline
(5B) Route Signing Prefix	2 U.S. numbered highway
(5D) Route Number	00191
(5E) Directional Suffix	2 East
(12) Base Highway Network	1 On Base Network
(13A) LRS Number	C000050N
(13B) Inventory Route, Subroute Number-Subroute Number	00

(19) Bypass|Detour Length	124 mi
(MDT009) Detour Speed	-1 mi/hr
(104) NHS Indicator	1 On the NHS
(MDT030) Posted speed limit (MPH)	70 mi/hr
(MDT035) Road Name	
(11) Accumulated Miles	77.906 mi
(MDT087) Decimal Mile Post	77.66
(MDT113) Mile Post	77+0.660 mi
(MDT075) Roadway System	
General Roadway Notes	

N - Base Network Data	
(28B) Lanes Under the Structure	0
(32) Approach Roadway Width	36.1 ft
(51) Bridge Roadway Width Curb-To-Curb	38 ft
(72) Approach Roadway Alignment	8 Equal Desirable Crit
(28A) Lanes on the Structure	2

O - Other NetWork Data	
(20) Toll	3 On Free Road
(100) STRAHNET Highway Designation	0 Not a STRAHNET route
(105) Federal Lands Highways	0 Not applicable
(110) National Truck Network	1 Part of National Truck Network
(MDT048) School Bus Route	0 Not on School Bus Route

P - Roadway Size and Clearance Data	
(10) Minimum Vertical Clearance	99.99 ft
(47) Total Horizontal Clearance	38 ft
(102) Direction of Traffic	2 2-way traffic
(MDT007) Departmental Route	P00050
(MDT002) Both|South|West Direction	0 Both Directions
(MDT003) Both|South|West Vertical Distance	99.990 ft
(MDT051) South|West Horizontal Distance	37.999
(MDT024) North|East Direction	
(MDT026) North|East Vertical Distance	ft
(MDT025) North|East Horizontal Distance	ft

STRUCTURE INSPECTION REPORT

Structure # 05912
FARMER`S CANAL - 1M N GALLATIN GATEWAY

Q - Traffic Data	
(26) Functional Classification	02 Rural, Principal Arterial - Other
(MDT060) Traffic Volume Class	05
(29) Average Daily Traffic	12350
(30) Year of Average Daily Traffic	2017
(109) Average Daily Truck Traffic (%)	4
(114) Future Average Daily Traffic	14511
(115) Year Of Future Avg Daily Traffic	2037

General Bridge Notes
Scour item 113 = 8, refer to 12|8|14 Memo from Hydraulics entitled "NBIS Item 113 Single Span Structures Over Irrigation Canals"

STRUCTURE INSPECTION REPORT

Structure # 05912

1M N GALLATIN GATEWAY - FARMER`S CANAL

Inspection Information

Responsible Person	Name	Signature
Inspector	John Jackson	
QC	Jason Johnson	

User	Begin	End	Comments
John Jackson	03-05-2019 11:00 am	03-05-2019 12:00 pm	On-site. Inspection completed
John Jackson	02-26-2019 10:30 am	02-26-2019 11:00 am	On-site. Conditions too dangerous for inspection

Day	Weather	Temperature	Comments
02-26-2019 10:30 - 11:00	Snow	5	
03-05-2019 11:00 - 12:00	Sunny	-5	

R- Inspection	Current Value	Previous Value
(36A) Traffic Safety Features - Bridge Railings	0	1
(36B) Traffic Safety Features - Transitions	0	1
(36C) Traffic Safety Features - Approach guardrail	N	1
(36D) Traffic Safety Features - Approach guardrail Ends	1	0
(41) Structure Open, Posted, or Closed to Traffic	A	A
(58) Deck Rating	6	7
(59) Superstructure	6	7
(60) Substructure	7	7
(MDT061) Type 1 Underwater Inspection Required	N	
(61) Channel	8	8
(62) Culvert	N	N
(67) Structural Evaluation	6	6
(68) Deck Geometry	4	4
(69) Underclear, Vertical and Horizontal	N	N
(71) Waterway Adequacy	8	8
(MDT090) Climbing Inspection Required	N	
(92C-1b) Special Inspection Required	N	
(MDT118) Type 2 Underwater Consultant		
(MDT121) Functional Needs		

STRUCTURE INSPECTION REPORT

Structure # 05912

1M N GALLATIN GATEWAY - FARMER`S CANAL

Inspection Hours and Dates	Current Value	Previous Values
(MDT005) Date Last QA	2000-01-01	
(MDT010) FC Inspection Details	None	
FC Next Inspection Date		
(MDT016) Load Rating Date	1973-07-23	
(MDT023) Next Inspection Date	2021-03-01	2019-03-01
(MDT028) Other Inspection Details	none	
Other Inspection Next Date		
(MDT034) Request Review of Load rating	0	
(MDT050) Snooper Required	N	
Special Inspection Next Date		
(MDT058) Structurally Deficient|Functionally Obsolete	0	0
(MDT061) Type 1 Underwater Inspection Required	N	
Type 1 Underwater Inspection Date		
Type 1 Underwater Inspection Frequency (months)		
(MDT064) Type 1 Underwater Inspection Next Date		
(MDT074) Underwater Inspection Details	N	
Type 2 Underwater Next Inspection Date		
(90) Inspection Date	2019-03-05	2017-03-01
(91) Regular Inspection Frequency (Months)	24	24.00
(92A-1) FC Inspection Required	N	N
FC Inspection Frequency (Months)		
(92B-1) Type 2 Underwater Inspection Required	N	N
Type 2 Underwater Inspection Frequency (Months)		
(92C-1a) Other Inspection Required	N	N
(92C-1b) Special Inspection Required	N	
Other Inspection Frequency (Months)		
Special Inspection Frequency (months)		
FC Inspection Date		
Special Inspection Date		

General Inspection Notes
02-26-2019 - Bozeman received about a ft of snow. Shoulders were either not plowed or in the process of being plowed.Roads are snow packed and icy with blowing and drifting with multiple slide offs and crashes in the area.There was no place to park to inspect the bridges without endangering myself and the traveling publicI will return later to complete the inspection.03-05-19: Inspection completed

Repair Suggestions:

Repair ID	Date Requested	Type	Status	Priority	Comments

General Bridge Photos

Photo #:3-5-19 Approach - North Location: , Comments:

Photo #: Profile - East Location: , Comments:

STRUCTURE INSPECTION REPORT

Structure # 05912

1M N GALLATIN GATEWAY - FARMER`S CANAL

Photo #:02-26-19 Weather conditions Location: , Comments:

Photo #: Underside of slab and Abut 2 Location: , Comments:

Element Inspection Data

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
38		Reinforced Concrete Slab (SF)	Area	829	39.0	61.0	0.0	0.0
38		1190 - Abrasion/Wear (PSC|RC)	Area	829	0.0	60.8	0.0	0.0

Generated by: MDT on 3/6/2019

STRUCTURE INSPECTION REPORT

Structure # 05912

1M N GALLATIN GATEWAY - FARMER`S CANAL

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
38		1130 - Cracking (RC and Other)	Area	829	0.0	7.6	0.0	0.0
38		1120 - Efflorescence/Rust Staining	Area	829	0.0	2.5	0.0	0.0
38		1080 - Delamination/Spall/Patched Area	Area	829	0.0	0.5	0.0	0.0

Previous Inspection Notes:

Abrasion with exposed coarse aggregate full width of both lanes Condition State 2 : 61
Longitudinal cracks on CL and in each lane Condition State 2 : 7.6
Efflorescence in soffit along CL Condition State 2 : 2.5

Current Inspection Notes:

CS2 abrasion full width of both lanes
Efflorescence in soffit along CL crack
Small spalls associated with damage to guard angle on Abut 2 slab edge
Two sqft of sound patches at beidge ends
CS2 longitudinal cracks on CL and in each lane

Photo #:Longitudinal Crack

Location:

Comments:

Element:38 - Reinforced Concrete Slab (SF)

Photo #:CS2 Abrasion

Location:

Comments:

Element:38 - Reinforced Concrete Slab (SF)

STRUCTURE INSPECTION REPORT

Structure # 05912

1M N GALLATIN GATEWAY - FARMER`S CANAL

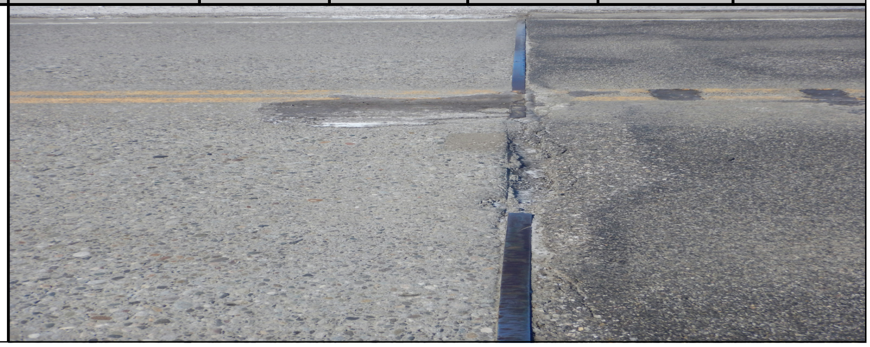
Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4

Photo #:Typical patch and spalling at slab edge

Location:

Comments:

Element:38 - Reinforced Concrete Slab (SF)



Generated by: MDT on 3/6/2019

STRUCTURE INSPECTION REPORT

Structure # 05912

1M N GALLATIN GATEWAY - FARMER`S CANAL

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
215		Reinforced Concrete Abutment (LF)	Length	112	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
Hairline vertical and map cracking Condition State 1 : 100								
Current Inspection Notes:								
Hairline vertical and map cracking								

STRUCTURE INSPECTION REPORT

Structure # 05912

1M N GALLATIN GATEWAY - FARMER`S CANAL

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
331		Reinforced Concrete Bridge Rail (LF)	Length	39	100.0	0.0	0.0	0.0

Previous Inspection Notes:
Hairline vertical cracks Condition State 1 : 100
Current Inspection Notes:
Hairline vertical cracks

Generated by: MDT on 3/6/2019

STRUCTURE INSPECTION REPORT

Structure # 05912

1M N GALLATIN GATEWAY - FARMER`S CANAL

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
521	38	Concrete Protective Coating (SF)	Area	829	39.0	0.0	0.0	61.0
521	38	3510 - Wear (Concrete Protective Coatings)	Area	829	0.0	0.0	0.0	61.0

Previous Inspection Notes:

HMWM seal worn off in travel lanes Condition State 4 : 61

Current Inspection Notes:

HMWM seal worn off in travel lanes
2012 HMWM seal is probably still effective in cracks

STRUCTURE INSPECTION REPORT

Structure # 05912

1M N GALLATIN GATEWAY - FARMER`S CANAL

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
950		Steel Approach Guardrail	Length	100	95.0	5.0	0.0	0.0
950		7000 - Damage	Length	100	0.0	5.0	0.0	0.0
950		1900 - Distortion	Length	100	0.0	5.0	0.0	0.0

Previous Inspection Notes:

Minor distortion from traffic impacts Condition State 2 : 5
Traffic impacts Condition State 2 : 5

Current Inspection Notes:

Traffic impacts
Minor distortion from traffic impacts

STRUCTURE INSPECTION REPORT

Structure # 05912
1M N GALLATIN GATEWAY - FARMER`S CANAL

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
960		Steel Approach Guardrail Ends	Each	4	100.0	0.0	0.0	0.0

Previous Inspection Notes:

No apparent defects Condition State 1 : 100

Current Inspection Notes:

No apparent defects

General Inspection Notes	
Previous Inspection Notes	
Current Inspection Notes	

Generated by: MDT on 3/6/2019

STRUCTURE INSPECTION REPORT

Structure # 05913

SPAIN-FERRIS DITCH - 6M W BOZEMAN

Bridge Inventory Information

Bridge Inspection Date: 03/05/2019

General Location Data	
(22) Owner	01 State Highway Agency
(6A) Feature Intersected	SPAIN-FERRIS DITCH
(8) NBI Structure Number	P00050081+04761
(9) Location	6M W BOZEMAN
(MDT058) Structurally Deficient|Functionally Obsolete	0 Not Deficient
(MDT076) Deck Condition	Fair-1
(MDT077) Structure Condition	Good
(SR) Sufficiency Rating	77.0

A- Location Data	
(MDT001) Agency structure name	none
(1) State Code	308
(MDT027) On|Off System	1 On System
(2) MDT Inspection District	02 BUTTE
(MDT115) MDT Administrative District	2 Butte
(MDT116) MDT Financial District	2 Butte
(MDT020) MDT Maintenance Division	22 BOZEMAN
(MDT078) MDT Maintenance Section	22-06 Big Sky
(3) County Code	031 GALLATIN
(MDT117) Border Bridge - Neighboring County Code	000 NONE
(4) Place Code	00000 Rural Area
(7) Facility Carried by Structure	US 191
(21) Maintenance Responsibility	01 State Highway Agency
(MDT031) Railroad Over/Underpass	0 Not Applicable
(MDT032) Railroad Owner	NA Not Applicable
(MDT014) Interchange Indicator	0 Not an Interchange
(MDT015) Interstate Ramp Indicator	0 Not a Ramp
(MDT114) MPO	not in MPO boundary
(112) Nbis Bridge Length	N Too Short
(MDT120) Environment	

STRUCTURE INSPECTION REPORT

Structure # 05913
SPAIN-FERRIS DITCH - 6M W BOZEMAN

B- Construction Data	
(27) Year Built	1964
(106) Year Reconstructed	
(MDT102) Years Rehabilitated	
(MDT019) MDT Original Drawing Number	4117
(MDT103) MDT Rehab Drawing Numbers	
(MDT097) Plans in SMS?	
(MDT098) Shop Drawings in SMS	
(MDT017) MDT Original Construction Project Number	F 209-4
(MDT099) MDT Rehab Project Numbers	
(MDT018) MDT Original Construction Station	595+22
(MDT100) MDT Rehab Stations	
(MDT021) MDT UPN	
(MDT101) MDT Rehab UPNs	
(MDT119) Date Bridge Opened|Re-Opened to Traffic	

C- Improvement Cost Data	
(75A) Type of Work Proposed	
(75B) Work to be Completed by	
(76) Length Of Structure Improvement	ft
(94) Bridge Improvement Cost	
(95) Roadway Improvement Cost	
(96) Total Project Cost	
(97) Year Of Improvement Cost Estimate	

D- Border State Data	
(98A-1) Border Bridge-Neighboring State Code	
(98A-2) Border Bridge - Neighboring FHWA Region Code	
(98B) Border Bridge-Percent Responsibility	
(99) Border Bridge Structure Number	

E- Historical Structure Data	
(37) Historical Significance	5 5 Not eligible for NRHP

F - Bridge Location	
(16) Latitude (DMS)	453953.42
(17) Longitude (DMS)	1111108.60

STRUCTURE INSPECTION REPORT

Structure # 05913
SPAIN-FERRIS DITCH - 6M W BOZEMAN

G - Span and Dimensional Data	
(33) Bridge Median	0 0 No median
(34) Skew (degrees)	0
(35) Structure Flared	0 0 No flare
(42A) Type of Service on Bridge	1 Highway
(48) Length Of Maximum Span	20 ft
(49) Structure Length	21.2 ft
(53) Min Vert Clear Over Bridge Roadway	99.99 ft
(101) Parallel Structure Designation	N No parallel structure exists
(103) Temporary Structure Designation	
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(39) Navigation Vertical Clearance	000 ft
(40) Navigation Horizontal Clearance	0000 ft
(116) Minimum Navigation Vertical Clearance	ft

H - Main Span	
(43A) Main Span Material	1 Concrete
(43B) Main Span Design Type	01 Slab
(45) Number Of Spans In Main Unit	1

I - Approach Span	
(44A) Approach Span Material	0 Not Applicable
(44B) Approach Span Design Type	00 Not Applicable
(46) Number Of Approach Spans	0

J - Deck Data	
(50A) Left Curb|Sidewalk Width	0 ft
(50B) Right Curb|Sidewalk Width	0 ft
(52) Out-to-Out Deck Width	41.4 ft
(MDT006) Deck Area	879 Area
(107) Deck Structure Type	1 Concrete Cast-in-Place
(108A) Type of Wearing Surface	0 None (no additional concrete thickness or wearing surface is included in the bridge deck)
(108B) Type of Membrane	0 None
(108C) Deck Protection	0 None
(MDT104) Bridge Deck Seal	

(MDT105) Polymer Overlay	
(MDT106) Mill and Overlay	
(MDT107) New Bridge Deck	
(MDT108) Experimental Deck	

K - Under Bridge Service	
(42B) Type of Service under	5 Waterway
(54A) Minimum Vertical Underclearance-Reference Feature	N Feature not a highway or railroad
(54B) Minimum Vertical Underclearance	0 ft
(55A) Min Lateral Underclear On Right-Reference Feature	N Feature not a highway or railroad
(55B) Minimum Lateral Underclearance on Right	0 ft
(56) Min Lateral Underclear On Left	0 ft
(111) Pier|abutment Protection	
(113) Scour Critical Status	8 Brdg. foundations stable for asses. or cal. conditions. Cal. scour is above top of footing.
(116) Minimum Navigation Vertical Clearance	ft
(69) Underclear, Vertical and Horizontal	N Not applicable
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(38) Navigation Control	0 No navigation control on waterway (bridge permit not required)
(40) Navigation Horizontal Clearance	0000 ft
(39) Navigation Vertical Clearance	000 ft

L - Load and Rating Data	
(MDT016) Load Rating Date	
(MDT022) Name of Load Rater	-1
(31) Design load - Live load for which the structure was designed	5 MS 18 (HS 20)
(66) Inventory Rating	36.0 ton
(65) Method Used To Determine Inventory Rating	B Assigned rating based on Allowable Stress Design (ASD)
(64) Operating Rating	51.9 ton
(63) Method Used to Determine Operating Rating	B Assigned rating based on Allowable Stress Design (ASD)
(70) Legal Load Status	5 Equal to or above legal loads
(MDT110) Bridge being Rated by Consultant	
(MDT112) Completed Rating Model?	
(MDT065) Type 3 Truck Inventory Rating	ton
(MDT071) Type 3S2 Truck Inventory Rating	ton

(MDT068) Type 3-3 Truck Inventory Rating	ton
(MDT036) SU4 Truck Inventory Rating	ton
(MDT039) SU5 Truck Inventory Rating	ton
(MDT045) SU7 Truck Inventory Rating	ton
(MDT042) SU6 Truck Inventory Rating	ton
(MDT091) EV2 Truck Inventory Rating	ton
(MDT092) EV3 Truck Inventory Rating	ton
(MDT066) Type 3 Truck Operating Rating	ton
(MDT072) Type 3S2 Truck Operating Rating	ton
(MDT069) Type 3-3 Truck Operating Rating	85 ton
(MDT037) SU4 Truck Operating Rating	ton
(MDT040) SU5 Truck Operating Rating	ton
(MDT043) SU6 Truck Operating Rating	ton
(MDT046) SU7 Truck Operating Rating	ton
(MDT093) EV2 Truck Operating Rating	ton
(MDT094) EV3 Truck Operating Rating	ton
(MDT079) Truck Type 3 LRFR Rating	ton
(MDT081) Truck Type 3S2 LRFR Rating	ton
(MDT080) Truck Type 3-3 LRFR Rating	ton
(MDT082) Truck Type SU4 LRFR Rating	ton
(MDT083) Truck Type SU5 LRFR Rating	ton
(MDT084) Truck Type SU6 LRFR Rating	ton
(MDT085) Truck Type SU7 LRFR Rating	ton
(MDT095) Truck Type EV2 LRFR Rating	ton
(MDT096) Truck Type EV3 LRFR Rating	ton

M - General Facility Data	
(5A) Inventory Route-Record Type	1 Route carried `on` the structure
(5C) Designated Level of Service	1 Mainline
(5B) Route Signing Prefix	2 U.S. numbered highway
(5D) Route Number	00191
(5E) Directional Suffix	2 East
(12) Base Highway Network	1 On Base Network
(13A) LRS Number	C000050N
(13B) Inventory Route, Subroute Number-Subroute Number	00
(19) Bypass|Detour Length	124 mi

STRUCTURE INSPECTION REPORT

Structure # 05913
SPAIN-FERRIS DITCH - 6M W BOZEMAN

(MDT009) Detour Speed	-1 mi/hr
(104) NHS Indicator	1 On the NHS
(MDT030) Posted speed limit (MPH)	70 mi/hr
(MDT035) Road Name	
(11) Accumulated Miles	81.713 mi
(MDT087) Decimal Mile Post	81.47
(MDT113) Mile Post	81+0.470 mi
(MDT075) Roadway System	
General Roadway Notes	

N - Base Network Data	
(28B) Lanes Under the Structure	0
(32) Approach Roadway Width	38 ft
(51) Bridge Roadway Width Curb-To-Curb	38 ft
(72) Approach Roadway Alignment	8 Equal Desirable Crit
(28A) Lanes on the Structure	2

O - Other NetWork Data	
(20) Toll	3 On Free Road
(100) STRAHNET Highway Designation	0 Not a STRAHNET route
(105) Federal Lands Highways	0 Not applicable
(110) National Truck Network	1 Part of National Truck Network
(MDT048) School Bus Route	0 Not on School Bus Route

P - Roadway Size and Clearance Data	
(10) Minimum Vertical Clearance	99.99 ft
(47) Total Horizontal Clearance	38 ft
(102) Direction of Traffic	2 2-way traffic
(MDT007) Departmental Route	P00050
(MDT002) Both|South|West Direction	0 Both Directions
(MDT003) Both|South|West Vertical Distance	99.990 ft
(MDT051) South|West Horizontal Distance	37.999
(MDT024) North|East Direction	
(MDT026) North|East Vertical Distance	ft
(MDT025) North|East Horizontal Distance	ft

Q - Traffic Data	
(26) Functional Classification	02 Rural, Principal Arterial - Other

(MDT060) Traffic Volume Class	05
(29) Average Daily Traffic	15696
(30) Year of Average Daily Traffic	2017
(109) Average Daily Truck Traffic (%)	3
(114) Future Average Daily Traffic	18443
(115) Year Of Future Avg Daily Traffic	2037

General Bridge Notes
Scour item 113 = 8, refer to 12|8|14 Memo from Hydraulics entitled "NBIS Item 113 Single Span Structures Over Irrigation Canals"

STRUCTURE INSPECTION REPORT

Structure # 05913

6M W BOZEMAN - SPAIN-FERRIS DITCH

Inspection Information

Responsible Person	Name	Signature
Inspector	John Jackson	
QC	Jason Johnson	

User	Begin	End	Comments
John Jackson	02-26-2019 11:00 am	02-26-2019 11:30 am	On-site. Conditions too dangerous for inspection
John Jackson	03-05-2019 12:00 pm	03-05-2019 01:00 pm	On-site. Inspection Completed

Day	Weather	Temperature	Comments
03-05-2019 12:00 - 01:00	Sunny	-5	
02-26-2019 11:00 - 11:30	Snow	5	

R- Inspection	Current Value	Previous Value
(36A) Traffic Safety Features - Bridge Railings	0	1
(36B) Traffic Safety Features - Transitions	0	0
(36C) Traffic Safety Features - Approach guardrail	N	1
(36D) Traffic Safety Features - Approach guardrail Ends	1	0
(41) Structure Open, Posted, or Closed to Traffic	A	A
(58) Deck Rating	6	6
(59) Superstructure	6	6
(60) Substructure	7	7
(MDT061) Type 1 Underwater Inspection Required	N	
(61) Channel	8	8
(62) Culvert	N	N
(67) Structural Evaluation	6	6
(68) Deck Geometry	4	4
(69) Underclear, Vertical and Horizontal	N	N
(71) Waterway Adequacy	8	8
(MDT090) Climbing Inspection Required	N	
(92C-1b) Special Inspection Required	N	
(MDT118) Type 2 Underwater Consultant		
(MDT121) Functional Needs		

STRUCTURE INSPECTION REPORT

Structure # 05913

6M W BOZEMAN - SPAIN-FERRIS DITCH

Inspection Hours and Dates	Current Value	Previous Values
(MDT005) Date Last QA	2000-01-01	
(MDT010) FC Inspection Details	None	
FC Next Inspection Date		
(MDT023) Next Inspection Date	2021-03-01	2019-03-01
(MDT028) Other Inspection Details	none	
Other Inspection Next Date		
(MDT034) Request Review of Load rating	0	
(MDT050) Snooper Required	N	
Special Inspection Next Date		
(MDT058) Structurally Deficient|Functionally Obsolete	0	0
(MDT061) Type 1 Underwater Inspection Required	N	
Type 1 Underwater Inspection Date		
Type 1 Underwater Inspection Frequency (months)		
(MDT064) Type 1 Underwater Inspection Next Date		
(MDT074) Underwater Inspection Details	N	
Type 2 Underwater Next Inspection Date		
(90) Inspection Date	2019-03-05	2017-03-01
(91) Regular Inspection Frequency (Months)	24	24.00
(92A-1) FC Inspection Required	N	N
FC Inspection Frequency (Months)		
(92B-1) Type 2 Underwater Inspection Required	N	N
Type 2 Underwater Inspection Frequency (Months)		
(92C-1a) Other Inspection Required	N	N
(92C-1b) Special Inspection Required	N	
Other Inspection Frequency (Months)		
Special Inspection Frequency (months)		
FC Inspection Date		
Special Inspection Date		

General Inspection Notes
02-26-2019 - Bozeman received about a ft of snow. Shoulders were either not plowed or in the process of being plowed.Roads are snow packed and icy with blowing and drifting with multiple slide offs and crashes in the area.There was no place to park to inspect the bridges without endangering myself and the traveling publicI will return later to complete the inspection.3-5-19: Inspection completed

STRUCTURE INSPECTION REPORT

Structure # 05913

6M W BOZEMAN - SPAIN-FERRIS DITCH

Repair Suggestions:

Repair ID	Date Requested	Type	Status	Priority	Comments

General Bridge Photos

Photo #: Superstructure - Abut 1 Location: , Comments:

Photo #: Profile - East Location: , Comments:

Photo #:02-26-19 Weather Conditions Location: , Comments:

Photo #: Approach - South Location: , Comments:

Element Inspection Data

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
38		Reinforced Concrete Slab (SF)	Area	829	34.6	65.4	0.0	0.0
38		1190 - Abrasion/Wear (PSC|RC)	Area	829	0.0	60.8	0.0	0.0

STRUCTURE INSPECTION REPORT

Structure # 05913

6M W BOZEMAN - SPAIN-FERRIS DITCH

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
38		1130 - Cracking (RC and Other)	Area	829	0.0	5.1	0.0	0.0
38		1120 - Efflorescence/Rust Staining	Area	829	0.0	5.1	0.0	0.0
38		1080 - Delamination/Spall/Patched Area	Area	829	0.0	4.6	0.0	0.0

Previous Inspection Notes:

Abrasion with exposed coarse aggregate full width of both lanes Condition State 2 : 61
Longitudinal cracks each side of CL Condition State 2 : 5.1
Efflorescence in cracks reflecting through from surface Condition State 2 : 5.1

Current Inspection Notes:

CS2 abrasion full width of both driving lanes
Efflorescence in soffit cracks matching surface cracks
Full width repairs at each bridge end where guard angle was removed.
Some minor cracking
Longitudinal CS2 cracks each side of CL

Photo #:Abut 2 Bridge End

Location:

Comments:

Element:38 - Reinforced Concrete Slab (SF)

Photo #:Abut 1 Bridge End

Location:

Comments:

Element:38 - Reinforced Concrete Slab (SF)

STRUCTURE INSPECTION REPORT

Structure # 05913

6M W BOZEMAN - SPAIN-FERRIS DITCH

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
215		Reinforced Concrete Abutment (LF)	Length	118	96.6	3.4	0.0	0.0
215		1130 - Cracking (RC and Other)	Length	118	0.0	3.4	0.0	0.0

Previous Inspection Notes:

Some hairline cracking Condition State 1 : 96.6
Two vertical cracks in each abutment Condition State 2 : 3.4

Current Inspection Notes:

Two vertical CS2 cracks in each abutment
Some hairline pattern cracking

STRUCTURE INSPECTION REPORT

Structure # 05913

6M W BOZEMAN - SPAIN-FERRIS DITCH

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
331		Reinforced Concrete Bridge Rail (LF)	Length	39	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
A few hairline vertical cracks Condition State 1 : 100								
Current Inspection Notes:								
A few hairline vertical cracks								

STRUCTURE INSPECTION REPORT

Structure # 05913

6M W BOZEMAN - SPAIN-FERRIS DITCH

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
521	38	Concrete Protective Coating (SF)	Area	829	39.0	0.0	0.0	61.0
521	38	3510 - Wear (Concrete Protective Coatings)	Area	829	0.0	0.0	0.0	61.0

Previous Inspection Notes:

HMWM seal worn off in travel lanes Condition State 4 : 61

Current Inspection Notes:

2012 HMWM seal is probably still effective in cracks
HMWM seal worn off in travel lanes

STRUCTURE INSPECTION REPORT

Structure # 05913

6M W BOZEMAN - SPAIN-FERRIS DITCH

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
950		Steel Approach Guardrail	Length	100	90.0	10.0	0.0	0.0
950		7000 - Damage	Length	100	0.0	10.0	0.0	0.0
950		1900 - Distortion	Length	100	0.0	10.0	0.0	0.0

Previous Inspection Notes:

Northwest approach rail has been severely damaged by traffic impact. See Approach photo Condition State 4 : 25
Severe traffic damage Condition State 4 : 25

Current Inspection Notes:

Minor distortion from traffic impacts
NW rail damage has been repaired
Traffic impacts

Photo #:Repaired NW approach rail and end treatment

Location:

Comments:

Element:950 - Steel Approach Guardrail

STRUCTURE INSPECTION REPORT

Structure # 05913

6M W BOZEMAN - SPAIN-FERRIS DITCH

Element #	Parent Element	Name	Unit	Quantity	%CS 1	%CS 2	%CS 3	%CS 4
960		Steel Approach Guardrail Ends	Each	4	100.0	0.0	0.0	0.0
Previous Inspection Notes:								
Northwest and Southeast end treatments have severe traffic damage Condition State 4 : 50								
Current Inspection Notes:								
Damged ends have been repaired								

General Inspection Notes	
Previous Inspection Notes	
Current Inspection Notes	

US 191 Corridor Study

Four Corners to Beaver Creek

Appendix B:

As Built Data Review

Horizontal Alignment

Curve PS (RP)	Radius (ft)	Length of Curve (ft)	SSD (ft)	Design Speed Met (mph)	Meets 70 mph Standards
40.3	2,604	1,536	25.5	75	Yes
40.5	1,432	687	46.3	60	No
40.9	3,820	1,751	17.4	80	Yes
41.2	1,736	621	38.2	65	No
41.8	1,910	549	34.8	70	Yes
42.0	2,865	547	23.2	80	Yes
42.4	5,730	1,268	11.6	80	Yes
42.6	5,730	482	11.6	80	Yes
43.2	1,432	547	46.3	60	No
44.3	2,865	453	23.2	80	Yes
45.0	5,730	1,425	11.6	80	Yes
46.8	5,730	2,006	11.6	80	Yes
47.3	2,865	570	23.2	80	Yes
47.7	1,910	82	34.8	70	Yes
48.5	2,287	2,106	29.1	75	Yes
49.9	2,865	946	23.2	80	Yes
Missing As-builts: RP 49.9 to 51.9					
51.9	716	182	91.0	45	No
52.1	819	460	80.1	50	No
52.5	1,763	778	37.7	65	No
52.8	716	76	91.0	45	No
52.8	1,910	408	34.8	70	Yes
53.0	955	222	68.9	50	No
53.8	1,146	392	57.6	55	No
54.1	2,865	241	23.2	80	Yes
54.5	5,730	265	11.6	80	Yes
55.1	955	161	68.9	50	No
55.5	1,521	374	43.6	65	No
55.7	955	96	68.9	50	No
55.8	716	127	91.0	45	No
56.1	1,910	421	34.8	70	Yes
56.3	1,146	259	57.6	55	No
56.4	3,820	1,356	17.4	80	Yes
56.7	2,292	1,672	29.0	75	Yes
57.2	955	224	68.9	50	No
57.4	820	662	79.9	50	No
57.6	716	1,508	91.0	45	No
58.0	794	97	82.4	50	No
58.3	955	94	68.9	50	No
58.4	794	95	82.4	50	No
58.7	637	529	101.8	45	No
58.9	637	357	101.8	45	No
59.1	637	96	101.8	45	No
59.3	637	414	101.8	45	No

Curve PS (RP)	Radius (ft)	Length of Curve (ft)	SSD (ft)	Design Speed Met (mph)	Meets 70 mph Standards
59.5	637	473	101.8	45	No
59.9	716	243	91.0	45	No
60.1	1,910	37	34.8	70	Yes
60.3	Unknown	Unknown	--	--	--
60.4	1,146	103	57.6	55	No
60.5	2,292	1,088	29.0	75	Yes
60.8	2,292	362	29.0	75	Yes
61.2	382	300	161.5	35	No
61.4	674	861	96.4	45	No
61.7	1,528	547	43.4	65	No
61.9	955	78	68.9	50	No
62.0	723	Unknown	90.2	45	No
62.0	637	131	101.8	45	No
62.3	1,637	92	40.5	65	No
62.4	619	Unknown	104.6	45	No
62.5	637	40	101.8	45	No
62.6	2,865	180	23.2	80	Yes
62.8	2,865	462	23.2	80	Yes
63.3	1,457	Unknown	45.5	60	No
63.4	1,432	180	46.3	60	No
63.8	22,978	1,360	2.9	80	Yes
64.1	2,083	739	31.9	70	Yes
64.4	1,909	233	34.8	70	Yes
64.4	1,432	752	46.3	60	No
64.6	5,728	446	11.6	80	Yes
64.7	1,296	587	51.1	60	No
64.7	1,115	548	59.2	55	No
65.1	1,115	653	59.2	55	No
65.3	1,115	253	59.2	55	No
66.6	955	217	68.9	50	No
66.7	2,865	655	23.2	80	Yes
67.0	5,730	1,033	11.6	80	Yes
67.4	2,292	319	29.0	75	Yes
67.6	2,546	873	26.1	75	Yes
67.9	1,432	333	46.3	60	No
68.6	1,432	526	46.3	60	No
68.8	1,432	194	46.3	60	No
68.9	1,432	303	46.3	60	No
69.3	3,820	773	17.4	80	Yes
70.3	1,910	511	34.8	70	Yes
74.1	2,099	1,478	31.7	70	Yes
76.2	11,459	793	5.8	80	Yes
77.3	5,730	910	11.6	80	Yes
78.0	5,730	617	11.6	80	Yes
79.6	3,820	1,592	17.4	80	Yes
80.9	2,870	1,172	23.2	80	Yes

Vertical Alignment

VPI (RP)	Curve Type	Curve Length (ft)	Grade Back	Grade Ahead	K-value	Design Speed Met (mph)	Meets 70 mph Standards
39.7	sag	400	0.95%	0.44%	786.47	80	Yes
40.0	crest	800	0.44%	1.11%	1201.20	80	Yes
40.2	sag	NONE	1.11%	0.63%	--	--	--
40.6	sag	NONE	0.63%	0.50%	--	--	--
40.8	sag	600	0.50%	-0.68%	508.47	80	Yes
40.9	crest	800	-0.68%	2.26%	272.36	70	Yes
41.2	sag	400	2.26%	0.34%	208.63	75	Yes
41.5	crest	400	0.34%	1.12%	512.16	80	Yes
41.8	sag	400	1.12%	0.39%	547.20	80	Yes
42.2	sag	NONE	0.39%	0.18%	--	--	--
42.5	crest	400	0.18%	0.81%	637.86	80	Yes
42.9	crest	600	0.81%	2.59%	336.53	75	Yes
43.1	sag	600	2.59%	0.69%	316.46	80	Yes
43.5	sag	400	0.69%	-0.05%	541.27	80	Yes
43.7	crest	800	-0.05%	0.88%	864.86	80	Yes
43.9	sag	NONE	0.88%	0.65%	--	--	--
44.1	crest	NONE	0.65%	0.95%	--	--	--
44.3	sag	NONE	0.95%	0.63%	--	--	--
44.6	crest	400	0.63%	1.08%	881.06	80	Yes
44.9	sag	400	1.08%	0.49%	677.97	80	Yes
45.1	crest	328	0.49%	1.36%	377.11	75	Yes
45.2	sag	656	1.36%	0.25%	591.14	80	Yes
45.4	crest	984	0.25%	1.10%	1157.94	80	Yes
45.6	sag	984	1.10%	0.70%	2460.63	80	Yes
45.8	crest	984	0.70%	1.50%	1230.31	80	Yes
46.0	sag	984	1.50%	0.82%	1447.43	80	Yes
46.3	sag	984	0.82%	0.65%	5789.72	80	Yes
46.6	crest	984	0.65%	1.00%	2812.15	80	Yes
46.9	sag	NONE	1.00%	-1.15%	--	--	--
47.1	crest	1476	-1.15%	2.43%	412.74	80	Yes
47.3	sag	984	2.43%	0.85%	622.94	80	Yes
47.9	sag	984	0.85%	-0.35%	822.95	80	Yes
48.1	crest	984	-0.35%	1.46%	544.99	80	Yes
48.4	sag	328	1.46%	0.46%	328.08	80	Yes
Missing As-builts: RP 49.9 to 51.9							
51.8	crest	400	Unknown	-1.40%	--	--	--
52.0	sag	400	-1.40%	-0.81%	683.34	80	Yes
52.4	sag	400	-0.81%	-0.19%	639.52	80	Yes
52.6	crest	400	-0.19%	-0.41%	1792.19	80	Yes
53.0	sag	400	-0.41%	2.52%	136.39	60	No
53.2	crest	1600	2.52%	-5.20%	207.25	65	No
53.4	sag	400	-5.20%	-0.94%	93.94	45	No
53.7	crest	200	-0.94%	-1.25%	654.39	80	Yes

VPI (RP)	Curve Type	Curve Length (ft)	Grade Back	Grade Ahead	K-value	Design Speed Met (mph)	Meets 70 mph Standards
54.0	sag	400	-1.25%	0.48%	231.23	80	Yes
54.1	crest	1400	0.48%	-0.94%	984.39	80	Yes
54.3	sag	200	-0.94%	0.39%	150.54	60	No
54.5	crest	600	0.39%	-1.82%	271.79	70	Yes
54.7	sag	400	-1.82%	-1.00%	488.40	80	Yes
55.0	sag	NONE	-1.00%	-0.80%	--	--	--
55.4	sag	656	-0.80%	-0.63%	3771.08	80	Yes
55.6	sag	400	-0.63%	0.30%	430.11	80	Yes
55.7	crest	600	0.30%	-0.47%	779.22	80	Yes
56.1	crest	984	-0.47%	-1.15%	1441.07	80	Yes
56.2	crest	400	-1.15%	-1.21%	6470.40	80	Yes
56.4	sag	400	-1.21%	-0.60%	651.13	80	Yes
56.6	crest	400	-0.60%	-0.93%	1200.59	80	Yes
56.8	sag	400	-0.93%	0.75%	238.47	80	Yes
57.0	crest	900	0.75%	-0.49%	727.76	80	Yes
57.2	sag	164	-0.49%	0.25%	221.68	75	Yes
57.4	crest	1312	0.25%	-1.00%	1049.87	80	Yes
58.0	crest	492	-1.00%	-1.17%	2894.86	80	Yes
58.1	sag	492	-1.17%	-0.34%	592.92	80	Yes
58.4	crest	1312	-0.34%	-0.82%	2734.03	80	Yes
58.7	sag	400	-0.82%	-0.33%	820.51	80	Yes
58.9	crest	800	-0.33%	-2.00%	479.76	80	Yes
59.1	sag	400	-2.00%	-0.55%	275.96	80	Yes
59.4	sag	400	-0.55%	1.15%	234.95	80	Yes
59.6	crest	1000	1.15%	-1.82%	336.44	75	Yes
59.9	sag	600	-1.82%	-0.30%	394.66	80	Yes
60.1	crest	600	-0.30%	-2.06%	340.91	75	Yes
60.2	sag	600	-2.06%	0.60%	225.56	75	Yes
60.5	crest	1100	0.60%	-2.06%	412.91	80	Yes
60.7	sag	600	-2.06%	-1.03%	579.15	80	Yes
61.0	sag	600	-1.03%	2.60%	165.38	65	No
61.2	crest	400	2.60%	0.35%	177.78	60	No
Missing As-builts: RP 61.2 to 61.7							
61.7	crest	1000	0.35%	-2.84%	313.48	75	Yes
62.1	sag	600	-2.84%	-0.49%	254.89	80	Yes
62.5	crest	1000	-0.49%	-3.42%	340.83	75	Yes
62.7	sag	500	-3.42%	1.50%	101.63	50	No
63.0	crest	1200	1.50%	-3.43%	243.50	65	No
63.2	sag	600	-3.43%	-0.44%	200.79	70	Yes
63.4	sag	600	-0.44%	1.20%	365.27	80	Yes
63.8	crest	1600	1.20%	-0.57%	904.67	80	Yes
64.2	crest	1000	-0.57%	-2.32%	569.48	80	Yes
64.4	sag	600	-2.32%	-0.41%	313.81	80	Yes
64.6	sag	328	-0.41%	-0.31%	3313.98	80	Yes
65.0	crest	1969	-0.31%	-1.51%	1633.61	80	Yes

VPI (RP)	Curve Type	Curve Length (ft)	Grade Back	Grade Ahead	K-value	Design Speed Met (mph)	Meets 70 mph Standards
65.3	sag	984	-1.51%	-0.14%	717.38	80	Yes
65.9	sag	600	-0.14%	-0.69%	1085.38	80	Yes
66.1	sag	600	-0.69%	0.13%	725.51	80	Yes
66.3	crest	600	0.13%	-1.80%	310.93	70	Yes
66.5	sag	600	-1.80%	-0.89%	664.67	80	Yes
66.6	sag	600	-0.89%	1.16%	292.28	80	Yes
66.9	crest	1600	1.16%	-2.74%	410.50	80	Yes
67.1	sag	500	-2.74%	-0.66%	240.58	80	Yes
67.6	crest	400	-0.66%	-0.86%	1994.02	80	Yes
68.0	crest	800	-0.86%	-1.56%	1147.78	80	Yes
68.2	sag	300	-1.56%	0.00%	192.68	70	Yes
68.3	crest	800	0.00%	-0.89%	898.07	80	Yes
68.7	sag	400	-0.89%	-0.32%	700.77	80	Yes
69.1	crest	NONE	-0.32%	-0.35%	--	--	--
69.5	crest	800	-0.35%	-0.60%	3200.00	80	Yes
70.1	crest	800	-0.60%	-1.16%	1428.57	80	Yes
Missing As-builts: RP 70.1 to 81.9							

Appendix C:

Traffic Data Collection

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Hwy 84_Hwy 85
Site Code: 1
Start Date: 08/22/2019
Page No: 1

Turning Movement Data

Start Time	Gallatin Rd Northbound					Jackrabbit Ln Southbound					Norris Rd Eastbound					Huffine Ln Westbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
12:00 AM	0	3	6	0	9	7	0	0	0	7	1	1	0	0	2	2	3	6	0	11	29
12:15 AM	0	3	7	0	10	1	5	1	0	7	1	1	0	0	2	2	2	3	0	7	26
12:30 AM	0	1	4	0	5	6	4	1	0	11	0	3	1	0	4	3	1	2	0	6	26
12:45 AM	0	3	0	0	3	2	3	2	0	7	1	0	0	0	1	3	1	2	0	6	17
Hourly Total	0	10	17	0	27	16	12	4	0	32	3	5	1	0	9	10	7	13	0	30	98
1:00 AM	0	4	3	0	7	3	7	2	0	12	0	3	2	0	5	3	0	1	0	4	28
1:15 AM	1	3	0	0	4	1	1	2	0	4	0	3	3	0	6	2	1	2	0	5	19
1:30 AM	0	0	1	0	1	4	1	1	0	6	0	2	0	0	2	0	1	1	0	2	11
1:45 AM	0	2	1	0	3	0	2	1	0	3	1	0	1	0	2	0	3	1	0	4	12
Hourly Total	1	9	5	0	15	8	11	6	0	25	1	8	6	0	15	5	5	5	0	15	70
2:00 AM	1	0	0	0	1	2	1	2	0	5	0	1	1	0	2	3	1	0	0	4	12
2:15 AM	1	0	0	0	1	2	0	1	0	3	0	1	0	0	1	2	2	1	0	5	10
2:30 AM	0	1	2	0	3	2	1	0	0	3	1	0	1	0	2	2	2	4	0	8	16
2:45 AM	0	1	5	0	6	2	0	2	0	4	1	1	1	0	3	2	3	1	0	6	19
Hourly Total	2	2	7	0	11	8	2	5	0	15	2	3	3	0	8	9	8	6	0	23	57
3:00 AM	0	0	1	0	1	1	4	1	0	6	0	0	0	0	0	2	1	4	0	7	14
3:15 AM	0	3	0	0	3	0	2	1	0	3	0	1	0	0	1	2	0	3	0	5	12
3:30 AM	1	0	5	0	6	1	1	1	0	3	1	2	1	0	4	1	2	1	0	4	17
3:45 AM	0	2	4	0	6	1	1	1	0	3	0	2	1	0	3	1	2	1	0	4	16
Hourly Total	1	5	10	0	16	3	8	4	0	15	1	5	2	0	8	6	5	9	0	20	59
4:00 AM	0	1	6	0	7	2	0	2	0	4	1	2	1	0	4	3	0	4	0	7	22
4:15 AM	0	3	1	0	4	0	4	2	0	6	0	1	1	0	2	4	0	6	0	10	22
4:30 AM	0	11	4	0	15	6	4	0	0	10	2	6	5	0	13	2	7	5	0	14	52
4:45 AM	0	10	5	0	15	17	10	2	0	29	2	3	2	0	7	8	4	11	0	23	74
Hourly Total	0	25	16	0	41	25	18	6	0	49	5	12	9	0	26	17	11	26	0	54	170
5:00 AM	0	4	3	0	7	13	13	1	0	27	6	7	6	0	19	11	1	17	0	29	82
5:15 AM	3	8	7	0	18	18	30	7	0	55	3	5	4	0	12	16	10	14	0	40	125
5:30 AM	3	13	13	0	29	26	35	7	0	68	9	9	21	0	39	32	22	23	0	77	213
5:45 AM	6	17	16	0	39	33	61	14	0	108	13	10	20	0	43	58	20	42	0	120	310
Hourly Total	12	42	39	0	93	90	139	29	0	258	31	31	51	0	113	117	53	96	0	266	730
6:00 AM	4	28	14	0	46	21	82	9	0	112	3	16	23	0	42	64	28	34	0	126	326
6:15 AM	5	20	23	0	48	39	92	16	0	147	14	24	20	0	58	72	25	37	0	134	387
6:30 AM	12	42	27	0	81	69	77	28	0	174	22	44	28	0	94	59	37	51	0	147	496
6:45 AM	11	49	41	0	101	84	113	14	0	211	19	48	21	0	88	101	39	73	0	213	613
Hourly Total	32	139	105	0	276	213	364	67	0	644	58	132	92	0	282	296	129	195	0	620	1822
7:00 AM	7	41	45	0	93	105	108	22	0	235	17	55	25	0	97	79	45	60	0	184	609
7:15 AM	13	42	38	0	93	135	84	18	0	237	28	53	16	0	97	65	59	64	0	188	615
7:30 AM	15	55	72	0	142	136	86	23	0	245	36	92	18	0	146	80	61	93	0	234	767
7:45 AM	20	57	69	0	146	174	105	31	0	310	31	63	13	0	107	87	87	117	0	291	854
Hourly Total	55	195	224	0	474	550	383	94	0	1027	112	263	72	0	447	311	252	334	0	897	2845
8:00 AM	19	57	71	0	147	115	78	20	0	213	32	68	26	0	126	81	77	91	0	249	735
8:15 AM	9	49	66	0	124	107	88	21	0	216	27	61	19	0	107	73	64	99	0	236	683
8:30 AM	12	46	59	0	117	131	84	26	0	241	31	59	13	0	103	81	64	83	0	228	689
8:45 AM	19	51	67	0	137	135	92	24	1	251	21	70	18	0	109	71	80	80	0	231	728
Hourly Total	59	203	263	0	525	488	342	91	1	921	111	258	76	0	445	306	285	353	0	944	2835
9:00 AM	9	61	58	0	128	76	67	35	0	178	31	71	14	1	116	74	51	65	0	190	612
9:15 AM	16	46	52	0	114	95	55	21	0	171	28	69	15	1	112	59	54	74	0	187	584
9:30 AM	15	62	67	0	144	91	62	25	0	178	19	71	15	0	105	60	52	61	0	173	600
9:45 AM	13	56	64	0	133	88	59	16	1	163	34	71	14	0	119	75	57	67	0	199	614
Hourly Total	53	225	241	0	519	350	243	97	1	690	112	282	58	2	452	268	214	267	0	749	2410
10:00 AM	11	53	56	0	120	94	55	23	0	172	32	64	21	0	117	53	50	68	0	171	580
10:15 AM	13	73	79	0	165	73	67	23	0	163	35	48	10	0	93	57	42	70	0	169	590
10:30 AM	13	53	66	0	132	82	59	13	0	154	29	57	14	0	100	66	63	68	0	197	583
10:45 AM	19	68	75	0	162	88	62	20	0	170	26	52	14	0	92	63	54	92	0	209	633
Hourly Total	56	247	276	0	579	337	243	79	0	659	122	221	59	0	402	239	209	298	0	746	2386
11:00 AM	18	67	61	0	146	89	82	29	0	200	25	49	16	0	90	52	40	69	0	161	597
11:15 AM	14	67	64	0	145	88	62	29	0	179	38	75	8	0	121	56	49	73	0	178	623
11:30 AM	13	62	71	0	146	90	71	24	0	185	31	80	12	1	123	67	52	76	0	195	649
11:45 AM	14	45	64	0	123	117	56	27	2	200	35	56	20	0	111	64	48	82	0	194	628
Hourly Total	59	241	260	0	560	384	271	109	2	764	129	260	56	1	445	239	189	300	0	728	2497

12:00 PM	11	58	72	0	141	86	62	29	2	177	46	69	12	0	127	84	73	100	0	257	702
12:15 PM	12	77	77	0	166	123	56	26	0	205	46	65	13	0	124	56	66	104	0	226	721
12:30 PM	16	72	77	0	165	104	64	29	0	197	41	64	11	0	116	71	58	104	0	233	711
12:45 PM	17	78	88	0	183	87	71	28	0	186	33	63	8	0	104	78	76	94	0	248	721
Hourly Total	56	285	314	0	655	400	253	112	2	765	166	261	44	0	471	289	273	402	0	964	2855
1:00 PM	13	60	65	0	138	91	58	21	0	170	33	75	12	0	120	74	62	103	0	239	667
1:15 PM	17	66	82	0	165	108	54	31	0	193	32	60	16	0	108	86	75	99	0	260	726
1:30 PM	14	60	67	0	141	94	64	17	0	175	36	67	16	0	119	80	62	115	0	257	692
1:45 PM	15	59	76	0	150	87	63	20	0	170	27	52	13	0	92	75	66	86	0	227	639
Hourly Total	59	245	290	0	594	380	239	89	0	708	128	254	57	0	439	315	265	403	0	983	2724
2:00 PM	10	50	85	0	145	93	62	16	0	171	33	73	11	0	117	82	65	114	0	261	694
2:15 PM	14	70	67	0	151	106	58	30	0	194	30	59	10	0	99	79	71	88	0	238	682
2:30 PM	16	63	88	0	167	74	58	22	0	154	28	78	10	0	116	77	69	97	0	243	680
2:45 PM	17	95	81	0	193	105	66	41	0	212	35	73	16	0	124	55	52	106	0	213	742
Hourly Total	57	278	321	0	656	378	244	109	0	731	126	283	47	0	456	293	257	405	0	955	2798
3:00 PM	5	93	94	0	192	100	56	23	0	179	38	61	9	0	108	68	60	90	0	218	697
3:15 PM	26	83	68	0	177	104	72	24	0	200	25	68	13	0	106	75	89	112	0	276	759
3:30 PM	14	99	77	0	190	85	59	28	0	172	40	54	9	0	103	66	87	129	0	282	747
3:45 PM	16	77	80	0	173	88	53	25	0	166	22	60	17	0	99	69	87	117	0	273	711
Hourly Total	61	352	319	0	732	377	240	100	0	717	125	243	48	0	416	278	323	448	0	1049	2914
4:00 PM	25	92	72	0	189	98	62	26	0	186	40	75	9	0	124	62	66	113	0	241	740
4:15 PM	12	93	83	0	188	85	66	29	0	180	37	60	10	0	107	60	76	104	0	240	715
4:30 PM	12	63	68	0	143	135	69	32	0	236	47	82	12	0	141	97	87	141	0	325	845
4:45 PM	28	137	105	0	270	142	70	35	0	247	47	70	15	0	132	75	78	135	0	288	937
Hourly Total	77	385	328	0	790	460	267	122	0	849	171	287	46	0	504	294	307	493	0	1094	3237
5:00 PM	30	113	98	0	241	140	78	37	0	255	37	96	17	0	150	81	94	161	0	336	982
5:15 PM	16	125	111	0	252	96	68	25	1	189	40	89	12	0	141	72	96	184	0	352	934
5:30 PM	24	107	116	0	247	126	71	35	0	232	42	79	9	0	130	65	111	140	0	316	925
5:45 PM	23	108	109	0	240	103	87	17	0	207	39	79	7	0	125	68	66	129	0	263	835
Hourly Total	93	453	434	0	980	465	304	114	1	883	158	343	45	0	546	286	367	614	0	1267	3676
6:00 PM	17	128	89	0	234	118	52	23	0	193	26	69	18	0	113	72	63	134	0	269	809
6:15 PM	17	93	60	0	170	94	50	32	1	176	22	67	11	0	100	61	72	107	0	240	686
6:30 PM	15	82	58	0	155	69	33	18	0	120	18	42	9	0	69	57	37	60	0	154	498
6:45 PM	15	77	73	0	165	78	51	22	0	151	15	49	15	0	79	53	46	65	0	164	559
Hourly Total	64	380	280	0	724	359	186	95	1	640	81	227	53	0	361	243	218	366	0	827	2552
7:00 PM	9	54	50	0	113	53	33	18	0	104	23	47	14	0	84	57	53	68	0	178	479
7:15 PM	10	39	45	0	94	45	32	20	0	97	28	39	11	0	78	47	36	83	0	166	435
7:30 PM	10	47	62	0	119	41	34	12	0	87	26	46	9	0	81	53	43	56	0	152	439
7:45 PM	8	32	48	0	88	37	23	5	0	65	26	38	10	0	74	57	25	61	0	143	370
Hourly Total	37	172	205	0	414	176	122	55	0	353	103	170	44	0	317	214	157	268	0	639	1723
8:00 PM	3	33	27	0	63	39	28	7	0	74	18	35	9	0	62	42	25	47	0	114	313
8:15 PM	7	37	58	0	102	37	24	10	0	71	4	34	9	0	47	45	23	44	0	112	332
8:30 PM	3	38	42	0	83	31	15	11	0	57	6	16	15	0	37	38	34	40	0	112	289
8:45 PM	4	28	30	0	62	27	24	9	0	60	12	22	8	0	42	29	26	53	0	108	272
Hourly Total	17	136	157	0	310	134	91	37	0	262	40	107	41	0	188	154	108	184	0	446	1206
9:00 PM	7	26	36	0	69	23	21	2	0	46	9	11	9	0	29	37	27	37	0	101	245
9:15 PM	4	24	22	0	50	19	21	11	1	51	4	16	6	0	26	35	27	49	0	111	238
9:30 PM	2	14	17	0	33	22	14	2	0	38	4	11	6	0	21	31	30	46	0	107	199
9:45 PM	5	25	37	0	67	12	12	5	0	29	8	6	5	0	19	35	11	23	0	69	184
Hourly Total	18	89	112	0	219	76	68	20	1	164	25	44	26	0	95	138	95	155	0	388	866
10:00 PM	2	15	21	0	38	12	15	4	0	31	2	8	2	0	12	19	13	18	0	50	131
10:15 PM	5	17	25	0	47	13	11	1	0	25	1	11	3	0	15	12	14	21	0	47	134
10:30 PM	1	12	19	0	32	10	7	5	0	22	2	6	0	0	8	13	8	11	0	32	94
10:45 PM	1	13	22	0	36	14	7	6	0	27	4	1	2	0	7	12	7	14	0	33	103
Hourly Total	9	57	87	0	153	49	40	16	0	105	9	26	7	0	42	56	42	64	0	162	462
11:00 PM	5	10	34	0	49	8	10	2	1	20	5	1	0	1	6	4	5	12	0	21	96
11:15 PM	3	8	16	0	27	5	6	3	0	14	2	4	2	0	8	8	6	6	0	20	69
11:30 PM	0	7	12	0	19	7	2	1	0	10	1	6	1	0	8	3	2	9	0	14	51
11:45 PM	1	4	4	0	9	5	0	1	0	6	1	3	1	0	5	10	5	5	0	20	40
Hourly Total	9	29	66	0	104	25	18	7	1	50	9	14	4	1	27	25	18	32	0	75	256
Grand Total	887	4204	4376	0	9467	5751	4108	1467	10	11326	1828	3739	947	4	6514	4408	3797	5736	0	13941	41248
Approach %	9.4	44.4	46.2	-	-	50.8	36.3	13.0	-	-	28.1	57.4	14.5	-	-	31.6	27.2	41.1	-	-	-
Total %	2.2	10.2	10.6	-	23.0	13.9	10.0	3.6	-	27.5	4.4	9.1	2.3	-	15.8	10.7	9.2	13.9	-	33.8	-
Motorcycles	1	30	9	-	40	23	8	8	-	39	11	10	2	-	23	8	10	8	-	26	128
% Motorcycles	0.1	0.7	0.2	-	0.4	0.4	0.2	0.5	-	0.3	0.6	0.3	0.2	-	0.4	0.2	0.3	0.1	-	0.2	0.3
Cars & Light Goods	843	3740	4198	-	8781	5517	3691	1313	-	10521	1585	3559	903	-	6047	4251	3547	5503	-	13301	38650
% Cars & Light Goods	95.0	89.0	95.9	-	92.8	95.9	89.8	89.5	-	92.9	86.7	95.2	95.4	-	92.8	96.4	93.4	95.9	-	95.4	93.7
Buses	5	6	6	-	17	9	9	0	-	18	0	0	4	-	4	1	5	7	-	13	52
% Buses	0.6	0.1	0.1	-	0.2	0.2	0.2	0.0	-	0.2	0.0	0.0	0.4	-	0.1	0.0	0.1	0.1	-	0.1	0.1
Single-Unit Trucks	33	182	84	-	299	132	171	65	-	368	67	105	27	-	199	79	93	146	-	318	1184
% Single-Unit Trucks	3.7	4.3	1.9	-	3.2	2.3	4.2	4.4	-	3.2	3.7	2.8	2.9	-	3.1	1.8	2.4	2.5	-	2.3	2.9
Articulated Trucks	5	245	79	-	329	70	229	81	-	380	165	63	11	-	239	69	140	72	-	281	1229
% Articulated Trucks	0.6	5.8	1.8	-	3.5	1.2	5.6	5.5	-	3.4	9.0	1.7	1.2	-	3.7	1.6	3.7	1.3	-	2.0	3.0

Bicycles on Road	0	1	0	-	1	0	0	0	-	0	0	2	0	-	2	0	2	0	-	2	5
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.1	0.0	-	0.0	0.0	0.1	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	10	-	-	-	-	4	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Hwy 84_Hwy 85
Site Code: 1
Start Date: 08/22/2019
Page No: 4

08/22/2019 12:00 AM
Ending At
08/23/2019 12:00 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Jackrabbit Ln [N]

Out	In	Total
49	39	88
10828	10521	21349
13	18	31
395	368	763
483	380	863
11768	**11326**	**23094**

R	T	L	P
8	8	23	0
1313	3691	5517	0
0	9	9	0
65	171	132	0
81	229	70	10
1467	**4108**	**5751**	**10**

Norris Rd [W]

Out	In	Total
19	23	42
5703	6047	11750
10	4	14
191	199	390
228	241	469
6151	**6514**	**12665**

L	T	R	P
11	10	2	0
1585	3559	903	0
0	0	4	0
67	105	27	0
165	65	11	4
1828	**3739**	**947**	**4**

Huffine Ln [E]

Out	In	Total
42	26	68
13274	13301	26575
15	13	28
321	318	639
214	283	497
13866	**13941**	**27807**

R	T	L	P
8	10	8	0
5503	3547	4251	0
7	5	1	0
146	93	79	0
72	142	69	0
5736	**3797**	**4408**	**0**

Gallatin Rd [S]

L	T	R	P
1	30	9	0
843	3740	4198	0
5	6	6	0
33	182	84	0
5	246	79	0
887	**4204**	**4376**	**0**

Out	In	Total
18	40	58
8845	8781	17626
14	17	31
277	299	576
309	330	639
9463	**9467**	**18930**

Turning Movement Data Plot

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Gallatin Rd Northbound					Jackrabbit Ln Southbound					Norris Rd Eastbound					Huffine Ln Westbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:30 AM	15	55	72	0	142	136	86	23	0	245	36	92	18	0	146	80	61	93	0	234	767
7:45 AM	20	57	69	0	146	174	105	31	0	310	31	63	13	0	107	87	87	117	0	291	854
8:00 AM	19	57	71	0	147	115	78	20	0	213	32	68	26	0	126	81	77	91	0	249	735
8:15 AM	9	49	66	0	124	107	88	21	0	216	27	61	19	0	107	73	64	99	0	236	683
Total	63	218	278	0	559	532	357	95	0	984	126	284	76	0	486	321	289	400	0	1010	3039
Approach %	11.3	39.0	49.7	-	-	54.1	36.3	9.7	-	-	25.9	58.4	15.6	-	-	31.8	28.6	39.6	-	-	-
Total %	2.1	7.2	9.1	-	18.4	17.5	11.7	3.1	-	32.4	4.1	9.3	2.5	-	16.0	10.6	9.5	13.2	-	33.2	-
PHF	0.788	0.956	0.965	-	0.951	0.764	0.850	0.766	-	0.794	0.875	0.772	0.731	-	0.832	0.922	0.830	0.855	-	0.868	0.890
Motorcycles	1	0	0	-	1	0	3	0	-	3	0	2	0	-	2	0	1	2	-	3	9
% Motorcycles	1.6	0.0	0.0	-	0.2	0.0	0.8	0.0	-	0.3	0.0	0.7	0.0	-	0.4	0.0	0.3	0.5	-	0.3	0.3
Cars & Light Goods	58	202	270	-	530	509	299	82	-	890	104	272	71	-	447	311	265	379	-	955	2822
% Cars & Light Goods	92.1	92.7	97.1	-	94.8	95.7	83.8	86.3	-	90.4	82.5	95.8	93.4	-	92.0	96.9	91.7	94.8	-	94.6	92.9
Buses	1	0	0	-	1	1	1	0	-	2	0	0	0	-	0	0	0	1	-	1	4
% Buses	1.6	0.0	0.0	-	0.2	0.2	0.3	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.0	0.0	0.3	-	0.1	0.1
Single-Unit Trucks	3	8	3	-	14	9	26	7	-	42	7	8	2	-	17	6	8	15	-	29	102
% Single-Unit Trucks	4.8	3.7	1.1	-	2.5	1.7	7.3	7.4	-	4.3	5.6	2.8	2.6	-	3.5	1.9	2.8	3.8	-	2.9	3.4
Articulated Trucks	0	8	5	-	13	13	28	6	-	47	15	2	3	-	20	4	15	3	-	22	102
% Articulated Trucks	0.0	3.7	1.8	-	2.3	2.4	7.8	6.3	-	4.8	11.9	0.7	3.9	-	4.1	1.2	5.2	0.8	-	2.2	3.4
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
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Jackrabbit Ln [N]

Out	In	Total
2	3	5
685	890	1575
1	2	3
30	42	72
26	47	73
744	**984**	**1728**

R	T	L	P
0	3	0	0
82	299	509	0
0	1	1	0
7	26	9	0
6	28	13	0
95	**357**	**532**	**0**

Norris Rd [W]

Out	In	Total
2	2	4
405	447	852
1	0	1
18	17	35
21	20	41
447	**486**	**933**

L	T	R	P
0	2	0	0
104	272	71	0
0	0	0	0
7	8	2	0
15	2	3	0
126	**284**	**76**	**0**

Peak Hour Data

08/22/2019 7:30 AM
Ending At
08/22/2019 8:30 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Huffine Ln [E]

Out	In	Total
2	3	5
1051	955	2006
1	1	2
20	29	49
20	22	42
1094	**1010**	**2104**

R	T	L	P
2	1	0	0
379	265	311	0
1	0	0	0
15	8	6	0
3	15	4	0
400	**289**	**321**	**0**

L	T	R	P
1	0	0	0
58	202	270	0
1	0	0	0
3	8	3	0
0	8	5	0
63	**218**	**278**	**0**

Out	In	Total
3	1	4
681	530	1211
1	1	2
34	14	48
35	13	48
754	**559**	**1313**

Gallatin Rd [S]

Turning Movement Peak Hour Data Plot (7:30 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (12:00 PM)

	Gallatin Rd Northbound					Jackrabbit Ln Southbound					Norris Rd Eastbound					Huffine Ln Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
12:00 PM	11	58	72	0	141	86	62	29	2	177	46	69	12	0	127	84	73	100	0	257	702
12:15 PM	12	77	77	0	166	123	56	26	0	205	46	65	13	0	124	56	66	104	0	226	721
12:30 PM	16	72	77	0	165	104	64	29	0	197	41	64	11	0	116	71	58	104	0	233	711
12:45 PM	17	78	88	0	183	87	71	28	0	186	33	63	8	0	104	78	76	94	0	248	721
Total	56	285	314	0	655	400	253	112	2	765	166	261	44	0	471	289	273	402	0	964	2855
Approach %	8.5	43.5	47.9	-	-	52.3	33.1	14.6	-	-	35.2	55.4	9.3	-	-	30.0	28.3	41.7	-	-	-
Total %	2.0	10.0	11.0	-	22.9	14.0	8.9	3.9	-	26.8	5.8	9.1	1.5	-	16.5	10.1	9.6	14.1	-	33.8	-
PHF	0.824	0.913	0.892	-	0.895	0.813	0.891	0.966	-	0.933	0.902	0.946	0.846	-	0.927	0.860	0.898	0.966	-	0.938	0.990
Motorcycles	0	4	2	-	6	10	1	2	-	13	9	1	0	-	10	1	0	0	-	1	30
% Motorcycles	0.0	1.4	0.6	-	0.9	2.5	0.4	1.8	-	1.7	5.4	0.4	0.0	-	2.1	0.3	0.0	0.0	-	0.1	1.1
Cars & Light Goods	55	252	301	-	608	372	221	101	-	694	140	245	42	-	427	281	247	384	-	912	2641
% Cars & Light Goods	98.2	88.4	95.9	-	92.8	93.0	87.4	90.2	-	90.7	84.3	93.9	95.5	-	90.7	97.2	90.5	95.5	-	94.6	92.5
Buses	0	0	0	-	0	1	0	0	-	1	0	0	0	-	0	0	0	1	-	1	2
% Buses	0.0	0.0	0.0	-	0.0	0.3	0.0	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.2	-	0.1	0.1
Single-Unit Trucks	1	13	5	-	19	12	11	2	-	25	10	8	2	-	20	4	11	11	-	26	90
% Single-Unit Trucks	1.8	4.6	1.6	-	2.9	3.0	4.3	1.8	-	3.3	6.0	3.1	4.5	-	4.2	1.4	4.0	2.7	-	2.7	3.2
Articulated Trucks	0	16	6	-	22	5	20	7	-	32	7	7	0	-	14	3	15	6	-	24	92
% Articulated Trucks	0.0	5.6	1.9	-	3.4	1.3	7.9	6.3	-	4.2	4.2	2.7	0.0	-	3.0	1.0	5.5	1.5	-	2.5	3.2
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	2	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Peak Hour Data

08/22/2019 12:00 PM
Ending At
08/22/2019 1:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Jackrabbit Ln [N]

Out	In	Total
13	13	26
776	694	1470
1	1	2
34	25	59
29	32	61
853	**765**	**1618**

R	T	L	P
2	1	10	0
101	221	372	0
0	0	1	0
2	11	12	0
7	20	5	2
112	**253**	**400**	**2**

Norris Rd [W]

Out	In	Total
2	10	12
403	427	830
0	0	0
14	20	34
22	14	36
441	**471**	**912**

L	T	R	P
6	1	0	0
140	245	42	0
0	0	0	0
10	8	2	0
7	7	0	0
166	**261**	**44**	**0**

Huffine Ln [E]

Out	In	Total
13	1	14
918	912	1830
1	1	2
25	26	51
18	24	42
975	**964**	**1939**

R	T	L	P
0	0	1	0
384	247	281	0
1	0	0	0
11	11	4	0
6	15	3	0
402	**273**	**289**	**0**

Gallatin Rd [S]

L	T	R	P
0	4	2	0
55	252	301	0
0	0	0	0
1	13	5	0
0	16	6	0
56	**285**	**314**	**0**

Out	In	Total
2	6	8
544	608	1152
0	0	0
17	19	36
23	22	45
586	**655**	**1241**

Turning Movement Peak Hour Data Plot (12:00 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Hwy 84_Hwy 85
Site Code: 1
Start Date: 08/22/2019

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Gallatin Rd Northbound					Jackrabbit Ln Southbound					Norris Rd Eastbound					Huffine Ln Westbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
4:45 PM	28	137	105	0	270	142	70	35	0	247	47	70	15	0	132	75	78	135	0	288	937
5:00 PM	30	113	98	0	241	140	78	37	0	255	37	96	17	0	150	81	94	161	0	336	982
5:15 PM	16	125	111	0	252	96	68	25	1	189	40	89	12	0	141	72	96	184	0	352	934
5:30 PM	24	107	116	0	247	126	71	35	0	232	42	79	9	0	130	65	111	140	0	316	925
Total	98	482	430	0	1010	504	287	132	1	923	166	334	53	0	553	293	379	620	0	1292	3778
Approach %	9.7	47.7	42.6	-	-	54.6	31.1	14.3	-	-	30.0	60.4	9.6	-	-	22.7	29.3	48.0	-	-	-
Total %	2.6	12.8	11.4	-	26.7	13.3	7.6	3.5	-	24.4	4.4	8.8	1.4	-	14.6	7.8	10.0	16.4	-	34.2	-
PHF	0.817	0.880	0.927	-	0.935	0.887	0.920	0.892	-	0.905	0.883	0.870	0.779	-	0.922	0.904	0.854	0.842	-	0.918	0.962
Motorcycles	0	13	1	-	14	1	0	0	-	1	0	1	0	-	1	0	1	1	-	2	18
% Motorcycles	0.0	2.7	0.2	-	1.4	0.2	0.0	0.0	-	0.1	0.0	0.3	0.0	-	0.2	0.0	0.3	0.2	-	0.2	0.5
Cars & Light Goods	95	419	418	-	932	497	275	130	-	902	148	326	52	-	526	288	370	599	-	1257	3617
% Cars & Light Goods	96.9	86.9	97.2	-	92.3	98.6	95.8	98.5	-	97.7	89.2	97.6	98.1	-	95.1	98.3	97.6	96.6	-	97.3	95.7
Buses	1	1	1	-	3	0	0	0	-	0	0	0	0	-	0	0	0	1	-	1	4
% Buses	1.0	0.2	0.2	-	0.3	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.2	-	0.1	0.1
Single-Unit Trucks	1	18	5	-	24	4	5	1	-	10	6	3	0	-	9	3	3	9	-	15	58
% Single-Unit Trucks	1.0	3.7	1.2	-	2.4	0.8	1.7	0.8	-	1.1	3.6	0.9	0.0	-	1.6	1.0	0.8	1.5	-	1.2	1.5
Articulated Trucks	1	31	5	-	37	2	7	1	-	10	12	4	1	-	17	2	5	10	-	17	81
% Articulated Trucks	1.0	6.4	1.2	-	3.7	0.4	2.4	0.8	-	1.1	7.2	1.2	1.9	-	3.1	0.7	1.3	1.6	-	1.3	2.1
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Hwy 84_Hwy 85
Site Code: 1
Start Date: 08/22/2019

Peak Hour Data

08/22/2019 4:45 PM
Ending At
08/22/2019 5:45 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Jackrabbit Ln [N]

Out	In	Total
14	1	15
1166	902	2068
2	0	2
33	10	43
53	10	63
1268	**923**	**2191**

R	T	L	P
0	0	1	0
130	275	497	0
0	0	0	0
1	5	4	0
1	7	2	1
132	**287**	**504**	**1**

Norris Rd [W]

Out	In	Total
1	1	2
595	526	1121
1	0	1
5	9	14
7	17	24
609	**553**	**1162**

L	T	R	P
0	1	0	0
148	326	52	0
0	0	0	0
6	3	0	0
12	4	1	0
166	**334**	**53**	**0**

Huffine Ln [E]

Out	In	Total
3	2	5
1241	1257	2498
1	1	2
12	15	27
11	17	28
1268	**1292**	**2560**

R	T	L	P
1	1	0	0
599	370	288	0
1	0	0	0
9	3	3	0
10	5	2	0
620	**379**	**293**	**0**

Gallatin Rd [S]

L	T	R	P
0	13	1	0
95	419	418	0
1	1	1	0
1	18	5	0
1	31	5	0
98	**482**	**430**	**0**

Out	In	Total
0	14	14
615	932	1547
0	3	3
8	24	32
10	37	47
633	**1010**	**1643**

Turning Movement Peak Hour Data Plot (4:45 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 08/22/2019

Turning Movement Data

Start Time	Gallatin Rd Northbound					Gallatin Rd Southbound					Mill St Eastbound					Rabel Ln Westbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
12:00 AM	0	4	0	0	4	0	3	0	0	3	0	0	1	0	1	0	2	0	0	2	10
12:15 AM	0	7	0	0	7	1	3	1	0	5	0	0	0	0	0	0	0	0	0	0	12
12:30 AM	0	2	0	0	2	0	4	0	0	4	1	0	0	0	1	0	0	0	0	0	7
12:45 AM	1	3	0	0	4	0	6	1	0	7	0	0	1	0	1	0	0	0	0	0	12
Hourly Total	1	16	0	0	17	1	16	2	0	19	1	0	2	0	3	0	2	0	0	2	41
1:00 AM	0	5	0	0	5	0	6	1	0	7	0	0	0	0	0	0	0	0	0	0	12
1:15 AM	1	2	0	0	3	0	4	0	0	4	1	0	0	0	1	0	0	0	0	0	8
1:30 AM	0	2	0	0	2	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	3
1:45 AM	0	6	0	0	6	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	8
Hourly Total	1	15	0	0	16	0	13	1	0	14	1	0	0	0	1	0	0	0	0	0	31
2:00 AM	0	0	0	0	0	0	5	1	0	6	0	0	0	0	0	0	0	0	0	0	6
2:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:30 AM	0	0	0	0	0	0	3	1	0	4	1	0	0	0	1	0	0	0	0	0	5
2:45 AM	0	3	0	0	3	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	6
Hourly Total	0	3	0	0	3	0	11	2	0	13	1	0	0	0	1	0	0	0	0	0	17
3:00 AM	0	1	0	0	1	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	6
3:15 AM	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
3:30 AM	0	1	0	0	1	0	3	0	0	3	1	0	0	0	1	0	0	0	0	0	5
3:45 AM	0	3	0	0	3	0	4	0	0	4	0	1	0	0	1	0	0	1	0	1	9
Hourly Total	0	9	0	0	9	0	12	0	0	12	1	1	0	0	2	0	0	1	0	1	24
4:00 AM	0	4	0	0	4	0	1	1	0	2	0	0	0	0	0	0	0	0	0	0	6
4:15 AM	0	10	0	0	10	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	15
4:30 AM	0	4	0	0	4	0	8	0	0	8	2	0	1	0	3	0	0	0	0	0	15
4:45 AM	0	5	0	0	5	0	10	0	0	10	0	0	0	0	0	0	0	0	0	0	15
Hourly Total	0	23	0	0	23	0	24	1	0	25	2	0	1	0	3	0	0	0	0	0	51
5:00 AM	0	4	0	0	4	2	20	0	0	22	0	0	0	0	0	0	0	0	0	0	26
5:15 AM	0	8	0	0	8	2	31	1	0	34	1	0	0	0	1	1	0	0	0	1	44
5:30 AM	0	14	0	0	14	9	63	0	0	72	4	1	0	0	5	1	0	0	0	1	92
5:45 AM	0	16	1	0	17	10	75	2	0	87	1	1	0	0	2	0	0	1	0	1	107
Hourly Total	0	42	1	0	43	23	189	3	0	215	6	2	0	0	8	2	0	1	0	3	269
6:00 AM	0	15	1	0	16	7	116	1	0	124	5	1	0	0	6	2	0	5	0	7	153
6:15 AM	0	23	1	0	24	11	147	0	0	158	5	2	1	0	8	0	0	0	0	0	190
6:30 AM	1	42	0	0	43	13	166	3	0	182	10	3	2	0	15	0	0	0	0	0	240
6:45 AM	2	43	0	0	45	11	142	10	0	163	8	2	2	0	12	2	3	2	0	7	227
Hourly Total	3	123	2	0	128	42	571	14	0	627	28	8	5	0	41	4	3	7	0	14	810
7:00 AM	0	24	2	0	26	12	166	9	0	187	5	1	5	0	11	2	1	7	0	10	234
7:15 AM	3	32	3	0	38	11	152	4	0	167	16	0	3	0	19	2	0	4	0	6	230
7:30 AM	3	54	0	0	57	12	142	8	0	162	11	3	2	0	16	4	2	7	0	13	248
7:45 AM	0	69	1	0	70	14	116	5	0	135	6	7	4	0	17	0	0	6	0	6	228
Hourly Total	6	179	6	0	191	49	576	26	0	651	38	11	14	0	63	8	3	24	0	35	940
8:00 AM	2	47	1	0	50	8	118	5	0	131	4	5	1	0	10	1	1	3	0	5	196
8:15 AM	2	71	0	0	73	25	135	3	0	163	9	1	0	0	10	3	1	2	0	6	252
8:30 AM	1	47	2	0	50	9	121	11	0	141	7	2	1	0	10	0	0	7	0	7	208
8:45 AM	3	84	1	0	88	8	118	3	0	129	6	1	1	0	8	4	1	3	0	8	233
Hourly Total	8	249	4	0	261	50	492	22	0	564	26	9	3	0	38	8	3	15	0	26	889
9:00 AM	0	53	1	0	54	6	105	4	0	115	6	2	4	0	12	1	1	4	0	6	187
9:15 AM	1	70	1	0	72	9	92	5	0	106	3	2	4	0	9	2	1	7	0	10	197
9:30 AM	2	85	2	0	89	4	78	4	0	86	10	1	5	0	16	3	1	7	0	11	202
9:45 AM	1	75	2	0	78	20	77	5	0	102	5	4	1	0	10	3	2	12	0	17	207
Hourly Total	4	283	6	0	293	39	352	18	0	409	24	9	14	0	47	9	5	30	0	44	793
10:00 AM	2	66	3	0	71	6	79	7	0	92	7	0	1	0	8	1	2	5	0	8	179
10:15 AM	7	67	2	0	76	7	71	5	0	83	4	1	3	0	8	0	2	9	0	11	178
10:30 AM	4	99	3	0	106	7	65	7	0	79	4	2	2	0	8	1	2	5	0	8	201
10:45 AM	2	66	4	0	72	8	80	9	0	97	11	0	0	0	11	1	0	9	0	10	190
Hourly Total	15	298	12	0	325	28	295	28	0	351	26	3	6	0	35	3	6	28	0	37	748
11:00 AM	3	70	1	0	74	8	84	6	0	98	7	1	1	0	9	2	0	9	0	11	192
11:15 AM	3	70	0	0	73	8	64	6	0	78	9	1	5	0	15	1	1	4	0	6	172
11:30 AM	2	76	2	0	80	9	76	8	0	93	1	0	2	0	3	1	0	5	0	6	182
11:45 AM	2	79	3	0	84	10	76	5	0	91	10	1	1	0	12	3	4	7	0	14	201
Hourly Total	10	295	6	0	311	35	300	25	0	360	27	3	9	0	39	7	5	25	0	37	747

12:00 PM	2	102	3	0	107	13	77	10	0	100	4	2	1	0	7	3	3	7	0	13	227
12:15 PM	4	76	1	0	81	7	59	9	0	75	10	3	2	0	15	1	1	6	0	8	179
12:30 PM	1	77	5	0	83	9	65	8	0	82	10	1	5	0	16	2	1	8	0	11	192
12:45 PM	2	80	4	0	86	10	80	7	0	97	8	1	2	0	11	4	2	6	0	12	206
Hourly Total	9	335	13	0	357	39	281	34	0	354	32	7	10	0	49	10	7	27	0	44	804
1:00 PM	3	92	0	0	95	7	76	9	0	92	5	1	2	0	8	2	1	7	0	10	205
1:15 PM	6	68	3	0	77	9	67	9	0	85	10	1	2	0	13	5	0	3	0	8	183
1:30 PM	2	99	1	0	102	8	66	13	0	87	5	3	2	0	10	2	0	7	0	9	208
1:45 PM	1	66	0	0	67	2	69	8	0	79	3	4	1	0	8	0	0	6	0	6	160
Hourly Total	12	325	4	0	341	26	278	39	0	343	23	9	7	0	39	9	1	23	0	33	756
2:00 PM	3	114	2	0	119	6	80	5	0	91	3	1	3	0	7	0	1	3	0	4	221
2:15 PM	3	75	1	0	79	18	76	11	0	105	5	2	1	0	8	6	1	5	0	12	204
2:30 PM	4	110	4	0	118	4	87	4	0	95	6	0	1	0	7	3	2	6	0	11	231
2:45 PM	5	129	3	0	137	5	67	7	0	79	5	1	0	0	6	1	3	8	0	12	234
Hourly Total	15	428	10	0	453	33	310	27	0	370	19	4	5	0	28	10	7	22	0	39	890
3:00 PM	3	135	4	0	142	8	69	12	0	89	5	1	1	0	7	3	1	10	0	14	252
3:15 PM	5	116	2	0	123	10	63	8	0	81	11	1	0	0	12	3	1	13	0	17	233
3:30 PM	4	117	4	0	125	8	70	5	0	83	7	1	0	0	8	5	2	9	0	16	232
3:45 PM	1	120	2	0	123	6	65	8	0	79	17	1	2	0	20	2	0	7	0	9	231
Hourly Total	13	488	12	0	513	32	267	33	0	332	40	4	3	0	47	13	4	39	0	56	948
4:00 PM	7	105	1	0	113	11	61	9	0	81	7	2	0	0	9	1	2	4	0	7	210
4:15 PM	5	127	1	0	133	6	68	14	0	88	8	1	2	0	11	2	2	5	0	9	241
4:30 PM	7	174	1	0	182	11	72	5	0	88	3	3	3	0	9	0	0	9	0	9	288
4:45 PM	3	136	2	0	141	3	77	19	0	99	12	1	3	0	16	1	2	15	0	18	274
Hourly Total	22	542	5	0	569	31	278	47	0	356	30	7	8	0	45	4	6	33	0	43	1013
5:00 PM	7	214	2	0	223	7	85	15	0	107	13	0	6	0	19	1	1	11	0	13	362
5:15 PM	9	168	3	0	180	8	76	16	0	100	10	2	2	0	14	0	1	5	0	6	300
5:30 PM	12	197	2	0	211	11	72	17	0	100	7	2	2	0	11	1	0	12	0	13	335
5:45 PM	7	179	3	0	189	6	54	5	0	65	2	1	16	0	19	2	0	7	0	9	282
Hourly Total	35	758	10	0	803	32	287	53	0	372	32	5	26	0	63	4	2	35	0	41	1279
6:00 PM	5	154	1	0	160	7	66	12	0	85	3	0	2	0	5	0	2	3	0	5	255
6:15 PM	5	113	0	0	118	4	54	11	0	69	11	3	4	0	18	1	0	4	0	5	210
6:30 PM	11	104	0	0	115	4	64	14	0	82	5	4	4	0	13	0	3	12	0	15	225
6:45 PM	6	102	2	0	110	4	49	11	0	64	13	1	4	0	18	0	0	5	0	5	197
Hourly Total	27	473	3	0	503	19	233	48	0	300	32	8	14	0	54	1	5	24	0	30	887
7:00 PM	6	48	0	0	54	5	55	14	0	74	10	1	3	0	14	0	1	6	0	7	149
7:15 PM	2	87	1	0	90	4	42	6	0	52	4	3	2	0	9	1	1	3	0	5	156
7:30 PM	3	55	0	0	58	7	48	8	0	63	9	2	2	0	13	0	1	3	0	4	138
7:45 PM	3	44	0	0	47	6	38	8	0	52	5	1	3	0	9	2	0	2	0	4	112
Hourly Total	14	234	1	0	249	22	183	36	0	241	28	7	10	0	45	3	3	14	0	20	555
8:00 PM	0	40	0	0	40	5	40	8	0	53	3	0	3	0	6	0	1	1	0	2	101
8:15 PM	0	53	0	0	53	4	30	5	0	39	4	1	4	0	9	1	0	1	0	2	103
8:30 PM	6	38	1	0	45	5	24	2	0	31	7	0	4	0	11	0	0	1	0	1	88
8:45 PM	2	40	0	0	42	0	25	3	0	28	4	0	0	0	4	0	0	0	0	0	74
Hourly Total	8	171	1	0	180	14	119	18	0	151	18	1	11	0	30	1	1	3	0	5	366
9:00 PM	0	16	0	0	16	5	20	7	0	32	7	0	2	0	9	0	1	1	0	2	59
9:15 PM	0	33	0	0	33	3	26	9	0	38	5	0	0	0	5	0	2	2	0	4	80
9:30 PM	2	23	0	0	25	1	24	6	0	31	9	1	2	0	12	0	0	1	0	1	69
9:45 PM	0	33	0	0	33	3	29	1	0	33	2	0	0	0	2	0	1	1	0	2	70
Hourly Total	2	105	0	0	107	12	99	23	0	134	23	1	4	0	28	0	4	5	0	9	278
10:00 PM	0	21	0	0	21	1	28	2	0	31	2	0	0	0	2	0	0	0	0	0	54
10:15 PM	2	22	0	0	24	2	16	1	0	19	4	0	0	0	4	1	0	0	0	1	48
10:30 PM	0	18	0	0	18	1	15	1	0	17	2	0	0	0	2	0	1	0	0	1	38
10:45 PM	1	24	0	0	25	0	13	1	0	14	3	0	0	0	3	0	0	0	0	0	42
Hourly Total	3	85	0	0	88	4	72	5	0	81	11	0	0	0	11	1	1	0	0	2	182
11:00 PM	0	18	0	0	18	0	15	1	0	16	0	1	2	0	3	0	0	0	0	0	37
11:15 PM	1	24	0	0	25	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	32
11:30 PM	0	19	0	0	19	0	5	0	0	5	0	0	0	0	0	0	0	1	0	1	25
11:45 PM	0	7	0	0	7	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	11
Hourly Total	1	68	0	0	69	0	31	1	0	32	0	1	2	0	3	0	0	1	0	1	105
Grand Total	209	5547	96	0	5852	531	5289	506	0	6326	469	100	154	0	723	97	68	357	0	522	13423
Approach %	3.6	94.8	1.6	-	-	8.4	83.6	8.0	-	-	64.9	13.8	21.3	-	-	18.6	13.0	68.4	-	-	-
Total %	1.6	41.3	0.7	-	43.6	4.0	39.4	3.8	-	47.1	3.5	0.7	1.1	-	5.4	0.7	0.5	2.7	-	3.9	-
Motorcycles	3	29	0	-	32	3	9	2	-	14	0	1	1	-	2	0	2	4	-	6	54
% Motorcycles	1.4	0.5	0.0	-	0.5	0.6	0.2	0.4	-	0.2	0.0	1.0	0.6	-	0.3	0.0	2.9	1.1	-	1.1	0.4
Cars & Light Goods	193	4979	89	-	5261	500	4795	478	-	5773	445	96	146	-	687	91	65	331	-	487	12208
% Cars & Light Goods	92.3	89.8	92.7	-	89.9	94.2	90.7	94.5	-	91.3	94.9	96.0	94.8	-	95.0	93.8	95.6	92.7	-	93.3	90.9
Buses	1	18	0	-	19	0	16	0	-	16	0	0	1	-	1	0	0	2	-	2	38
% Buses	0.5	0.3	0.0	-	0.3	0.0	0.3	0.0	-	0.3	0.0	0.0	0.6	-	0.1	0.0	0.0	0.6	-	0.4	0.3
Single-Unit Trucks	8	225	4	-	237	24	225	15	-	264	21	0	4	-	25	3	0	16	-	19	545
% Single-Unit Trucks	3.8	4.1	4.2	-	4.0	4.5	4.3	3.0	-	4.2	4.5	0.0	2.6	-	3.5	3.1	0.0	4.5	-	3.6	4.1
Articulated Trucks	4	295	2	-	301	4	241	10	-	255	3	2	0	-	5	2	0	4	-	6	567
% Articulated Trucks	1.9	5.3	2.1	-	5.1	0.8	4.6	2.0	-	4.0	0.6	2.0	0.0	-	0.7	2.1	0.0	1.1	-	1.1	4.2

Bicycles on Road	0	1	1	-	2	0	3	1	-	4	0	1	2	-	3	1	1	0	-	2	11
% Bicycles on Road	0.0	0.0	1.0	-	0.0	0.0	0.1	0.2	-	0.1	0.0	1.0	1.3	-	0.4	1.0	1.5	0.0	-	0.4	0.1
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 08/22/2019
Page No: 4

Gallatin Rd [N]

Out	In	Total
33	14	47
5755	5773	11528
20	16	36
262	264	526
303	259	562
6373	**6326**	**12699**

2	9	3	0
478	4795	500	0
0	16	0	0
15	225	24	0
11	244	4	0
506	**5289**	**531**	**0**
R	T	L	P

Mill St [W]

Out	In	Total
7	2	9
736	687	1423
1	1	2
23	25	48
16	8	24
783	**723**	**1506**

L	T	R	P
0	1	1	0
445	96	146	0
0	0	1	0
21	0	4	0
3	3	2	0
469	**100**	**154**	**0**

08/22/2019 12:00 AM
Ending At
08/23/2019 12:00 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Rabel Ln [E]

R	T	L	P
4	2	0	0
331	65	91	0
2	0	0	0
16	0	3	0
4	1	3	0
357	**68**	**97**	**0**

Out	In	Total
4	6	10
685	487	1172
0	2	2
28	19	47
10	8	18
727	**522**	**1249**

L	T	R	P
3	29	0	0
193	4979	89	0
1	18	0	0
8	225	4	0
4	296	3	0
209	**5547**	**96**	**0**

10	32	42
5032	5261	10293
17	19	36
232	237	469
249	303	552
5540	**5852**	**11392**
Out	In	Total

Gallatin Rd [S]

Turning Movement Data Plot

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (7:00 AM)

	Gallatin Rd Northbound					Gallatin Rd Southbound					Mill St Eastbound					Rabel Ln Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	0	24	2	0	26	12	166	9	0	187	5	1	5	0	11	2	1	7	0	10	234
7:15 AM	3	32	3	0	38	11	152	4	0	167	16	0	3	0	19	2	0	4	0	6	230
7:30 AM	3	54	0	0	57	12	142	8	0	162	11	3	2	0	16	4	2	7	0	13	248
7:45 AM	0	69	1	0	70	14	116	5	0	135	6	7	4	0	17	0	0	6	0	6	228
Total	6	179	6	0	191	49	576	26	0	651	38	11	14	0	63	8	3	24	0	35	940
Approach %	3.1	93.7	3.1	-	-	7.5	88.5	4.0	-	-	60.3	17.5	22.2	-	-	22.9	8.6	68.6	-	-	-
Total %	0.6	19.0	0.6	-	20.3	5.2	61.3	2.8	-	69.3	4.0	1.2	1.5	-	6.7	0.9	0.3	2.6	-	3.7	-
PHF	0.500	0.649	0.500	-	0.682	0.875	0.867	0.722	-	0.870	0.594	0.393	0.700	-	0.829	0.500	0.375	0.857	-	0.673	0.948
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	5	166	6	-	177	46	505	23	-	574	36	11	13	-	60	8	3	23	-	34	845
% Cars & Light Goods	83.3	92.7	100.0	-	92.7	93.9	87.7	88.5	-	88.2	94.7	100.0	92.9	-	95.2	100.0	100.0	95.8	-	97.1	89.9
Buses	1	1	0	-	2	0	2	0	-	2	0	0	1	-	1	0	0	0	-	0	5
% Buses	16.7	0.6	0.0	-	1.0	0.0	0.3	0.0	-	0.3	0.0	0.0	7.1	-	1.6	0.0	0.0	0.0	-	0.0	0.5
Single-Unit Trucks	0	4	0	-	4	2	47	1	-	50	2	0	0	-	2	0	0	1	-	1	57
% Single-Unit Trucks	0.0	2.2	0.0	-	2.1	4.1	8.2	3.8	-	7.7	5.3	0.0	0.0	-	3.2	0.0	0.0	4.2	-	2.9	6.1
Articulated Trucks	0	8	0	-	8	1	21	2	-	24	0	0	0	-	0	0	0	0	-	0	32
% Articulated Trucks	0.0	4.5	0.0	-	4.2	2.0	3.6	7.7	-	3.7	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	3.4
Bicycles on Road	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	1
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.2	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.1
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 08/22/2019

Peak Hour Data

08/22/2019 7:00 AM
Ending At
08/22/2019 8:00 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
0	0	0
225	574	799
1	2	3
7	50	57
8	25	33
241	**651**	**892**

R	T	L	P
0	0	0	0
23	505	46	0
0	2	0	0
1	47	2	0
2	22	1	0
26	**576**	**49**	**0**

Mill St [W]

Out	In	Total
0	0	0
31	60	91
1	1	2
1	2	3
2	0	2
35	**63**	**98**

L	T	R	P
0	0	0	0
36	11	13	0
0	0	1	0
2	0	0	0
0	0	0	0
38	**11**	**14**	**0**

Rabel Ln [E]

Out	In	Total
0	0	0
63	34	97
0	0	0
2	1	3
1	0	1
66	**35**	**101**

R	T	L	P
0	0	0	0
23	3	8	0
0	0	0	0
1	0	0	0
0	0	0	0
24	**3**	**8**	**0**

L	T	R	P
0	0	0	0
5	166	6	0
1	1	0	0
0	4	0	0
0	8	0	0
6	**179**	**6**	**0**

Out	In	Total
0	0	0
526	177	703
3	2	5
47	4	51
22	8	30
598	**191**	**789**

Gallatin Rd [S]

Turning Movement Peak Hour Data Plot (7:00 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 08/22/2019

Turning Movement Peak Hour Data (12:00 PM)

Start Time	Gallatin Rd Northbound					Gallatin Rd Southbound					Mill St Eastbound					Rabel Ln Westbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
12:00 PM	2	102	3	0	107	13	77	10	0	100	4	2	1	0	7	3	3	7	0	13	227
12:15 PM	4	76	1	0	81	7	59	9	0	75	10	3	2	0	15	1	1	6	0	8	179
12:30 PM	1	77	5	0	83	9	65	8	0	82	10	1	5	0	16	2	1	8	0	11	192
12:45 PM	2	80	4	0	86	10	80	7	0	97	8	1	2	0	11	4	2	6	0	12	206
Total	9	335	13	0	357	39	281	34	0	354	32	7	10	0	49	10	7	27	0	44	804
Approach %	2.5	93.8	3.6	-	-	11.0	79.4	9.6	-	-	65.3	14.3	20.4	-	-	22.7	15.9	61.4	-	-	-
Total %	1.1	41.7	1.6	-	44.4	4.9	35.0	4.2	-	44.0	4.0	0.9	1.2	-	6.1	1.2	0.9	3.4	-	5.5	-
PHF	0.563	0.821	0.650	-	0.834	0.750	0.878	0.850	-	0.885	0.800	0.583	0.500	-	0.766	0.625	0.583	0.844	-	0.846	0.885
Motorcycles	0	6	0	-	6	0	0	0	-	0	0	0	1	-	1	0	0	0	-	0	7
% Motorcycles	0.0	1.8	0.0	-	1.7	0.0	0.0	0.0	-	0.0	0.0	0.0	10.0	-	2.0	0.0	0.0	0.0	-	0.0	0.9
Cars & Light Goods	9	293	12	-	314	36	251	33	-	320	30	7	9	-	46	9	6	27	-	42	722
% Cars & Light Goods	100.0	87.5	92.3	-	88.0	92.3	89.3	97.1	-	90.4	93.8	100.0	90.0	-	93.9	90.0	85.7	100.0	-	95.5	89.8
Buses	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Buses	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Single-Unit Trucks	0	22	1	-	23	3	20	1	-	24	2	0	0	-	2	1	0	0	-	1	50
% Single-Unit Trucks	0.0	6.6	7.7	-	6.4	7.7	7.1	2.9	-	6.8	6.3	0.0	0.0	-	4.1	10.0	0.0	0.0	-	2.3	6.2
Articulated Trucks	0	14	0	-	14	0	10	0	-	10	0	0	0	-	0	0	0	0	-	0	24
% Articulated Trucks	0.0	4.2	0.0	-	3.9	0.0	3.6	0.0	-	2.8	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	3.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	1	0	-	1	1
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	14.3	0.0	-	2.3	0.1
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Peak Hour Data

08/22/2019 12:00 PM
Ending At
08/22/2019 1:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
6	0	6
350	320	670
0	0	0
24	24	48
14	10	24
394	**354**	**748**

R	T	L	P
0	0	0	0
33	251	36	0
0	0	0	0
1	20	3	0
0	10	0	0
34	**281**	**39**	**0**

Mill St [W]

Out	In	Total
0	1	1
48	46	94
0	0	0
1	2	3
1	0	1
50	**49**	**99**

L	T	R	P
0	0	1	0
30	7	9	0
0	0	0	0
2	0	0	0
0	0	0	0
32	**7**	**10**	**0**

Rabel Ln [E]

Out	In	Total
0	0	0
55	42	97
0	0	0
4	1	5
0	1	1
59	**44**	**103**

R	T	L	P
0	0	0	0
27	6	9	0
0	0	0	0
0	0	1	0
0	1	0	0
27	**7**	**10**	**0**

L	T	R	P
0	6	0	0
9	293	12	0
0	0	0	0
0	22	1	0
0	14	0	0
9	**335**	**13**	**0**

Out	In	Total
1	6	7
269	314	583
0	0	0
21	23	44
10	14	24
301	**357**	**658**

Gallatin Rd [S]

Turning Movement Peak Hour Data Plot (12:00 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 08/22/2019

Turning Movement Peak Hour Data (5:00 PM)

	Gallatin Rd Northbound					Gallatin Rd Southbound					Mill St Eastbound					Rabel Ln Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
5:00 PM	7	214	2	0	223	7	85	15	0	107	13	0	6	0	19	1	1	11	0	13	362
5:15 PM	9	168	3	0	180	8	76	16	0	100	10	2	2	0	14	0	1	5	0	6	300
5:30 PM	12	197	2	0	211	11	72	17	0	100	7	2	2	0	11	1	0	12	0	13	335
5:45 PM	7	179	3	0	189	6	54	5	0	65	2	1	16	0	19	2	0	7	0	9	282
Total	35	758	10	0	803	32	287	53	0	372	32	5	26	0	63	4	2	35	0	41	1279
Approach %	4.4	94.4	1.2	-	-	8.6	77.2	14.2	-	-	50.8	7.9	41.3	-	-	9.8	4.9	85.4	-	-	-
Total %	2.7	59.3	0.8	-	62.8	2.5	22.4	4.1	-	29.1	2.5	0.4	2.0	-	4.9	0.3	0.2	2.7	-	3.2	-
PHF	0.729	0.886	0.833	-	0.900	0.727	0.844	0.779	-	0.869	0.615	0.625	0.406	-	0.829	0.500	0.500	0.729	-	0.788	0.883
Motorcycles	0	9	0	-	9	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	9
% Motorcycles	0.0	1.2	0.0	-	1.1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.7
Cars & Light Goods	32	691	9	-	732	30	279	53	-	362	30	5	26	-	61	4	2	32	-	38	1193
% Cars & Light Goods	91.4	91.2	90.0	-	91.2	93.8	97.2	100.0	-	97.3	93.8	100.0	100.0	-	96.8	100.0	100.0	91.4	-	92.7	93.3
Buses	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1
% Buses	0.0	0.1	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.1
Single-Unit Trucks	1	21	0	-	22	2	2	0	-	4	2	0	0	-	2	0	0	2	-	2	30
% Single-Unit Trucks	2.9	2.8	0.0	-	2.7	6.3	0.7	0.0	-	1.1	6.3	0.0	0.0	-	3.2	0.0	0.0	5.7	-	4.9	2.3
Articulated Trucks	2	36	1	-	39	0	6	0	-	6	0	0	0	-	0	0	0	1	-	1	46
% Articulated Trucks	5.7	4.7	10.0	-	4.9	0.0	2.1	0.0	-	1.6	0.0	0.0	0.0	-	0.0	0.0	0.0	2.9	-	2.4	3.6
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Peak Hour Data

08/22/2019 5:00 PM
Ending At
08/22/2019 6:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
9	0	9
753	362	1115
1	0	1
25	4	29
37	6	43
825	**372**	**1197**

R	T	L	P
0	0	0	0
53	279	30	0
0	0	0	0
0	2	2	0
0	6	0	0
53	**287**	**32**	**0**

Mill St [W]

Out	In	Total
0	0	0
87	61	148
0	0	0
1	2	3
2	0	2
90	**63**	**153**

L	T	R	P
0	0	0	0
30	5	26	0
0	0	0	0
2	0	0	0
0	0	0	0
32	**5**	**26**	**0**

Rabel Ln [E]

Out	In	Total
0	0	0
44	38	82
0	0	0
2	2	4
1	1	2
47	**41**	**88**

R	T	L	P
0	0	0	0
32	2	4	0
0	0	0	0
2	0	0	0
1	0	0	0
35	**2**	**4**	**0**

L	T	R	P
0	9	0	0
32	691	9	0
0	1	0	0
1	21	0	0
2	36	1	0
35	**758**	**10**	**0**

Out	In	Total
0	9	9
309	732	1041
0	1	1
2	22	24
6	39	45
317	**803**	**1120**

Gallatin Rd [S]

Turning Movement Peak Hour Data Plot (5:00 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Hwy 64
Site Code: 3
Start Date: 08/22/2019

Turning Movement Data

Start Time	Gallatin Rd Northbound				Gallatin Rd Southbound				Eastbound Approach Eastbound				
	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
12:00 AM	2	4	0	6	2	10	0	12	0	1	0	1	19
12:15 AM	3	1	0	4	3	2	0	5	2	1	0	3	12
12:30 AM	0	3	0	3	1	2	0	3	1	1	0	2	8
12:45 AM	0	0	0	0	3	2	0	5	0	2	0	2	7
Hourly Total	5	8	0	13	9	16	0	25	3	5	0	8	46
1:00 AM	0	2	0	2	0	2	0	2	0	0	0	0	4
1:15 AM	0	3	0	3	2	1	0	3	2	5	0	7	13
1:30 AM	0	0	0	0	4	4	0	8	2	0	0	2	10
1:45 AM	1	1	0	2	2	0	0	2	0	1	0	1	5
Hourly Total	1	6	0	7	8	7	0	15	4	6	0	10	32
2:00 AM	2	0	0	2	0	0	0	0	1	2	0	3	5
2:15 AM	0	3	0	3	3	0	0	3	1	1	0	2	8
2:30 AM	0	2	0	2	2	1	0	3	1	1	0	2	7
2:45 AM	0	3	0	3	1	0	0	1	1	0	0	1	5
Hourly Total	2	8	0	10	6	1	0	7	4	4	0	8	25
3:00 AM	3	2	0	5	0	0	0	0	0	0	0	0	5
3:15 AM	0	1	0	1	3	0	0	3	0	0	0	0	4
3:30 AM	0	3	0	3	4	2	0	6	0	1	0	1	10
3:45 AM	0	4	0	4	0	0	0	0	5	0	0	5	9
Hourly Total	3	10	0	13	7	2	0	9	5	1	0	6	28
4:00 AM	0	2	0	2	1	1	0	2	1	1	0	2	6
4:15 AM	0	0	0	0	3	1	0	4	2	1	0	3	7
4:30 AM	1	0	0	1	2	1	0	3	1	1	0	2	6
4:45 AM	0	2	0	2	2	5	0	7	1	0	0	1	10
Hourly Total	1	4	0	5	8	8	0	16	5	3	0	8	29
5:00 AM	1	1	0	2	2	2	0	4	1	3	0	4	10
5:15 AM	2	3	0	5	2	12	0	14	3	2	0	5	24
5:30 AM	4	5	0	9	2	14	0	16	6	3	0	9	34
5:45 AM	6	0	0	6	6	35	0	41	7	1	0	8	55
Hourly Total	13	9	0	22	12	63	0	75	17	9	0	26	123
6:00 AM	6	8	0	14	21	50	0	71	13	4	0	17	102
6:15 AM	17	4	0	21	11	82	0	93	15	9	0	24	138
6:30 AM	24	7	0	31	16	97	0	113	10	17	0	27	171
6:45 AM	33	9	0	42	11	72	0	83	15	27	0	42	167
Hourly Total	80	28	0	108	59	301	0	360	53	57	0	110	578
7:00 AM	19	9	0	28	35	129	0	164	19	11	0	30	222
7:15 AM	22	19	0	41	38	158	0	196	18	34	0	52	289
7:30 AM	34	10	0	44	39	144	0	183	19	34	0	53	280
7:45 AM	53	17	0	70	26	106	0	132	25	40	0	65	267
Hourly Total	128	55	0	183	138	537	0	675	81	119	0	200	1058
8:00 AM	38	25	0	63	38	154	0	192	25	32	0	57	312
8:15 AM	39	20	0	59	19	87	0	106	38	31	0	69	234
8:30 AM	28	19	0	47	38	106	0	144	37	36	0	73	264
8:45 AM	44	28	0	72	24	83	0	107	38	45	0	83	262
Hourly Total	149	92	0	241	119	430	0	549	138	144	0	282	1072
9:00 AM	48	19	0	67	35	100	0	135	46	49	0	95	297
9:15 AM	43	28	0	71	26	91	0	117	31	40	0	71	259
9:30 AM	36	26	0	62	31	72	0	103	42	44	0	86	251
9:45 AM	43	26	0	69	27	83	0	110	49	33	0	82	261
Hourly Total	170	99	0	269	119	346	0	465	168	166	0	334	1068
10:00 AM	41	26	0	67	16	47	0	63	36	29	0	65	195
10:15 AM	48	28	0	76	26	66	0	92	40	31	0	71	239
10:30 AM	26	28	0	54	22	67	0	89	25	41	0	66	209
10:45 AM	34	29	0	63	12	53	0	65	51	45	0	96	224
Hourly Total	149	111	0	260	76	233	0	309	152	146	0	298	867
11:00 AM	55	20	0	75	24	40	0	64	47	46	0	93	232
11:15 AM	40	28	0	68	13	41	0	54	53	38	0	91	213
11:30 AM	44	31	0	75	27	58	0	85	44	39	0	83	243
11:45 AM	46	28	0	74	32	53	0	85	38	48	0	86	245
Hourly Total	185	107	0	292	96	192	0	288	182	171	0	353	933
12:00 PM	39	21	0	60	15	28	0	43	37	29	0	66	169

12:15 PM	38	32	0	70	28	55	0	83	50	54	0	104	257
12:30 PM	34	23	0	57	25	27	0	52	51	46	0	97	206
12:45 PM	53	18	0	71	23	34	0	57	50	42	0	92	220
Hourly Total	164	94	0	258	91	144	0	235	188	171	0	359	852
1:00 PM	27	28	0	55	25	46	0	71	37	35	0	72	198
1:15 PM	39	39	0	78	26	29	0	55	44	55	0	99	232
1:30 PM	36	31	0	67	34	41	0	75	59	39	0	98	240
1:45 PM	43	36	0	79	25	41	0	66	46	42	0	88	233
Hourly Total	145	134	0	279	110	157	0	267	186	171	0	357	903
2:00 PM	57	38	0	95	15	34	0	49	65	59	0	124	268
2:15 PM	45	37	0	82	35	30	0	65	86	52	0	138	285
2:30 PM	32	33	0	65	35	38	0	73	91	45	0	136	274
2:45 PM	47	39	0	86	28	43	0	71	82	37	0	119	276
Hourly Total	181	147	0	328	113	145	0	258	324	193	0	517	1103
3:00 PM	30	21	0	51	34	42	0	76	72	47	0	119	246
3:15 PM	39	34	0	73	27	42	0	69	77	46	0	123	265
3:30 PM	34	36	0	70	14	27	0	41	84	42	0	126	237
3:45 PM	43	28	0	71	28	44	0	72	104	61	0	165	308
Hourly Total	146	119	0	265	103	155	0	258	337	196	0	533	1056
4:00 PM	40	47	0	87	25	29	0	54	94	44	0	138	279
4:15 PM	47	37	0	84	29	50	0	79	126	63	0	189	352
4:30 PM	42	42	0	84	21	35	0	56	116	59	0	175	315
4:45 PM	41	47	0	88	21	42	0	63	118	47	0	165	316
Hourly Total	170	173	0	343	96	156	0	252	454	213	0	667	1262
5:00 PM	23	57	0	80	24	40	0	64	146	66	0	212	356
5:15 PM	32	35	0	67	29	44	0	73	143	41	0	184	324
5:30 PM	43	24	0	67	32	46	0	78	102	40	0	142	287
5:45 PM	39	40	0	79	28	33	0	61	83	68	0	151	291
Hourly Total	137	156	0	293	113	163	0	276	474	215	0	689	1258
6:00 PM	67	37	0	104	18	38	0	56	84	53	0	137	297
6:15 PM	48	24	0	72	21	33	0	54	65	35	0	100	226
6:30 PM	48	25	0	73	19	30	0	49	46	34	0	80	202
6:45 PM	46	28	0	74	13	29	0	42	47	25	0	72	188
Hourly Total	209	114	0	323	71	130	0	201	242	147	0	389	913
7:00 PM	37	22	0	59	14	34	0	48	36	25	0	61	168
7:15 PM	38	21	0	59	13	24	0	37	28	41	0	69	165
7:30 PM	31	9	0	40	21	22	0	43	40	38	0	78	161
7:45 PM	23	9	0	32	10	21	0	31	37	20	0	57	120
Hourly Total	129	61	0	190	58	101	0	159	141	124	0	265	614
8:00 PM	19	16	0	35	13	22	0	35	31	19	0	50	120
8:15 PM	17	9	0	26	9	15	0	24	20	19	0	39	89
8:30 PM	18	14	0	32	12	13	0	25	16	16	0	32	89
8:45 PM	9	17	0	26	10	14	0	24	7	16	0	23	73
Hourly Total	63	56	0	119	44	64	0	108	74	70	0	144	371
9:00 PM	13	17	0	30	7	5	0	12	19	14	0	33	75
9:15 PM	25	14	0	39	12	16	0	28	16	14	0	30	97
9:30 PM	9	10	0	19	9	11	0	20	13	13	0	26	65
9:45 PM	11	5	0	16	4	10	0	14	14	10	0	24	54
Hourly Total	58	46	0	104	32	42	0	74	62	51	0	113	291
10:00 PM	12	14	0	26	7	13	0	20	13	8	0	21	67
10:15 PM	13	8	0	21	4	12	0	16	15	9	0	24	61
10:30 PM	9	7	0	16	11	12	0	23	19	17	0	36	75
10:45 PM	7	8	0	15	3	6	0	9	16	4	0	20	44
Hourly Total	41	37	0	78	25	43	0	68	63	38	0	101	247
11:00 PM	5	11	0	16	2	2	0	4	9	3	0	12	32
11:15 PM	4	1	0	5	5	3	0	8	6	6	0	12	25
11:30 PM	4	1	0	5	3	10	0	13	4	2	0	6	24
11:45 PM	3	6	0	9	1	2	0	3	3	3	0	6	18
Hourly Total	16	19	0	35	11	17	0	28	22	14	0	36	99
Grand Total	2345	1693	0	4038	1524	3453	0	4977	3379	2434	0	5813	14828
Approach %	58.1	41.9	-	-	30.6	69.4	-	-	58.1	41.9	-	-	-
Total %	15.8	11.4	-	27.2	10.3	23.3	-	33.6	22.8	16.4	-	39.2	-
Motorcycles	12	28	-	40	7	5	-	12	12	7	-	19	71
% Motorcycles	0.5	1.7	-	1.0	0.5	0.1	-	0.2	0.4	0.3	-	0.3	0.5
Cars & Light Goods	2056	1419	-	3475	1282	3184	-	4466	3082	2146	-	5228	13169
% Cars & Light Goods	87.7	83.8	-	86.1	84.1	92.2	-	89.7	91.2	88.2	-	89.9	88.8
Buses	20	6	-	26	4	13	-	17	11	28	-	39	82
% Buses	0.9	0.4	-	0.6	0.3	0.4	-	0.3	0.3	1.2	-	0.7	0.6
Single-Unit Trucks	130	77	-	207	72	137	-	209	138	137	-	275	691
% Single-Unit Trucks	5.5	4.5	-	5.1	4.7	4.0	-	4.2	4.1	5.6	-	4.7	4.7
Articulated Trucks	127	163	-	290	159	113	-	272	136	115	-	251	813
% Articulated Trucks	5.4	9.6	-	7.2	10.4	3.3	-	5.5	4.0	4.7	-	4.3	5.5
Bicycles on Road	0	0	-	0	0	1	-	1	0	1	-	1	2
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Hwy 64
Site Code: 3
Start Date: 08/22/2019

Gallatin Rd [N]

Out	In	Total
40	12	52
4501	4466	8967
17	17	34
215	209	424
299	273	572
5072	**4977**	**10049**

R	T	P
5	7	0
3184	1282	0
13	4	0
137	72	0
114	159	0
3453	**1524**	**0**

Eastbound Approach [W]

Out	In	Total
17	19	36
5240	5228	10468
33	39	72
267	275	542
241	252	493
5798	**5813**	**11611**

L	R	P
12	7	0
3082	2146	0
11	28	0
138	137	0
136	116	0
3379	**2434**	**0**

08/22/2019 12:00 AM
Ending At
08/23/2019 12:00 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T	P
12	28	0
2056	1419	0
20	6	0
130	77	0
127	163	0
2345	**1693**	**0**

Out	In	Total
14	40	54
3428	3475	6903
32	26	58
209	207	416
275	290	565
3958	**4038**	**7996**

Gallatin Rd [S]

Turning Movement Data Plot

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Gallatin Rd Northbound				Gallatin Rd Southbound				Eastbound Approach Eastbound				
	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
7:15 AM	22	19	0	41	38	158	0	196	18	34	0	52	289
7:30 AM	34	10	0	44	39	144	0	183	19	34	0	53	280
7:45 AM	53	17	0	70	26	106	0	132	25	40	0	65	267
8:00 AM	38	25	0	63	38	154	0	192	25	32	0	57	312
Total	147	71	0	218	141	562	0	703	87	140	0	227	1148
Approach %	67.4	32.6	-	-	20.1	79.9	-	-	38.3	61.7	-	-	-
Total %	12.8	6.2	-	19.0	12.3	49.0	-	61.2	7.6	12.2	-	19.8	-
PHF	0.693	0.710	-	0.779	0.904	0.889	-	0.897	0.870	0.875	-	0.873	0.920
Motorcycles	0	0	-	0	0	0	-	0	0	1	-	1	1
% Motorcycles	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.7	-	0.4	0.1
Cars & Light Goods	124	58	-	182	102	518	-	620	81	130	-	211	1013
% Cars & Light Goods	84.4	81.7	-	83.5	72.3	92.2	-	88.2	93.1	92.9	-	93.0	88.2
Buses	2	1	-	3	0	1	-	1	1	2	-	3	7
% Buses	1.4	1.4	-	1.4	0.0	0.2	-	0.1	1.1	1.4	-	1.3	0.6
Single-Unit Trucks	11	3	-	14	13	24	-	37	3	6	-	9	60
% Single-Unit Trucks	7.5	4.2	-	6.4	9.2	4.3	-	5.3	3.4	4.3	-	4.0	5.2
Articulated Trucks	10	9	-	19	26	19	-	45	2	1	-	3	67
% Articulated Trucks	6.8	12.7	-	8.7	18.4	3.4	-	6.4	2.3	0.7	-	1.3	5.8
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
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Count Name: US 191_Hwy 64
Site Code: 3
Start Date: 08/22/2019
Page No: 5

Peak Hour Data

08/22/2019 7:15 AM
Ending At
08/22/2019 8:15 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
0	0	0
139	620	759
2	1	3
6	37	43
11	45	56
158	**703**	**861**

R	T	P
0	0	0
518	102	0
1	0	0
24	13	0
19	26	0
562	**141**	**0**

Eastbound Approach [W]

Out	In	Total
0	1	1
642	211	853
3	3	6
35	9	44
29	3	32
709	**227**	**936**

L	R	P
0	1	0
81	130	0
1	2	0
3	6	0
2	1	0
87	**140**	**0**

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T	P
0	0	0
124	58	0
2	1	0
11	3	0
10	9	0
147	**71**	**0**

Out	In	Total
1	0	1
232	182	414
2	3	5
19	14	33
27	19	46
281	**218**	**499**

Gallatin Rd [S]

Turning Movement Peak Hour Data Plot (7:15 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (11:00 AM)

Start Time	Gallatin Rd Northbound				Gallatin Rd Southbound				Eastbound Approach Eastbound				
	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
11:00 AM	55	20	0	75	24	40	0	64	47	46	0	93	232
11:15 AM	40	28	0	68	13	41	0	54	53	38	0	91	213
11:30 AM	44	31	0	75	27	58	0	85	44	39	0	83	243
11:45 AM	46	28	0	74	32	53	0	85	38	48	0	86	245
Total	185	107	0	292	96	192	0	288	182	171	0	353	933
Approach %	63.4	36.6	-	-	33.3	66.7	-	-	51.6	48.4	-	-	-
Total %	19.8	11.5	-	31.3	10.3	20.6	-	30.9	19.5	18.3	-	37.8	-
PHF	0.841	0.863	-	0.973	0.750	0.828	-	0.847	0.858	0.891	-	0.949	0.952
Motorcycles	4	3	-	7	5	0	-	5	2	2	-	4	16
% Motorcycles	2.2	2.8	-	2.4	5.2	0.0	-	1.7	1.1	1.2	-	1.1	1.7
Cars & Light Goods	144	94	-	238	72	167	-	239	156	132	-	288	765
% Cars & Light Goods	77.8	87.9	-	81.5	75.0	87.0	-	83.0	85.7	77.2	-	81.6	82.0
Buses	2	0	-	2	1	0	-	1	0	1	-	1	4
% Buses	1.1	0.0	-	0.7	1.0	0.0	-	0.3	0.0	0.6	-	0.3	0.4
Single-Unit Trucks	16	6	-	22	10	8	-	18	10	18	-	28	68
% Single-Unit Trucks	8.6	5.6	-	7.5	10.4	4.2	-	6.3	5.5	10.5	-	7.9	7.3
Articulated Trucks	19	4	-	23	8	17	-	25	14	17	-	31	79
% Articulated Trucks	10.3	3.7	-	7.9	8.3	8.9	-	8.7	7.7	9.9	-	8.8	8.5
Bicycles on Road	0	0	-	0	0	0	-	0	0	1	-	1	1
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.6	-	0.3	0.1
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Peak Hour Data

08/22/2019 11:00 AM
Ending At
08/22/2019 12:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
5	5	10
250	239	489
0	1	1
16	18	34
18	25	43
289	**288**	**577**

R	T	P
0	5	0
167	72	0
0	1	0
8	10	0
17	8	0
192	**96**	**0**

Eastbound Approach [W]

Out	In	Total
4	4	8
311	288	599
2	1	3
24	28	52
36	32	68
377	**353**	**730**

L	R	P
2	2	0
156	132	0
0	1	0
10	18	0
14	18	0
182	**171**	**0**

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Gallatin Rd [S]

L	T	P
4	3	0
144	94	0
2	0	0
16	6	0
19	4	0
185	**107**	**0**

Out	In	Total
7	7	14
204	238	442
2	2	4
28	22	50
26	23	49
267	**292**	**559**

Turning Movement Peak Hour Data Plot (11:00 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Gallatin Rd Northbound				Gallatin Rd Southbound				Eastbound Approach Eastbound				
	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
4:15 PM	47	37	0	84	29	50	0	79	126	63	0	189	352
4:30 PM	42	42	0	84	21	35	0	56	116	59	0	175	315
4:45 PM	41	47	0	88	21	42	0	63	118	47	0	165	316
5:00 PM	23	57	0	80	24	40	0	64	146	66	0	212	356
Total	153	183	0	336	95	167	0	262	506	235	0	741	1339
Approach %	45.5	54.5	-	-	36.3	63.7	-	-	68.3	31.7	-	-	-
Total %	11.4	13.7	-	25.1	7.1	12.5	-	19.6	37.8	17.6	-	55.3	-
PHF	0.814	0.803	-	0.955	0.819	0.835	-	0.829	0.866	0.890	-	0.874	0.940
Motorcycles	1	8	-	9	0	0	-	0	2	0	-	2	11
% Motorcycles	0.7	4.4	-	2.7	0.0	0.0	-	0.0	0.4	0.0	-	0.3	0.8
Cars & Light Goods	139	156	-	295	84	164	-	248	463	223	-	686	1229
% Cars & Light Goods	90.8	85.2	-	87.8	88.4	98.2	-	94.7	91.5	94.9	-	92.6	91.8
Buses	1	0	-	1	1	1	-	2	1	4	-	5	8
% Buses	0.7	0.0	-	0.3	1.1	0.6	-	0.8	0.2	1.7	-	0.7	0.6
Single-Unit Trucks	7	5	-	12	2	2	-	4	18	4	-	22	38
% Single-Unit Trucks	4.6	2.7	-	3.6	2.1	1.2	-	1.5	3.6	1.7	-	3.0	2.8
Articulated Trucks	5	14	-	19	8	0	-	8	22	4	-	26	53
% Articulated Trucks	3.3	7.7	-	5.7	8.4	0.0	-	3.1	4.3	1.7	-	3.5	4.0
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
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Peak Hour Data

08/22/2019 4:15 PM
Ending At
08/22/2019 5:15 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
10	0	10
619	248	867
1	2	3
23	4	27
36	8	44
689	**262**	**951**

R	T	P
0	0	0
164	84	0
1	1	0
2	2	0
0	8	0
167	**95**	**0**

Eastbound Approach [W]

Out	In	Total
1	2	3
303	686	989
2	5	7
9	22	31
5	26	31
320	**741**	**1061**

L	R	P
2	0	0
463	223	0
1	4	0
18	4	0
22	4	0
506	**235**	**0**

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Gallatin Rd [S]

L	T	P
1	8	0
139	156	0
1	0	0
7	5	0
5	14	0
153	**183**	**0**

Out	In	Total
0	9	9
307	295	602
5	1	6
6	12	18
12	19	31
330	**336**	**666**

Turning Movement Peak Hour Data Plot (4:15 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Hwy 84_Hwy 85
Site Code: 1
Start Date: 12/19/2019

Turning Movement Data

Start Time	Gallatin Rd Northbound Left	Gallatin Rd Northbound Thru	Gallatin Rd Northbound Right	Gallatin Rd Northbound App. Total	Jackrabbit Ln Southbound Left	Jackrabbit Ln Southbound Thru	Jackrabbit Ln Southbound Right	Jackrabbit Ln Southbound Peds	Jackrabbit Ln Southbound App. Total	Norris Rd Eastbound Left	Norris Rd Eastbound Thru	Norris Rd Eastbound Right	Norris Rd Eastbound Peds	Norris Rd Eastbound App. Total	Huffine Ln Westbound Left	Huffine Ln Westbound Thru	Huffine Ln Westbound Right	Huffine Ln Westbound App. Total	Int. Total
12:00 AM	1	6	4	11	0	4	2	0	6	0	1	0	0	1	4	2	1	7	25
12:15 AM	0	0	6	6	4	5	3	0	12	1	1	0	0	2	7	1	4	12	32
12:30 AM	0	3	4	7	2	10	1	0	13	0	3	0	0	3	0	2	7	9	32
12:45 AM	0	1	2	3	3	1	0	0	4	1	2	0	0	3	3	1	2	6	16
Hourly Total	1	10	16	27	9	20	6	0	35	2	7	0	0	9	14	6	14	34	105
1:00 AM	1	2	2	5	6	0	0	0	6	1	1	1	0	3	2	0	1	3	17
1:15 AM	0	3	4	7	0	2	0	0	2	0	1	0	0	1	3	1	3	7	17
1:30 AM	0	3	3	6	1	0	0	0	1	0	1	0	0	1	0	0	2	2	10
1:45 AM	0	0	1	1	1	3	0	0	4	0	1	1	0	2	1	1	0	2	9
Hourly Total	1	8	10	19	8	5	0	0	13	1	4	2	0	7	6	2	6	14	53
2:00 AM	0	1	1	2	3	1	0	0	4	1	2	0	0	3	2	1	1	4	13
2:15 AM	1	2	1	4	1	2	0	0	3	1	2	0	0	3	0	2	2	4	14
2:30 AM	0	2	0	2	1	0	0	0	1	1	1	0	0	2	2	2	1	5	10
2:45 AM	0	3	0	3	1	1	0	0	2	0	1	0	0	1	1	0	1	2	8
Hourly Total	1	8	2	11	6	4	0	0	10	3	6	0	0	9	5	5	5	15	45
3:00 AM	0	2	3	5	2	3	0	0	5	2	0	0	0	2	0	0	1	1	13
3:15 AM	0	3	3	6	1	1	0	0	2	0	2	0	0	2	1	0	1	2	12
3:30 AM	0	3	7	10	1	2	1	0	4	0	3	0	0	3	1	1	4	6	23
3:45 AM	0	6	1	7	4	4	0	0	8	0	0	2	0	2	1	1	0	2	19
Hourly Total	0	14	14	28	8	10	1	0	19	2	5	2	0	9	3	2	6	11	67
4:00 AM	0	3	1	4	0	1	1	0	2	2	0	3	0	5	0	0	3	3	14
4:15 AM	0	4	4	8	3	1	1	0	5	2	4	0	0	6	3	3	6	12	31
4:30 AM	0	3	5	8	6	7	2	0	15	0	8	6	0	14	7	1	4	12	49
4:45 AM	1	6	3	10	21	13	0	0	34	1	3	7	0	11	8	3	16	27	82
Hourly Total	1	16	13	30	30	22	4	0	56	5	15	16	0	36	18	7	29	54	176
5:00 AM	2	2	3	7	7	19	5	0	31	5	7	1	0	13	16	5	12	33	84
5:15 AM	3	9	9	21	20	21	11	0	52	3	5	6	0	14	21	15	20	56	143
5:30 AM	1	10	14	25	14	47	2	0	63	4	10	13	0	27	39	15	29	83	198
5:45 AM	2	15	12	29	25	62	7	0	94	5	12	20	0	37	52	8	34	94	254
Hourly Total	8	36	38	82	66	149	25	0	240	17	34	40	0	91	128	43	95	266	679
6:00 AM	3	15	13	31	25	75	7	0	107	3	10	14	0	27	54	13	21	88	253
6:15 AM	5	16	6	27	33	54	10	0	97	16	24	16	0	56	58	24	26	108	288
6:30 AM	1	39	27	67	48	59	10	0	117	14	33	10	0	57	71	27	38	136	377
6:45 AM	6	41	25	72	76	99	24	0	199	19	45	16	0	80	95	45	60	200	551
Hourly Total	15	111	71	197	182	287	51	0	520	52	112	56	0	220	278	109	145	532	1469
7:00 AM	8	34	39	81	70	87	18	0	175	15	38	11	0	64	87	39	57	183	503
7:15 AM	6	38	55	99	110	83	19	0	212	16	61	29	0	106	76	41	76	193	610
7:30 AM	9	50	59	118	132	73	16	0	221	34	82	15	0	131	79	54	77	210	680
7:45 AM	14	59	62	135	138	119	28	0	285	33	64	21	0	118	97	89	93	279	817
Hourly Total	37	181	215	433	450	362	81	0	893	98	245	76	0	419	339	223	303	865	2610
8:00 AM	13	37	64	114	118	71	25	0	214	37	84	17	0	138	87	70	82	239	705
8:15 AM	9	40	59	108	133	79	20	0	232	33	85	20	0	138	72	65	82	219	697
8:30 AM	13	42	50	105	88	80	30	0	198	26	74	13	0	113	86	65	72	223	639
8:45 AM	11	51	48	110	95	89	26	0	210	18	53	17	0	88	69	70	65	204	612
Hourly Total	46	170	221	437	434	319	101	0	854	114	296	67	0	477	314	270	301	885	2653
9:00 AM	5	37	41	83	68	76	24	0	168	25	57	10	0	92	60	42	53	155	498
9:15 AM	7	38	54	99	72	63	16	0	151	32	42	15	0	89	58	47	57	162	501
9:30 AM	10	43	76	129	71	60	17	0	148	16	51	10	0	77	68	39	66	173	527
9:45 AM	10	56	51	117	70	66	19	0	155	19	49	12	0	80	57	51	52	160	512
Hourly Total	32	174	222	428	281	265	76	0	622	92	199	47	0	338	243	179	228	650	2038
10:00 AM	13	37	47	97	70	62	16	0	148	27	59	14	0	100	52	37	67	156	501
10:15 AM	13	43	62	118	76	54	20	0	150	21	33	12	0	66	60	35	55	150	484
10:30 AM	8	77	60	145	64	58	15	0	137	29	52	4	0	85	49	30	48	127	494
10:45 AM	10	49	60	119	83	36	20	0	139	25	48	9	0	82	57	39	58	154	494
Hourly Total	44	206	229	479	293	210	71	0	574	102	192	39	0	333	218	141	228	587	1973
11:00 AM	10	52	57	119	75	39	12	0	126	23	58	14	0	95	45	41	66	152	492
11:15 AM	9	47	44	100	80	41	26	0	147	27	48	9	0	84	52	41	69	162	493
11:30 AM	16	60	47	123	88	44	31	0	163	31	67	7	0	105	55	36	60	151	542
11:45 AM	9	56	61	126	90	62	20	0	172	40	64	9	0	113	65	41	85	191	602
Hourly Total	44	215	209	468	333	186	89	0	608	121	237	39	0	397	217	159	280	656	2129

12:00 PM	18	48	51	117	100	80	24	0	204	34	58	11	0	103	63	63	64	190	614
12:15 PM	9	67	55	131	79	67	23	0	169	22	47	8	0	77	48	56	86	190	567
12:30 PM	11	62	65	138	80	53	22	0	155	38	72	9	0	119	52	61	70	183	595
12:45 PM	12	50	66	128	89	58	27	0	174	23	59	12	0	94	49	59	83	191	587
Hourly Total	50	227	237	514	348	258	96	0	702	117	236	40	0	393	212	239	303	754	2363
1:00 PM	27	63	54	144	84	59	23	0	166	43	70	8	0	121	52	58	77	187	618
1:15 PM	19	73	57	149	73	70	32	0	175	31	56	10	0	97	58	32	85	175	596
1:30 PM	16	50	63	129	73	81	22	0	176	32	53	11	0	96	49	51	87	187	588
1:45 PM	11	49	61	121	81	52	26	0	159	29	43	9	0	81	53	54	76	183	544
Hourly Total	73	235	235	543	311	262	103	0	676	135	222	38	0	395	212	195	325	732	2346
2:00 PM	7	56	53	116	77	51	21	0	149	25	39	11	0	75	62	55	83	200	540
2:15 PM	8	41	45	94	80	53	15	0	148	23	47	17	0	87	66	53	83	202	531
2:30 PM	10	65	68	143	71	75	21	0	167	20	51	12	0	83	85	65	79	229	622
2:45 PM	11	65	75	151	95	54	23	1	172	39	54	7	0	100	65	47	80	192	615
Hourly Total	36	227	241	504	323	233	80	1	636	107	191	47	0	345	278	220	325	823	2308
3:00 PM	9	67	71	147	94	73	24	1	191	30	59	7	0	96	80	68	89	237	671
3:15 PM	13	77	84	174	88	52	32	0	172	30	77	5	0	112	61	48	82	191	649
3:30 PM	13	75	57	145	89	56	31	0	176	40	71	10	0	121	70	69	114	253	695
3:45 PM	21	96	77	194	97	61	33	0	191	17	62	8	0	87	69	59	81	209	681
Hourly Total	56	315	289	660	368	242	120	1	730	117	269	30	0	416	280	244	366	890	2696
4:00 PM	18	89	87	194	78	60	27	0	165	31	72	8	0	111	75	75	108	258	728
4:15 PM	21	101	85	207	114	63	22	1	199	39	68	16	0	123	80	89	126	295	824
4:30 PM	23	109	79	211	118	64	18	0	200	34	83	16	0	133	70	69	117	256	800
4:45 PM	21	100	103	224	108	76	39	0	223	33	80	8	0	121	74	65	99	238	806
Hourly Total	83	399	354	836	418	263	106	1	787	137	303	48	0	488	299	298	450	1047	3158
5:00 PM	21	107	108	236	124	64	31	0	219	52	90	11	0	153	73	78	136	287	895
5:15 PM	18	120	117	255	88	97	29	0	214	30	53	17	0	100	70	78	126	274	843
5:30 PM	16	123	131	270	107	59	31	0	197	37	69	11	0	117	77	66	142	285	869
5:45 PM	19	104	96	219	117	64	15	0	196	32	75	17	0	124	78	77	137	292	831
Hourly Total	74	454	452	980	436	284	106	0	826	151	287	56	0	494	298	299	541	1138	3438
6:00 PM	12	105	75	192	100	68	9	1	177	30	43	9	0	82	64	54	104	222	673
6:15 PM	11	105	87	203	76	34	14	0	124	31	43	11	0	85	42	52	84	178	590
6:30 PM	9	74	65	148	62	32	14	0	108	21	50	3	0	74	43	41	69	153	483
6:45 PM	10	45	55	110	47	25	13	0	85	16	34	8	0	58	40	44	50	134	387
Hourly Total	42	329	282	653	285	159	50	1	494	98	170	31	0	299	189	191	307	687	2133
7:00 PM	5	34	45	84	29	22	6	0	57	21	35	3	0	59	36	31	45	112	312
7:15 PM	9	32	45	86	34	30	10	0	74	14	20	10	0	44	26	26	62	114	318
7:30 PM	7	29	29	65	40	18	5	0	63	10	20	4	0	34	37	27	47	111	273
7:45 PM	9	43	44	96	19	23	10	0	52	14	14	1	0	29	33	24	51	108	285
Hourly Total	30	138	163	331	122	93	31	0	246	59	89	18	0	166	132	108	205	445	1188
8:00 PM	2	32	30	64	33	15	8	0	56	8	16	8	0	32	39	22	55	116	268
8:15 PM	11	35	31	77	23	24	8	0	55	7	14	7	0	28	19	22	28	69	229
8:30 PM	5	34	21	60	27	22	8	0	57	11	16	5	0	32	32	23	38	93	242
8:45 PM	1	26	17	44	13	18	8	0	39	9	16	6	0	31	23	25	42	90	204
Hourly Total	19	127	99	245	96	79	32	0	207	35	62	26	0	123	113	92	163	368	943
9:00 PM	2	22	10	34	25	16	8	0	49	5	7	6	0	18	28	12	33	73	174
9:15 PM	4	21	8	33	15	10	12	0	37	3	10	3	0	16	19	14	36	69	155
9:30 PM	2	11	15	28	12	19	6	0	37	7	6	5	0	18	24	19	23	66	149
9:45 PM	2	13	16	31	13	19	5	0	37	1	10	5	0	16	22	15	22	59	143
Hourly Total	10	67	49	126	65	64	31	0	160	16	33	19	0	68	93	60	114	267	621
10:00 PM	1	20	24	45	19	15	3	0	37	1	5	3	0	9	17	12	23	52	143
10:15 PM	3	19	14	36	17	9	4	0	30	5	13	2	0	20	14	9	15	38	124
10:30 PM	1	11	22	34	7	16	3	0	26	3	6	2	0	11	6	8	15	29	100
10:45 PM	3	23	12	38	11	20	3	0	34	1	4	4	0	9	10	5	12	27	108
Hourly Total	8	73	72	153	54	60	13	0	127	10	28	11	0	49	47	34	65	146	475
11:00 PM	3	12	12	27	12	17	2	0	31	5	4	0	0	9	5	8	8	21	88
11:15 PM	0	6	8	14	12	4	2	0	18	2	4	1	0	7	4	5	10	19	58
11:30 PM	0	10	5	15	8	5	1	0	14	1	4	0	0	5	6	4	7	17	51
11:45 PM	0	7	5	12	4	2	0	0	6	1	2	1	0	4	6	9	14	29	51
Hourly Total	3	35	30	68	36	28	5	0	69	9	14	2	0	25	21	26	39	86	248
Grand Total	714	3775	3763	8252	4962	3864	1278	4	10104	1600	3256	750	0	5606	3957	3152	4843	11952	35914
Approach %	8.7	45.7	45.6	-	49.1	38.2	12.6	-	-	28.5	58.1	13.4	-	-	33.1	26.4	40.5	-	-
Total %	2.0	10.5	10.5	23.0	13.8	10.8	3.6	-	28.1	4.5	9.1	2.1	-	15.6	11.0	8.8	13.5	33.3	-
Motorcycles	0	0	0	0	0	1	0	-	1	0	0	0	-	0	0	0	3	3	4
% Motorcycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.1	0.0	0.0
Cars & Light Goods	668	3494	3647	7809	4781	3589	1133	-	9503	1464	3140	708	-	5312	3837	3034	4643	11514	34138
% Cars & Light Goods	93.6	92.6	96.9	94.6	96.4	92.9	88.7	-	94.1	91.5	96.4	94.4	-	94.8	97.0	96.3	95.9	96.3	95.1
Buses	17	17	17	51	23	20	8	-	51	2	9	9	-	20	23	16	14	53	175
% Buses	2.4	0.5	0.5	0.6	0.5	0.5	0.6	-	0.5	0.1	0.3	1.2	-	0.4	0.6	0.5	0.3	0.4	0.5
Single-Unit Trucks	20	118	57	195	111	122	67	-	300	56	63	16	-	135	54	64	125	243	873
% Single-Unit Trucks	2.8	3.1	1.5	2.4	2.2	3.2	5.2	-	3.0	3.5	1.9	2.1	-	2.4	1.4	2.0	2.6	2.0	2.4
Articulated Trucks	9	146	42	197	47	132	70	-	249	78	44	17	-	139	43	38	58	139	724
% Articulated Trucks	1.3	3.9	1.1	2.4	0.9	3.4	5.5	-	2.5	4.9	1.4	2.3	-	2.5	1.1	1.2	1.2	1.2	2.0

Bicycles on Road	0	0	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	0	0
% Bicycles on Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrians	-	-	-	-	-	-	-	4	-	-	-	-	0	-	-	-	-	-	-
% Pedestrians	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Hwy 84_Hwy 85
Site Code: 1
Start Date: 12/19/2019

12/19/2019 12:00 AM
Ending At
12/20/2019 12:00 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Jackrabbit Ln [N]

	Out	In	Total
Motorcycles	3	1	4
Cars & Light Goods	9601	9503	19104
Buses	33	51	84
Single-Unit Trucks	299	300	599
Other	282	249	531
	10218	**10104**	**20322**

	R	T	L	P
Motorcycles	0	1	0	0
Cars & Light Goods	1133	3589	4781	0
Buses	8	20	23	0
Single-Unit Trucks	67	122	111	0
Other	70	132	47	4
	1278	**3864**	**4962**	**4**

Norris Rd [W]

	Out	In	Total
Motorcycles	0	0	0
Cars & Light Goods	4835	5312	10147
Buses	41	20	61
Single-Unit Trucks	151	135	286
Other	117	139	256
	5144	**5606**	**10750**

	L	T	R	P
Motorcycles	0	0	0	0
Cars & Light Goods	1464	3140	708	0
Buses	2	9	9	0
Single-Unit Trucks	56	63	16	0
Other	78	44	17	0
	1600	**3256**	**750**	**0**

Huffine Ln [E]

	Out	In	Total
Motorcycles	0	3	3
Cars & Light Goods	11568	11514	23082
Buses	49	53	102
Single-Unit Trucks	231	243	474
Other	133	139	272
	11981	**11952**	**23933**

	R	T	L
Motorcycles	3	0	0
Cars & Light Goods	4643	3034	3837
Buses	14	16	23
Single-Unit Trucks	125	64	54
Other	58	38	43
	4843	**3152**	**3957**

Gallatin Rd [S]

	L	T	R
Motorcycles	0	0	0
Cars & Light Goods	668	3494	3647
Buses	17	17	17
Single-Unit Trucks	20	118	57
Other	9	146	42
	714	**3775**	**3763**

	Out	In	Total
Motorcycles	1	0	1
Cars & Light Goods	8134	7809	15943
Buses	52	51	103
Single-Unit Trucks	192	195	387
Other	192	197	389
	8571	**8252**	**16823**

Turning Movement Data Plot

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Gallatin Rd Northbound				Jackrabbit Ln Southbound					Norris Rd Eastbound					Huffine Ln Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	App. Total	Int. Total
7:30 AM	9	50	59	118	132	73	16	0	221	34	82	15	0	131	79	54	77	210	680
7:45 AM	14	59	62	135	138	119	28	0	285	33	64	21	0	118	97	89	93	279	817
8:00 AM	13	37	64	114	118	71	25	0	214	37	84	17	0	138	87	70	82	239	705
8:15 AM	9	40	59	108	133	79	20	0	232	33	85	20	0	138	72	65	82	219	697
Total	45	186	244	475	521	342	89	0	952	137	315	73	0	525	335	278	334	947	2899
Approach %	9.5	39.2	51.4	-	54.7	35.9	9.3	-	-	26.1	60.0	13.9	-	-	35.4	29.4	35.3	-	-
Total %	1.6	6.4	8.4	16.4	18.0	11.8	3.1	-	32.8	4.7	10.9	2.5	-	18.1	11.6	9.6	11.5	32.7	-
PHF	0.804	0.788	0.953	0.880	0.944	0.718	0.795	-	0.835	0.926	0.926	0.869	-	0.951	0.863	0.781	0.898	0.849	0.887
Motorcycles	0	0	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	0	0
% Motorcycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Cars & Light Goods	40	175	237	452	495	301	78	-	874	132	304	70	-	506	323	273	318	914	2746
% Cars & Light Goods	88.9	94.1	97.1	95.2	95.0	88.0	87.6	-	91.8	96.4	96.5	95.9	-	96.4	96.4	98.2	95.2	96.5	94.7
Buses	3	0	3	6	4	1	0	-	5	0	1	1	-	2	1	1	1	3	16
% Buses	6.7	0.0	1.2	1.3	0.8	0.3	0.0	-	0.5	0.0	0.3	1.4	-	0.4	0.3	0.4	0.3	0.3	0.6
Single-Unit Trucks	0	4	3	7	13	23	8	-	44	1	7	0	-	8	8	4	10	22	81
% Single-Unit Trucks	0.0	2.2	1.2	1.5	2.5	6.7	9.0	-	4.6	0.7	2.2	0.0	-	1.5	2.4	1.4	3.0	2.3	2.8
Articulated Trucks	2	7	1	10	9	17	3	-	29	4	3	2	-	9	3	0	5	8	56
% Articulated Trucks	4.4	3.8	0.4	2.1	1.7	5.0	3.4	-	3.0	2.9	1.0	2.7	-	1.7	0.9	0.0	1.5	0.8	1.9
Bicycles on Road	0	0	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	0	0
% Bicycles on Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrians	-	-	-	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Peak Hour Data

12/19/2019 7:30 AM
Ending At
12/19/2019 8:30 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Jackrabbit Ln [N]

Out	In	Total
0	0	0
625	874	1499
1	5	6
15	44	59
16	29	45
657	**952**	**1609**

R	T	L	P
0	0	0	0
78	301	495	0
0	1	4	0
8	23	13	0
3	17	9	0
89	**342**	**521**	**0**

Norris Rd [W]

Out	In	Total
0	0	0
391	506	897
4	2	6
12	8	20
5	9	14
412	**525**	**937**

L	T	R	P
0	0	0	0
132	304	70	0
0	1	1	0
1	7	0	0
4	3	2	0
137	**315**	**73**	**0**

Huffine Ln [E]

Out	In	Total
0	0	0
1036	914	1950
8	3	11
23	22	45
13	8	21
1080	**947**	**2027**

R	T	L
0	0	0
318	273	323
1	1	1
10	4	8
5	0	3
334	**278**	**335**

Gallatin Rd [S]

L	T	R
0	0	0
40	175	237
3	0	3
0	4	3
2	7	1
45	**186**	**244**

Out	In	Total
0	0	0
694	452	1146
3	6	9
31	7	38
22	10	32
750	**475**	**1225**

Turning Movement Peak Hour Data Plot (7:30 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Hwy 84_Hwy 85
Site Code: 1
Start Date: 12/19/2019

Turning Movement Peak Hour Data (11:45 AM)

Start Time	Gallatin Rd Northbound				Jackrabbit Ln Southbound					Norris Rd Eastbound					Huffine Ln Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	App. Total	Int. Total
11:45 AM	9	56	61	126	90	62	20	0	172	40	64	9	0	113	65	41	85	191	602
12:00 PM	18	48	51	117	100	80	24	0	204	34	58	11	0	103	63	63	64	190	614
12:15 PM	9	67	55	131	79	67	23	0	169	22	47	8	0	77	48	56	86	190	567
12:30 PM	11	62	65	138	80	53	22	0	155	38	72	9	0	119	52	61	70	183	595
Total	47	233	232	512	349	262	89	0	700	134	241	37	0	412	228	221	305	754	2378
Approach %	9.2	45.5	45.3	-	49.9	37.4	12.7	-	-	32.5	58.5	9.0	-	-	30.2	29.3	40.5	-	-
Total %	2.0	9.8	9.8	21.5	14.7	11.0	3.7	-	29.4	5.6	10.1	1.6	-	17.3	9.6	9.3	12.8	31.7	-
PHF	0.653	0.869	0.892	0.928	0.873	0.819	0.927	-	0.858	0.838	0.837	0.841	-	0.866	0.877	0.877	0.887	0.987	0.968
Motorcycles	0	0	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	0	0
% Motorcycles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Cars & Light Goods	42	217	225	484	337	241	76	-	654	121	231	33	-	385	221	208	286	715	2238
% Cars & Light Goods	89.4	93.1	97.0	94.5	96.6	92.0	85.4	-	93.4	90.3	95.9	89.2	-	93.4	96.9	94.1	93.8	94.8	94.1
Buses	1	0	1	2	0	0	0	-	0	1	0	0	-	1	0	1	1	2	5
% Buses	2.1	0.0	0.4	0.4	0.0	0.0	0.0	-	0.0	0.7	0.0	0.0	-	0.2	0.0	0.5	0.3	0.3	0.2
Single-Unit Trucks	3	5	2	10	8	7	8	-	23	8	5	2	-	15	4	6	12	22	70
% Single-Unit Trucks	6.4	2.1	0.9	2.0	2.3	2.7	9.0	-	3.3	6.0	2.1	5.4	-	3.6	1.8	2.7	3.9	2.9	2.9
Articulated Trucks	1	11	4	16	4	14	5	-	23	4	5	2	-	11	3	6	6	15	65
% Articulated Trucks	2.1	4.7	1.7	3.1	1.1	5.3	5.6	-	3.3	3.0	2.1	5.4	-	2.7	1.3	2.7	2.0	2.0	2.7
Bicycles on Road	0	0	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	0	0
% Bicycles on Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrians	-	-	-	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Peak Hour Data

12/19/2019 11:45 AM
Ending At
12/19/2019 12:45 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Jackrabbit Ln [N]

Out	In	Total
0	0	0
624	654	1278
2	0	2
25	23	48
21	23	44
672	**700**	**1372**

R	T	L	P
0	0	0	0
76	241	337	0
0	0	0	0
8	7	8	0
5	14	4	0
89	**262**	**349**	**0**

Norris Rd [W]

Out	In	Total
0	0	0
326	385	711
2	1	3
17	15	32
12	11	23
357	**412**	**769**

L	T	R	P
0	0	0	0
121	231	33	0
1	0	0	0
8	5	2	0
4	5	2	0
134	**241**	**37**	**0**

Huffine Ln [E]

R	T	L
0	0	0
286	208	221
1	1	0
12	6	4
6	6	3
305	**221**	**228**

Out	In	Total
0	0	0
793	715	1508
1	2	3
15	22	37
13	15	28
822	**754**	**1576**

Gallatin Rd [S]

L	T	R
0	0	0
42	217	225
1	0	1
3	5	2
1	11	4
47	**233**	**232**

Out	In	Total
0	0	0
495	484	979
0	2	2
13	10	23
19	16	35
527	**512**	**1039**

Turning Movement Peak Hour Data Plot (11:45 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (5:00 PM)

Start Time	Gallatin Rd Northbound				Jackrabbit Ln Southbound					Norris Rd Eastbound					Huffine Ln Westbound				
	Left	Thru	Right	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	App. Total	Int. Total
5:00 PM	21	107	108	236	124	64	31	0	219	52	90	11	0	153	73	78	136	287	895
5:15 PM	18	120	117	255	88	97	29	0	214	30	53	17	0	100	70	78	126	274	843
5:30 PM	16	123	131	270	107	59	31	0	197	37	69	11	0	117	77	66	142	285	869
5:45 PM	19	104	96	219	117	64	15	0	196	32	75	17	0	124	78	77	137	292	831
Total	74	454	452	980	436	284	106	0	826	151	287	56	0	494	298	299	541	1138	3438
Approach %	7.6	46.3	46.1	-	52.8	34.4	12.8	-	-	30.6	58.1	11.3	-	-	26.2	26.3	47.5	-	-
Total %	2.2	13.2	13.1	28.5	12.7	8.3	3.1	-	24.0	4.4	8.3	1.6	-	14.4	8.7	8.7	15.7	33.1	-
PHF	0.881	0.923	0.863	0.907	0.879	0.732	0.855	-	0.943	0.726	0.797	0.824	-	0.807	0.955	0.958	0.952	0.974	0.960
Motorcycles	0	0	0	0	0	1	0	-	1	0	0	0	-	0	0	0	0	0	1
% Motorcycles	0.0	0.0	0.0	0.0	0.0	0.4	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Cars & Light Goods	71	431	447	949	429	273	102	-	804	145	286	55	-	486	295	296	530	1121	3360
% Cars & Light Goods	95.9	94.9	98.9	96.8	98.4	96.1	96.2	-	97.3	96.0	99.7	98.2	-	98.4	99.0	99.0	98.0	98.5	97.7
Buses	2	5	1	8	5	0	1	-	6	0	0	1	-	1	0	0	4	4	19
% Buses	2.7	1.1	0.2	0.8	1.1	0.0	0.9	-	0.7	0.0	0.0	1.8	-	0.2	0.0	0.0	0.7	0.4	0.6
Single-Unit Trucks	1	12	0	13	0	7	1	-	8	2	0	0	-	2	2	3	6	11	34
% Single-Unit Trucks	1.4	2.6	0.0	1.3	0.0	2.5	0.9	-	1.0	1.3	0.0	0.0	-	0.4	0.7	1.0	1.1	1.0	1.0
Articulated Trucks	0	6	4	10	2	3	2	-	7	4	1	0	-	5	1	0	1	2	24
% Articulated Trucks	0.0	1.3	0.9	1.0	0.5	1.1	1.9	-	0.8	2.6	0.3	0.0	-	1.0	0.3	0.0	0.2	0.2	0.7
Bicycles on Road	0	0	0	0	0	0	0	-	0	0	0	0	-	0	0	0	0	0	0
% Bicycles on Road	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	0.0	0.0
Pedestrians	-	-	-	-	-	-	-	0	-	-	-	-	0	-	-	-	-	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Peak Hour Data

12/19/2019 5:00 PM
Ending At
12/19/2019 6:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Jackrabbit Ln [N]

Out	In	Total
0	1	1
1106	804	1910
9	6	15
20	8	28
11	7	18
1146	**826**	**1972**

R	T	L	P
0	1	0	0
102	273	429	0
1	0	5	0
1	7	0	0
2	3	2	0
106	**284**	**436**	**0**

Norris Rd [W]

Out	In	Total
0	0	0
469	486	955
3	1	4
5	2	7
2	5	7
479	**494**	**973**

L	T	R	P
0	0	0	0
145	286	55	0
0	0	1	0
2	0	0	0
4	1	0	0
151	**287**	**56**	**0**

Huffine Ln [E]

Out	In	Total
0	0	0
1162	1121	2283
6	4	10
0	11	11
7	2	9
1175	**1138**	**2313**

R	T	L
0	0	0
530	296	295
4	0	0
6	3	2
1	0	1
541	**299**	**298**

Gallatin Rd [S]

L	T	R
0	0	0
71	431	447
2	5	1
1	12	0
0	6	4
74	**454**	**452**

Out	In	Total
1	0	1
623	949	1572
1	8	9
9	13	22
4	10	14
638	**980**	**1618**

Turning Movement Peak Hour Data Plot (5:00 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 12/19/2019
Page No: 1

Turning Movement Data

Start Time	Gallatin Rd Northbound					Gallatin Rd Southbound					Mill St Eastbound					Rabel Ln Westbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
12:00 AM	0	10	0	0	10	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	14
12:15 AM	0	3	0	0	3	0	6	1	0	7	0	0	0	0	0	0	0	0	0	0	10
12:30 AM	0	4	0	0	4	0	10	1	0	11	0	0	0	0	0	0	0	0	0	0	15
12:45 AM	0	6	0	0	6	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	10
Hourly Total	0	23	0	0	23	0	24	2	0	26	0	0	0	0	0	0	0	0	0	0	49
1:00 AM	0	6	0	0	6	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	7
1:15 AM	0	5	0	0	5	0	2	1	0	3	0	0	0	0	0	0	0	0	0	0	8
1:30 AM	0	4	0	0	4	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	8
1:45 AM	0	3	0	0	3	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	5
Hourly Total	0	18	0	0	18	0	9	1	0	10	0	0	0	0	0	0	0	0	0	0	28
2:00 AM	0	3	0	0	3	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	5
2:15 AM	0	3	0	0	3	0	1	0	0	1	1	0	0	0	1	0	0	0	0	0	5
2:30 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
2:45 AM	0	3	0	0	3	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	4
Hourly Total	0	10	0	0	10	0	4	0	0	4	1	0	0	0	1	0	0	0	0	0	15
3:00 AM	0	4	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
3:15 AM	0	4	0	0	4	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	6
3:30 AM	0	5	0	0	5	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	7
3:45 AM	0	3	0	0	3	0	3	0	0	3	0	0	0	0	0	0	0	0	0	0	6
Hourly Total	0	16	0	0	16	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	23
4:00 AM	0	4	0	0	4	1	2	0	0	3	0	1	0	0	1	0	0	1	0	1	9
4:15 AM	0	4	0	0	4	0	5	0	0	5	0	0	0	0	0	0	0	0	0	0	9
4:30 AM	0	2	0	0	2	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	9
4:45 AM	0	3	0	0	3	1	19	0	0	20	1	0	0	0	1	0	0	0	0	0	24
Hourly Total	0	13	0	0	13	2	33	0	0	35	1	1	0	0	2	0	0	1	0	1	51
5:00 AM	0	5	0	0	5	1	24	1	0	26	1	0	0	0	1	0	0	1	0	1	33
5:15 AM	0	8	0	0	8	4	34	0	0	38	1	0	0	0	1	1	0	0	0	1	48
5:30 AM	0	11	0	0	11	3	50	0	0	53	1	1	1	0	3	0	0	0	0	0	67
5:45 AM	1	10	1	0	12	7	89	0	0	96	0	2	1	0	3	2	0	2	0	4	115
Hourly Total	1	34	1	0	36	15	197	1	0	213	3	3	2	0	8	3	0	3	0	6	263
6:00 AM	1	12	0	0	13	10	88	0	0	98	1	1	1	0	3	0	0	2	0	2	116
6:15 AM	0	13	1	0	14	17	122	2	0	141	5	2	2	0	9	3	0	3	0	6	170
6:30 AM	4	38	1	0	43	14	93	2	0	109	8	3	0	0	11	1	0	1	0	2	165
6:45 AM	0	30	1	0	31	11	127	2	0	140	6	2	0	0	8	1	0	1	0	2	181
Hourly Total	5	93	3	0	101	52	430	6	0	488	20	8	3	0	31	5	0	7	0	12	632
7:00 AM	1	17	0	0	18	16	119	8	0	143	8	5	3	0	16	4	0	8	0	12	189
7:15 AM	2	26	1	0	29	10	167	15	0	192	8	1	0	0	9	3	0	3	0	6	236
7:30 AM	5	43	1	0	49	14	146	15	0	175	12	5	2	0	19	1	1	12	0	14	257
7:45 AM	11	39	0	0	50	25	139	19	0	183	17	3	6	0	26	5	1	2	0	8	267
Hourly Total	19	125	2	0	146	65	571	57	0	693	45	14	11	0	70	13	2	25	0	40	949
8:00 AM	11	44	2	0	57	16	147	20	0	183	30	3	13	0	46	3	1	7	0	11	297
8:15 AM	1	34	1	0	36	22	112	7	0	141	9	0	0	0	9	3	1	6	0	10	196
8:30 AM	2	38	3	0	43	13	117	3	0	133	4	3	1	0	8	3	1	4	0	8	192
8:45 AM	2	51	1	0	54	10	142	8	0	160	9	1	3	0	13	7	0	5	0	12	239
Hourly Total	16	167	7	0	190	61	518	38	0	617	52	7	17	0	76	16	3	22	0	41	924
9:00 AM	4	50	3	0	57	15	105	6	0	126	6	0	1	0	7	5	2	2	0	9	199
9:15 AM	3	56	1	0	60	5	88	9	0	102	8	2	1	0	11	3	1	7	0	11	184
9:30 AM	2	64	1	0	67	17	75	3	0	95	11	2	0	0	13	3	1	8	0	12	187
9:45 AM	0	57	1	0	58	9	101	3	0	113	10	0	1	0	11	1	1	10	0	12	194
Hourly Total	9	227	6	0	242	46	369	21	0	436	35	4	3	0	42	12	5	27	0	44	764
10:00 AM	2	48	0	0	50	5	59	5	0	69	6	1	2	0	9	1	0	1	0	2	130
10:15 AM	1	63	1	0	65	4	75	8	0	87	7	2	2	0	11	3	1	3	0	7	170
10:30 AM	2	74	3	0	79	15	75	1	0	91	12	3	1	0	16	0	1	8	0	9	195
10:45 AM	3	78	4	0	85	14	66	2	0	82	6	1	1	0	8	1	2	7	0	10	185
Hourly Total	8	263	8	0	279	38	275	16	0	329	31	7	6	0	44	5	4	19	0	28	680
11:00 AM	3	61	1	0	65	11	47	6	0	64	4	4	1	0	9	3	0	11	0	14	152
11:15 AM	2	53	3	0	58	9	47	8	0	64	7	1	0	0	8	1	2	13	0	16	146
11:30 AM	0	72	2	0	74	14	60	9	0	83	7	0	0	0	7	3	2	6	0	11	175
11:45 AM	0	54	5	0	59	8	41	5	0	54	2	4	0	0	6	1	0	9	0	10	129
Hourly Total	5	240	11	0	256	42	195	28	0	265	20	9	1	0	30	8	4	39	0	51	602

12:00 PM	2	65	2	0	69	14	68	7	0	89	8	1	0	0	9	1	1	7	0	9	176
12:15 PM	3	68	3	0	74	10	63	7	0	80	5	3	1	0	9	5	0	10	0	15	178
12:30 PM	1	46	5	0	52	12	47	6	0	65	3	4	3	0	10	2	5	8	0	15	142
12:45 PM	4	63	1	0	68	7	54	5	0	66	8	4	2	0	14	4	1	8	0	13	161
Hourly Total	10	242	11	0	263	43	232	25	0	300	24	12	6	0	42	12	7	33	0	52	657
1:00 PM	1	77	2	0	80	13	60	12	0	85	5	0	2	0	7	4	3	7	0	14	186
1:15 PM	6	75	2	0	83	13	45	7	0	65	9	5	3	0	17	3	2	12	0	17	182
1:30 PM	4	59	0	0	63	6	84	12	0	102	6	2	2	0	10	0	4	3	0	7	182
1:45 PM	2	73	0	0	75	13	67	9	0	89	8	1	0	0	9	2	1	9	0	12	185
Hourly Total	13	284	4	0	301	45	256	40	0	341	28	8	7	0	43	9	10	31	0	50	735
2:00 PM	2	64	8	0	74	10	58	6	1	74	3	2	2	0	7	3	0	8	0	11	166
2:15 PM	1	72	4	0	77	8	62	9	0	79	6	6	3	0	15	4	1	15	0	20	191
2:30 PM	3	84	2	0	89	13	77	5	0	95	4	1	1	0	6	5	0	8	0	13	203
2:45 PM	5	95	0	0	100	14	69	9	0	92	2	5	4	0	11	5	6	15	0	26	229
Hourly Total	11	315	14	0	340	45	266	29	1	340	15	14	10	0	39	17	7	46	0	70	789
3:00 PM	12	85	3	0	100	16	72	19	0	107	5	4	1	1	10	2	4	11	0	17	234
3:15 PM	14	88	6	0	108	10	77	24	0	111	6	3	3	0	12	2	7	11	0	20	251
3:30 PM	20	122	4	0	146	9	65	17	0	91	27	2	16	0	45	4	3	4	0	11	293
3:45 PM	6	138	1	0	145	10	66	8	0	84	18	7	4	0	29	2	1	11	0	14	272
Hourly Total	52	433	14	0	499	45	280	68	0	393	56	16	24	1	96	10	15	37	0	62	1050
4:00 PM	3	129	6	0	138	12	56	17	0	85	16	2	6	0	24	0	2	19	0	21	268
4:15 PM	4	152	0	0	156	6	67	14	0	87	6	0	2	0	8	2	1	12	0	15	266
4:30 PM	3	123	1	0	127	13	52	8	0	73	5	0	3	0	8	0	2	14	0	16	224
4:45 PM	4	183	2	0	189	13	54	14	0	81	14	1	7	0	22	4	0	9	0	13	305
Hourly Total	14	587	9	0	610	44	229	53	0	326	41	3	18	0	62	6	5	54	0	65	1063
5:00 PM	7	160	1	0	168	8	62	16	0	86	5	2	3	0	10	1	0	10	0	11	275
5:15 PM	5	187	1	0	193	4	52	17	0	73	11	3	1	0	15	0	0	6	0	6	287
5:30 PM	6	204	1	0	211	12	64	14	0	90	7	3	2	0	12	0	1	10	0	11	324
5:45 PM	19	147	2	0	168	9	54	30	0	93	2	1	3	0	6	3	1	8	0	12	279
Hourly Total	37	698	5	0	740	33	232	77	0	342	25	9	9	0	43	4	2	34	0	40	1165
6:00 PM	37	168	0	0	205	5	46	42	0	93	8	0	5	0	13	1	2	4	0	7	318
6:15 PM	13	151	0	0	164	4	41	26	0	71	2	2	4	0	8	0	0	4	0	4	247
6:30 PM	7	79	0	0	86	0	30	13	0	43	8	3	6	0	17	2	1	5	0	8	154
6:45 PM	2	71	1	0	74	9	36	7	0	52	4	2	2	0	8	1	1	3	0	5	139
Hourly Total	59	469	1	0	529	18	153	88	0	259	22	7	17	0	46	4	4	16	0	24	858
7:00 PM	4	53	2	0	59	4	25	9	0	38	11	2	1	0	14	2	0	2	0	4	115
7:15 PM	1	50	0	0	51	5	19	9	0	33	2	2	2	0	6	2	0	2	0	4	94
7:30 PM	4	41	0	0	45	5	25	3	0	33	7	3	2	0	12	1	0	1	0	2	92
7:45 PM	2	53	0	0	55	1	23	5	0	29	13	0	2	0	15	0	0	1	0	1	100
Hourly Total	11	197	2	0	210	15	92	26	0	133	33	7	7	0	47	5	0	6	0	11	401
8:00 PM	2	29	0	0	31	3	23	3	0	29	28	6	16	0	50	0	1	0	0	1	111
8:15 PM	1	41	0	0	42	5	25	4	0	34	32	1	17	0	50	0	0	0	0	0	126
8:30 PM	1	27	0	0	28	0	21	3	0	24	19	2	7	0	28	0	0	1	0	1	81
8:45 PM	4	18	0	0	22	1	15	5	0	21	6	1	0	0	7	0	0	1	0	1	51
Hourly Total	8	115	0	0	123	9	84	15	0	108	85	10	40	0	135	0	1	2	0	3	369
9:00 PM	2	20	0	0	22	4	13	4	0	21	8	0	0	0	8	0	2	2	0	4	55
9:15 PM	0	21	0	0	21	2	19	0	0	21	2	1	1	0	4	0	1	0	0	1	47
9:30 PM	1	19	0	0	20	1	20	1	0	22	1	1	0	0	2	0	1	0	0	1	45
9:45 PM	1	13	0	0	14	1	25	2	0	28	3	0	1	0	4	0	0	0	0	0	46
Hourly Total	4	73	0	0	77	8	77	7	0	92	14	2	2	0	18	0	4	2	0	6	193
10:00 PM	0	18	0	0	18	2	23	0	0	25	4	0	0	0	4	0	1	4	0	5	52
10:15 PM	0	18	0	0	18	0	12	2	0	14	6	0	0	0	6	0	0	0	0	0	38
10:30 PM	1	17	0	0	18	0	14	0	0	14	2	0	1	0	3	0	0	0	0	0	35
10:45 PM	0	22	0	0	22	0	20	2	0	22	2	0	0	0	2	0	0	0	0	0	46
Hourly Total	1	75	0	0	76	2	69	4	0	75	14	0	1	0	15	0	1	4	0	5	171
11:00 PM	1	10	0	0	11	0	21	0	0	21	3	0	0	0	3	0	0	0	0	0	35
11:15 PM	0	16	0	0	16	1	4	1	0	6	0	0	0	0	0	0	0	0	0	0	22
11:30 PM	0	10	0	0	10	0	5	1	0	6	0	0	0	0	0	0	0	1	0	1	17
11:45 PM	0	8	0	0	8	1	2	1	0	4	0	0	0	0	0	1	0	0	0	1	13
Hourly Total	1	44	0	0	45	2	32	3	0	37	3	0	0	0	3	1	0	1	0	2	87
Grand Total	284	4761	98	0	5143	630	4634	605	1	5869	568	141	184	1	893	130	74	409	0	613	12518
Approach %	5.5	92.6	1.9	-	-	10.7	79.0	10.3	-	-	63.6	15.8	20.6	-	-	21.2	12.1	66.7	-	-	-
Total %	2.3	38.0	0.8	-	41.1	5.0	37.0	4.8	-	46.9	4.5	1.1	1.5	-	7.1	1.0	0.6	3.3	-	4.9	-
Motorcycles	0	1	0	-	1	0	0	0	-	0	1	0	0	-	1	0	0	0	-	0	2
% Motorcycles	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.2	0.0	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	272	4410	94	-	4776	608	4293	586	-	5487	549	137	181	-	867	124	73	389	-	586	11716
% Cars & Light Goods	95.8	92.6	95.9	-	92.9	96.5	92.6	96.9	-	93.5	96.7	97.2	98.4	-	97.1	95.4	98.6	95.1	-	95.6	93.6
Buses	4	40	1	-	45	3	40	2	-	45	3	0	2	-	5	1	0	2	-	3	98
% Buses	1.4	0.8	1.0	-	0.9	0.5	0.9	0.3	-	0.8	0.5	0.0	1.1	-	0.6	0.8	0.0	0.5	-	0.5	0.8
Single-Unit Trucks	5	127	1	-	133	14	133	17	-	164	12	4	1	-	17	5	1	13	-	19	333
% Single-Unit Trucks	1.8	2.7	1.0	-	2.6	2.2	2.9	2.8	-	2.8	2.1	2.8	0.5	-	1.9	3.8	1.4	3.2	-	3.1	2.7
Articulated Trucks	3	183	2	-	188	5	168	0	-	173	3	0	0	-	3	0	0	5	-	5	369
% Articulated Trucks	1.1	3.8	2.0	-	3.7	0.8	3.6	0.0	-	2.9	0.5	0.0	0.0	-	0.3	0.0	0.0	1.2	-	0.8	2.9

Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	1	-	-	-	-	1	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

12/19/2019 12:00 AM
Ending At
12/20/2019 12:00 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
2	0	2
5348	5487	10835
45	45	90
152	164	316
191	173	364
5738	**5869**	**11607**

R	T	L	P
0	0	0	0
586	4293	608	0
2	40	3	0
17	133	14	0
0	168	5	1
605	**4634**	**630**	**1**

Mill St [W]

Out	In	Total
0	1	1
931	867	1798
6	5	11
23	17	40
3	3	6
963	**893**	**1856**

L	T	R	P
1	0	0	0
549	137	181	0
3	0	2	0
12	4	1	0
3	0	0	1
568	**141**	**184**	**1**

Rabel Ln [E]

Out	In	Total
0	0	0
839	586	1425
4	3	7
19	19	38
7	5	12
869	**613**	**1482**

R	T	L	P
0	0	0	0
389	73	124	0
2	0	1	0
13	1	5	0
5	0	0	0
409	**74**	**130**	**0**

L	T	R	P
0	1	0	0
272	4410	94	0
4	40	1	0
5	127	1	0
3	183	2	0
284	**4761**	**98**	**0**

Out	In	Total
0	1	1
4598	4776	9374
43	45	88
139	133	272
168	188	356
4948	**5143**	**10091**

Gallatin Rd [S]

Turning Movement Data Plot

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 12/19/2019

Turning Movement Peak Hour Data (7:15 AM)

	Gallatin Rd					Gallatin Rd					Mill St					Rabel Ln					
	Northbound					Southbound					Eastbound					Westbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:15 AM	2	26	1	0	29	10	167	15	0	192	8	1	0	0	9	3	0	3	0	6	236
7:30 AM	5	43	1	0	49	14	146	15	0	175	12	5	2	0	19	1	1	12	0	14	257
7:45 AM	11	39	0	0	50	25	139	19	0	183	17	3	6	0	26	5	1	2	0	8	267
8:00 AM	11	44	2	0	57	16	147	20	0	183	30	3	13	0	46	3	1	7	0	11	297
Total	29	152	4	0	185	65	599	69	0	733	67	12	21	0	100	12	3	24	0	39	1057
Approach %	15.7	82.2	2.2	-	-	8.9	81.7	9.4	-	-	67.0	12.0	21.0	-	-	30.8	7.7	61.5	-	-	-
Total %	2.7	14.4	0.4	-	17.5	6.1	56.7	6.5	-	69.3	6.3	1.1	2.0	-	9.5	1.1	0.3	2.3	-	3.7	-
PHF	0.659	0.864	0.500	-	0.811	0.650	0.897	0.863	-	0.954	0.558	0.600	0.404	-	0.543	0.600	0.750	0.500	-	0.696	0.890
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	29	141	4	-	174	65	566	68	-	699	67	12	21	-	100	11	3	24	-	38	1011
% Cars & Light Goods	100.0	92.8	100.0	-	94.1	100.0	94.5	98.6	-	95.4	100.0	100.0	100.0	-	100.0	91.7	100.0	100.0	-	97.4	95.6
Buses	0	3	0	-	3	0	1	1	-	2	0	0	0	-	0	0	0	0	-	0	5
% Buses	0.0	2.0	0.0	-	1.6	0.0	0.2	1.4	-	0.3	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.5
Single-Unit Trucks	0	1	0	-	1	0	16	0	-	16	0	0	0	-	0	1	0	0	-	1	18
% Single-Unit Trucks	0.0	0.7	0.0	-	0.5	0.0	2.7	0.0	-	2.2	0.0	0.0	0.0	-	0.0	8.3	0.0	0.0	-	2.6	1.7
Articulated Trucks	0	7	0	-	7	0	16	0	-	16	0	0	0	-	0	0	0	0	-	0	23
% Articulated Trucks	0.0	4.6	0.0	-	3.8	0.0	2.7	0.0	-	2.2	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	2.2
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 12/19/2019
Page No: 6

Peak Hour Data

12/19/2019 7:15 AM
Ending At
12/19/2019 8:15 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
0	0	0
232	699	931
3	2	5
1	16	17
7	16	23
243	**733**	**976**

R	T	L	P
0	0	0	0
68	566	65	0
1	1	0	0
0	16	0	0
0	16	0	0
69	**599**	**65**	**0**

Mill St [W]

Out	In	Total
0	0	0
100	100	200
1	0	1
0	0	0
0	0	0
101	**100**	**201**

L	T	R	P
0	0	0	0
67	12	21	0
0	0	0	0
0	0	0	0
0	0	0	0
67	**12**	**21**	**0**

Rabel Ln [E]

Out	In	Total
0	0	0
81	38	119
0	0	0
0	1	1
0	0	0
81	**39**	**120**

R	T	L	P
0	0	0	0
24	3	11	0
0	0	0	0
0	0	1	0
0	0	0	0
24	**3**	**12**	**0**

L	T	R	P
0	0	0	0
29	141	4	0
0	3	0	0
0	1	0	0
0	7	0	0
29	**152**	**4**	**0**

Out	In	Total
0	0	0
598	174	772
1	3	4
17	1	18
16	7	23
632	**185**	**817**

Gallatin Rd [S]

Turning Movement Peak Hour Data Plot (7:15 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 12/19/2019

Turning Movement Peak Hour Data (11:30 AM)

Start Time	Gallatin Rd Northbound					Gallatin Rd Southbound					Mill St Eastbound					Rabel Ln Westbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
11:30 AM	0	72	2	0	74	14	60	9	0	83	7	0	0	0	7	3	2	6	0	11	175
11:45 AM	0	54	5	0	59	8	41	5	0	54	2	4	0	0	6	1	0	9	0	10	129
12:00 PM	2	65	2	0	69	14	68	7	0	89	8	1	0	0	9	1	1	7	0	9	176
12:15 PM	3	68	3	0	74	10	63	7	0	80	5	3	1	0	9	5	0	10	0	15	178
Total	5	259	12	0	276	46	232	28	0	306	22	8	1	0	31	10	3	32	0	45	658
Approach %	1.8	93.8	4.3	-	-	15.0	75.8	9.2	-	-	71.0	25.8	3.2	-	-	22.2	6.7	71.1	-	-	-
Total %	0.8	39.4	1.8	-	41.9	7.0	35.3	4.3	-	46.5	3.3	1.2	0.2	-	4.7	1.5	0.5	4.9	-	6.8	-
PHF	0.417	0.899	0.600	-	0.932	0.821	0.853	0.778	-	0.860	0.688	0.500	0.250	-	0.861	0.500	0.375	0.800	-	0.750	0.924
Motorcycles	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1
% Motorcycles	0.0	0.4	0.0	-	0.4	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.2
Cars & Light Goods	5	233	12	-	250	46	204	26	-	276	20	6	1	-	27	10	3	30	-	43	596
% Cars & Light Goods	100.0	90.0	100.0	-	90.6	100.0	87.9	92.9	-	90.2	90.9	75.0	100.0	-	87.1	100.0	100.0	93.8	-	95.6	90.6
Buses	0	2	0	-	2	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	3
% Buses	0.0	0.8	0.0	-	0.7	0.0	0.4	0.0	-	0.3	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.5
Single-Unit Trucks	0	10	0	-	10	0	10	2	-	12	2	2	0	-	4	0	0	2	-	2	28
% Single-Unit Trucks	0.0	3.9	0.0	-	3.6	0.0	4.3	7.1	-	3.9	9.1	25.0	0.0	-	12.9	0.0	0.0	6.3	-	4.4	4.3
Articulated Trucks	0	13	0	-	13	0	17	0	-	17	0	0	0	-	0	0	0	0	-	0	30
% Articulated Trucks	0.0	5.0	0.0	-	4.7	0.0	7.3	0.0	-	5.6	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	4.6
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 12/19/2019

Peak Hour Data

12/19/2019 11:30 AM
Ending At
12/19/2019 12:30 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
1	0	1
283	276	559
2	1	3
14	12	26
13	17	30
313	**306**	**619**

R	T	L	P
0	0	0	0
26	204	46	0
0	1	0	0
2	10	0	0
0	17	0	0
28	**232**	**46**	**0**

Mill St [W]

Out	In	Total
0	0	0
34	27	61
0	0	0
2	4	6
0	0	0
36	**31**	**67**

L	T	R	P
0	0	0	0
20	6	1	0
0	0	0	0
2	2	0	0
0	0	0	0
22	**8**	**1**	**0**

Rabel Ln [E]

R	T	L	P
0	0	0	0
30	3	10	0
0	0	0	0
2	0	0	0
0	0	0	0
32	**3**	**10**	**0**

Out	In	Total
0	0	0
64	43	107
0	0	0
2	2	4
0	0	0
66	**45**	**111**

Gallatin Rd [S]

L	T	R	P
0	1	0	0
5	233	12	0
0	2	0	0
0	10	0	0
0	13	0	0
5	**259**	**12**	**0**

Out	In	Total
0	1	1
215	250	465
1	2	3
10	10	20
17	13	30
243	**276**	**519**

Turning Movement Peak Hour Data Plot (11:30 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 12/19/2019

Turning Movement Peak Hour Data (5:15 PM)

Start Time	Gallatin Rd Northbound					Gallatin Rd Southbound					Mill St Eastbound					Rabel Ln Westbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
5:15 PM	5	187	1	0	193	4	52	17	0	73	11	3	1	0	15	0	0	6	0	6	287
5:30 PM	6	204	1	0	211	12	64	14	0	90	7	3	2	0	12	0	1	10	0	11	324
5:45 PM	19	147	2	0	168	9	54	30	0	93	2	1	3	0	6	3	1	8	0	12	279
6:00 PM	37	168	0	0	205	5	46	42	0	93	8	0	5	0	13	1	2	4	0	7	318
Total	67	706	4	0	777	30	216	103	0	349	28	7	11	0	46	4	4	28	0	36	1208
Approach %	8.6	90.9	0.5	-	-	8.6	61.9	29.5	-	-	60.9	15.2	23.9	-	-	11.1	11.1	77.8	-	-	-
Total %	5.5	58.4	0.3	-	64.3	2.5	17.9	8.5	-	28.9	2.3	0.6	0.9	-	3.8	0.3	0.3	2.3	-	3.0	-
PHF	0.453	0.865	0.500	-	0.921	0.625	0.844	0.613	-	0.938	0.636	0.583	0.550	-	0.767	0.333	0.500	0.700	-	0.750	0.932
Motorcycles	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Motorcycles	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	67	679	4	-	750	29	209	103	-	341	28	7	11	-	46	4	4	28	-	36	1173
% Cars & Light Goods	100.0	96.2	100.0	-	96.5	96.7	96.8	100.0	-	97.7	100.0	100.0	100.0	-	100.0	100.0	100.0	100.0	-	100.0	97.1
Buses	0	3	0	-	3	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	3
% Buses	0.0	0.4	0.0	-	0.4	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.2
Single-Unit Trucks	0	7	0	-	7	0	1	0	-	1	0	0	0	-	0	0	0	0	-	0	8
% Single-Unit Trucks	0.0	1.0	0.0	-	0.9	0.0	0.5	0.0	-	0.3	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.7
Articulated Trucks	0	17	0	-	17	1	6	0	-	7	0	0	0	-	0	0	0	0	-	0	24
% Articulated Trucks	0.0	2.4	0.0	-	2.2	3.3	2.8	0.0	-	2.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	2.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

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406-447-5000 srandall@rpa-hln.com

Count Name: US 191_Mill St
Site Code: 2
Start Date: 12/19/2019
Page No: 10

Peak Hour Data

12/19/2019 5:15 PM
Ending At
12/19/2019 6:15 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
0	0	0
735	341	1076
3	0	3
7	1	8
17	7	24
762	**349**	**1111**

R	T	L	P
0	0	0	0
103	209	29	0
0	0	0	0
0	1	0	0
0	6	1	0
103	**216**	**30**	**0**

Mill St [W]

Out	In	Total
0	0	0
174	46	220
0	0	0
0	0	0
0	0	0
174	**46**	**220**

L	T	R	P
0	0	0	0
28	7	11	0
0	0	0	0
0	0	0	0
0	0	0	0
28	**7**	**11**	**0**

Rabel Ln [E]

Out	In	Total
0	0	0
40	36	76
0	0	0
0	0	0
1	0	1
41	**36**	**77**

R	T	L	P
0	0	0	0
28	4	4	0
0	0	0	0
0	0	0	0
0	0	0	0
28	**4**	**4**	**0**

Gallatin Rd [S]

L	T	R	P
0	0	0	0
67	679	4	0
0	3	0	0
0	7	0	0
0	17	0	0
67	**706**	**4**	**0**

Out	In	Total
0	0	0
224	750	974
0	3	3
1	7	8
6	17	23
231	**777**	**1008**

Turning Movement Peak Hour Data Plot (5:15 PM)

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406-447-5000 srandall@rpa-hln.com

Count Name: US 191_MT 64
Site Code: 3
Start Date: 12/19/2019

Turning Movement Data

Start Time	Gallatin Rd Northbound Left	Gallatin Rd Northbound Thru	Gallatin Rd Northbound Peds	Gallatin Rd Northbound App. Total	Gallatin Rd Southbound Thru	Gallatin Rd Southbound Right	Gallatin Rd Southbound Peds	Gallatin Rd Southbound App. Total	MT 64 Eastbound Left	MT 64 Eastbound Right	MT 64 Eastbound Peds	MT 64 Eastbound App. Total	Int. Total
12:00 AM	2	1	0	3	2	3	0	5	2	3	0	5	13
12:15 AM	3	2	0	5	0	2	0	2	3	1	0	4	11
12:30 AM	0	1	0	1	0	2	0	2	1	2	0	3	6
12:45 AM	1	2	0	3	2	5	0	7	1	4	0	5	15
Hourly Total	6	6	0	12	4	12	0	16	7	10	0	17	45
1:00 AM	1	1	0	2	2	6	0	8	6	2	0	8	18
1:15 AM	2	0	0	2	3	2	0	5	1	1	0	2	9
1:30 AM	1	1	0	2	0	0	0	0	3	1	0	4	6
1:45 AM	1	2	0	3	2	0	0	2	1	3	0	4	9
Hourly Total	5	4	0	9	7	8	0	15	11	7	0	18	42
2:00 AM	1	0	0	1	1	1	0	2	2	1	0	3	6
2:15 AM	2	3	0	5	2	0	0	2	1	1	0	2	9
2:30 AM	0	1	0	1	1	1	0	2	0	4	0	4	7
2:45 AM	0	4	0	4	2	0	0	2	2	1	0	3	9
Hourly Total	3	8	0	11	6	2	0	8	5	7	0	12	31
3:00 AM	1	1	0	2	1	0	0	1	2	1	0	3	6
3:15 AM	0	0	0	0	0	0	0	0	2	0	0	2	2
3:30 AM	0	3	0	3	0	0	0	0	1	1	0	2	5
3:45 AM	1	0	0	1	1	0	0	1	2	0	0	2	4
Hourly Total	2	4	0	6	2	0	0	2	7	2	0	9	17
4:00 AM	0	1	0	1	2	1	0	3	1	0	0	1	5
4:15 AM	2	2	0	4	3	1	0	4	2	0	0	2	10
4:30 AM	0	1	0	1	2	2	0	4	0	0	0	0	5
4:45 AM	2	0	0	2	3	1	0	4	0	1	0	1	7
Hourly Total	4	4	0	8	10	5	0	15	3	1	0	4	27
5:00 AM	3	2	0	5	3	2	0	5	2	1	0	3	13
5:15 AM	2	1	0	3	4	19	0	23	6	0	0	6	32
5:30 AM	5	1	0	6	2	26	0	28	6	0	0	6	40
5:45 AM	26	2	0	28	4	34	0	38	0	3	0	3	69
Hourly Total	36	6	0	42	13	81	0	94	14	4	0	18	154
6:00 AM	12	3	0	15	9	37	0	46	11	3	0	14	75
6:15 AM	16	7	0	23	10	87	0	97	7	4	0	11	131
6:30 AM	17	1	0	18	5	90	0	95	4	6	0	10	123
6:45 AM	25	3	0	28	17	115	0	132	10	11	0	21	181
Hourly Total	70	14	0	84	41	329	0	370	32	24	0	56	510
7:00 AM	20	0	0	20	10	100	0	110	16	12	0	28	158
7:15 AM	33	7	0	40	9	104	0	113	11	13	0	24	177
7:30 AM	39	6	0	45	19	134	0	153	15	13	0	28	226
7:45 AM	34	3	0	37	21	165	0	186	22	39	0	61	284
Hourly Total	126	16	0	142	59	503	0	562	64	77	0	141	845
8:00 AM	44	8	0	52	23	169	0	192	16	41	0	57	301
8:15 AM	54	19	0	73	19	124	0	143	16	75	0	91	307
8:30 AM	85	20	0	105	18	165	0	183	18	19	0	37	325
8:45 AM	38	20	0	58	24	95	0	119	27	31	0	58	235
Hourly Total	221	67	0	288	84	553	0	637	77	166	0	243	1168
9:00 AM	30	21	0	51	22	106	0	128	32	19	0	51	230
9:15 AM	45	9	0	54	28	130	0	158	33	23	0	56	268
9:30 AM	32	11	0	43	21	104	0	125	31	23	0	54	222
9:45 AM	35	19	0	54	16	66	0	82	47	20	0	67	203
Hourly Total	142	60	0	202	87	406	0	493	143	85	0	228	923
10:00 AM	20	19	0	39	23	75	0	98	41	22	0	63	200
10:15 AM	31	19	0	50	16	79	0	95	42	23	0	65	210
10:30 AM	24	17	0	41	9	63	0	72	34	25	0	59	172
10:45 AM	34	12	0	46	27	63	0	90	35	26	0	61	197
Hourly Total	109	67	0	176	75	280	0	355	152	96	0	248	779
11:00 AM	27	17	0	44	15	51	0	66	50	28	0	78	188
11:15 AM	34	16	0	50	15	48	0	63	38	26	0	64	177
11:30 AM	25	10	0	35	12	38	0	50	44	29	0	73	158
11:45 AM	34	24	0	58	8	46	0	54	38	26	0	64	176
Hourly Total	120	67	0	187	50	183	0	233	170	109	0	279	699
12:00 PM	23	13	0	36	18	45	0	63	37	31	0	68	167

12:15 PM	22	9	0	31	16	42	0	58	53	17	0	70	159
12:30 PM	26	14	0	40	9	51	0	60	51	27	0	78	178
12:45 PM	22	13	0	35	17	48	0	65	53	45	0	98	198
Hourly Total	93	49	0	142	60	186	0	246	194	120	0	314	702
1:00 PM	31	21	0	52	14	28	0	42	46	37	0	83	177
1:15 PM	23	21	0	44	21	37	0	58	42	35	0	77	179
1:30 PM	23	16	0	39	17	31	0	48	51	26	0	77	164
1:45 PM	33	18	0	51	10	31	0	41	48	39	0	87	179
Hourly Total	110	76	0	186	62	127	0	189	187	137	0	324	699
2:00 PM	26	17	0	43	26	69	0	95	60	30	0	90	228
2:15 PM	18	23	0	41	19	47	0	66	62	28	0	90	197
2:30 PM	26	17	0	43	17	48	0	65	80	34	0	114	222
2:45 PM	37	27	0	64	16	40	0	56	64	33	0	97	217
Hourly Total	107	84	0	191	78	204	0	282	266	125	0	391	864
3:00 PM	25	22	0	47	23	54	0	77	108	34	0	142	266
3:15 PM	26	31	0	57	19	44	0	63	106	64	0	170	290
3:30 PM	55	36	0	91	21	43	0	64	100	66	0	166	321
3:45 PM	51	30	0	81	22	57	0	79	124	48	0	172	332
Hourly Total	157	119	0	276	85	198	0	283	438	212	0	650	1209
4:00 PM	25	25	0	50	18	26	0	44	115	38	0	153	247
4:15 PM	40	23	0	63	15	41	0	56	159	53	0	212	331
4:30 PM	25	33	0	58	16	27	0	43	166	56	0	222	323
4:45 PM	38	27	0	65	15	29	0	44	159	53	0	212	321
Hourly Total	128	108	0	236	64	123	0	187	599	200	0	799	1222
5:00 PM	36	30	0	66	12	27	0	39	158	63	0	221	326
5:15 PM	24	21	0	45	9	36	0	45	154	55	0	209	299
5:30 PM	24	29	0	53	16	20	0	36	155	57	0	212	301
5:45 PM	21	27	0	48	22	31	0	53	96	59	0	155	256
Hourly Total	105	107	0	212	59	114	0	173	563	234	0	797	1182
6:00 PM	22	8	0	30	16	21	0	37	78	37	0	115	182
6:15 PM	22	22	0	44	14	19	0	33	59	24	0	83	160
6:30 PM	29	18	0	47	13	18	0	31	43	28	0	71	149
6:45 PM	23	6	0	29	9	20	0	29	41	23	0	64	122
Hourly Total	96	54	0	150	52	78	0	130	221	112	0	333	613
7:00 PM	21	9	0	30	8	20	0	28	24	28	0	52	110
7:15 PM	18	13	0	31	9	23	0	32	38	24	0	62	125
7:30 PM	15	7	0	22	5	11	0	16	20	16	0	36	74
7:45 PM	13	7	0	20	4	13	0	17	31	13	0	44	81
Hourly Total	67	36	0	103	26	67	0	93	113	81	0	194	390
8:00 PM	10	7	0	17	9	10	0	19	18	15	0	33	69
8:15 PM	7	5	0	12	5	14	0	19	19	11	0	30	61
8:30 PM	30	7	0	37	4	11	0	15	18	12	0	30	82
8:45 PM	34	10	0	44	7	17	0	24	17	9	0	26	94
Hourly Total	81	29	0	110	25	52	0	77	72	47	0	119	306
9:00 PM	18	3	0	21	5	9	0	14	15	11	0	26	61
9:15 PM	5	4	0	9	2	4	0	6	15	12	0	27	42
9:30 PM	12	7	0	19	2	12	0	14	11	9	0	20	53
9:45 PM	5	7	0	12	3	8	0	11	14	11	0	25	48
Hourly Total	40	21	0	61	12	33	0	45	55	43	0	98	204
10:00 PM	9	4	0	13	2	14	0	16	15	11	0	26	55
10:15 PM	10	7	0	17	5	11	0	16	17	9	0	26	59
10:30 PM	4	3	0	7	7	12	0	19	10	8	0	18	44
10:45 PM	2	3	0	5	5	7	0	12	14	2	0	16	33
Hourly Total	25	17	0	42	19	44	0	63	56	30	0	86	191
11:00 PM	3	2	0	5	4	10	0	14	7	5	0	12	31
11:15 PM	4	0	0	4	1	16	0	17	8	7	0	15	36
11:30 PM	2	1	0	3	4	14	0	18	14	2	0	16	37
11:45 PM	2	0	0	2	0	3	0	3	3	4	0	7	12
Hourly Total	11	3	0	14	9	43	0	52	32	18	0	50	116
Grand Total	1864	1026	0	2890	989	3631	0	4620	3481	1947	0	5428	12938
Approach %	64.5	35.5	-	-	21.4	78.6	-	-	64.1	35.9	-	-	-
Total %	14.4	7.9	-	22.3	7.6	28.1	-	35.7	26.9	15.0	-	42.0	-
Motorcycles	0	0	-	0	0	0	-	0	0	0	-	0	0
% Motorcycles	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	1753	864	-	2617	820	3444	-	4264	3288	1845	-	5133	12014
% Cars & Light Goods	94.0	84.2	-	90.6	82.9	94.8	-	92.3	94.5	94.8	-	94.6	92.9
Buses	33	6	-	39	7	35	-	42	39	33	-	72	153
% Buses	1.8	0.6	-	1.3	0.7	1.0	-	0.9	1.1	1.7	-	1.3	1.2
Single-Unit Trucks	63	28	-	91	34	100	-	134	100	56	-	156	381
% Single-Unit Trucks	3.4	2.7	-	3.1	3.4	2.8	-	2.9	2.9	2.9	-	2.9	2.9
Articulated Trucks	15	128	-	143	128	52	-	180	54	13	-	67	390
% Articulated Trucks	0.8	12.5	-	4.9	12.9	1.4	-	3.9	1.6	0.7	-	1.2	3.0
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: US 191_MT 64
Site Code: 3
Start Date: 12/19/2019

Gallatin Rd [N]

Out	In	Total
0	0	0
4152	4264	8416
45	42	87
128	134	262
182	180	362
4507	**4620**	**9127**

0	0	0
3444	820	0
35	7	0
100	34	0
52	128	0
3631	**989**	**0**
R	T	P

MT 64 [W]

Out	In	Total
0	0	0
5197	5133	10330
68	72	140
163	156	319
67	67	134
5495	**5428**	**10923**

L	R	P
0	0	0
3288	1845	0
39	33	0
100	56	0
54	13	0
3481	**1947**	**0**

12/19/2019 12:00 AM
Ending At
12/20/2019 12:00 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T	P
0	0	0
1753	864	0
33	6	0
63	28	0
15	128	0
1864	**1026**	**0**

0	0	0
2665	2617	5282
40	39	79
90	91	181
141	143	284
2936	**2890**	**5826**
Out	In	Total

Gallatin Rd [S]

Turning Movement Data Plot

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_MT 64
Site Code: 3
Start Date: 12/19/2019

Turning Movement Peak Hour Data (7:45 AM)

Start Time	Gallatin Rd Northbound				Gallatin Rd Southbound				MT 64 Eastbound				
	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
7:45 AM	34	3	0	37	21	165	0	186	22	39	0	61	284
8:00 AM	44	8	0	52	23	169	0	192	16	41	0	57	301
8:15 AM	54	19	0	73	19	124	0	143	16	75	0	91	307
8:30 AM	85	20	0	105	18	165	0	183	18	19	0	37	325
Total	217	50	0	267	81	623	0	704	72	174	0	246	1217
Approach %	81.3	18.7	-	-	11.5	88.5	-	-	29.3	70.7	-	-	-
Total %	17.8	4.1	-	21.9	6.7	51.2	-	57.8	5.9	14.3	-	20.2	-
PHF	0.638	0.625	-	0.636	0.880	0.922	-	0.917	0.818	0.580	-	0.676	0.936
Motorcycles	0	0	-	0	0	0	-	0	0	0	-	0	0
% Motorcycles	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	206	41	-	247	71	597	-	668	67	166	-	233	1148
% Cars & Light Goods	94.9	82.0	-	92.5	87.7	95.8	-	94.9	93.1	95.4	-	94.7	94.3
Buses	2	0	-	2	1	1	-	2	1	4	-	5	9
% Buses	0.9	0.0	-	0.7	1.2	0.2	-	0.3	1.4	2.3	-	2.0	0.7
Single-Unit Trucks	6	1	-	7	3	16	-	19	1	4	-	5	31
% Single-Unit Trucks	2.8	2.0	-	2.6	3.7	2.6	-	2.7	1.4	2.3	-	2.0	2.5
Articulated Trucks	3	8	-	11	6	9	-	15	3	0	-	3	29
% Articulated Trucks	1.4	16.0	-	4.1	7.4	1.4	-	2.1	4.2	0.0	-	1.2	2.4
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_MT 64
Site Code: 3
Start Date: 12/19/2019
Page No: 5

Peak Hour Data

12/19/2019 7:45 AM
Ending At
12/19/2019 8:45 AM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
0	0	0
108	668	776
1	2	3
2	19	21
11	15	26
122	**704**	**826**

R	T	P
0	0	0
597	71	0
1	1	0
16	3	0
9	6	0
623	**81**	**0**

MT 64 [W]

Out	In	Total
0	0	0
803	233	1036
3	5	8
22	5	27
12	3	15
840	**246**	**1086**

L	R	P
0	0	0
67	166	0
1	4	0
1	4	0
3	0	0
72	**174**	**0**

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

L	T	P
0	0	0
206	41	0
2	0	0
6	1	0
3	8	0
217	**50**	**0**

Out	In	Total
0	0	0
237	247	484
5	2	7
7	7	14
6	11	17
255	**267**	**522**

Gallatin Rd [S]

Turning Movement Peak Hour Data Plot (7:45 AM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Count Name: US 191_MT 64
Site Code: 3
Start Date: 12/19/2019

Turning Movement Peak Hour Data (12:00 PM)

Start Time	Gallatin Rd Northbound				Gallatin Rd Southbound				MT 64 Eastbound				
	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
12:00 PM	23	13	0	36	18	45	0	63	37	31	0	68	167
12:15 PM	22	9	0	31	16	42	0	58	53	17	0	70	159
12:30 PM	26	14	0	40	9	51	0	60	51	27	0	78	178
12:45 PM	22	13	0	35	17	48	0	65	53	45	0	98	198
Total	93	49	0	142	60	186	0	246	194	120	0	314	702
Approach %	65.5	34.5	-	-	24.4	75.6	-	-	61.8	38.2	-	-	-
Total %	13.2	7.0	-	20.2	8.5	26.5	-	35.0	27.6	17.1	-	44.7	-
PHF	0.894	0.875	-	0.888	0.833	0.912	-	0.946	0.915	0.667	-	0.801	0.886
Motorcycles	0	0	-	0	0	0	-	0	0	0	-	0	0
% Motorcycles	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	89	42	-	131	44	172	-	216	175	113	-	288	635
% Cars & Light Goods	95.7	85.7	-	92.3	73.3	92.5	-	87.8	90.2	94.2	-	91.7	90.5
Buses	1	0	-	1	0	0	-	0	0	1	-	1	2
% Buses	1.1	0.0	-	0.7	0.0	0.0	-	0.0	0.0	0.8	-	0.3	0.3
Single-Unit Trucks	2	2	-	4	1	10	-	11	13	5	-	18	33
% Single-Unit Trucks	2.2	4.1	-	2.8	1.7	5.4	-	4.5	6.7	4.2	-	5.7	4.7
Articulated Trucks	1	5	-	6	15	4	-	19	6	1	-	7	32
% Articulated Trucks	1.1	10.2	-	4.2	25.0	2.2	-	7.7	3.1	0.8	-	2.2	4.6
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: US 191_MT 64
Site Code: 3
Start Date: 12/19/2019

Peak Hour Data

12/19/2019 12:00 PM
Ending At
12/19/2019 1:00 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
0	0	0
217	216	433
0	0	0
15	11	26
11	19	30
243	**246**	**489**

R	T	P
0	0	0
172	44	0
0	0	0
10	1	0
4	15	0
186	**60**	**0**

MT 64 [W]

Out	In	Total
0	0	0
261	288	549
1	1	2
12	18	30
5	7	12
279	**314**	**593**

L	R	P
0	0	0
175	113	0
0	1	0
13	5	0
6	1	0
194	**120**	**0**

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Gallatin Rd [S]

L	T	P
0	0	0
89	42	0
1	0	0
2	2	0
1	5	0
93	**49**	**0**

Out	In	Total
0	0	0
157	131	288
1	1	2
6	4	10
16	6	22
180	**142**	**322**

Turning Movement Peak Hour Data Plot (12:00 PM)

Robert Peccia & Associates
3147 Saddle Drive

Helena, Montana, United States 59601
406-447-5000 srandall@rpa-hln.com

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Gallatin Rd Northbound				Gallatin Rd Southbound				MT 64 Eastbound				
	Left	Thru	Peds	App. Total	Thru	Right	Peds	App. Total	Left	Right	Peds	App. Total	Int. Total
4:15 PM	40	23	0	63	15	41	0	56	159	53	0	212	331
4:30 PM	25	33	0	58	16	27	0	43	166	56	0	222	323
4:45 PM	38	27	0	65	15	29	0	44	159	53	0	212	321
5:00 PM	36	30	0	66	12	27	0	39	158	63	0	221	326
Total	139	113	0	252	58	124	0	182	642	225	0	867	1301
Approach %	55.2	44.8	-	-	31.9	68.1	-	-	74.0	26.0	-	-	-
Total %	10.7	8.7	-	19.4	4.5	9.5	-	14.0	49.3	17.3	-	66.6	-
PHF	0.869	0.856	-	0.955	0.906	0.756	-	0.813	0.967	0.893	-	0.976	0.983
Motorcycles	0	0	-	0	0	0	-	0	0	0	-	0	0
% Motorcycles	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Cars & Light Goods	137	101	-	238	50	121	-	171	623	218	-	841	1250
% Cars & Light Goods	98.6	89.4	-	94.4	86.2	97.6	-	94.0	97.0	96.9	-	97.0	96.1
Buses	2	0	-	2	0	3	-	3	5	3	-	8	13
% Buses	1.4	0.0	-	0.8	0.0	2.4	-	1.6	0.8	1.3	-	0.9	1.0
Single-Unit Trucks	0	2	-	2	1	0	-	1	9	4	-	13	16
% Single-Unit Trucks	0.0	1.8	-	0.8	1.7	0.0	-	0.5	1.4	1.8	-	1.5	1.2
Articulated Trucks	0	10	-	10	7	0	-	7	5	0	-	5	22
% Articulated Trucks	0.0	8.8	-	4.0	12.1	0.0	-	3.8	0.8	0.0	-	0.6	1.7
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Pedestrians	-	-	0	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-

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Count Name: US 191_MT 64
Site Code: 3
Start Date: 12/19/2019

Peak Hour Data

12/19/2019 4:15 PM
Ending At
12/19/2019 5:15 PM

Motorcycles
Cars & Light Goods
Buses
Single-Unit Trucks
Other

Gallatin Rd [N]

Out	In	Total
0	0	0
724	171	895
5	3	8
11	1	12
15	7	22
755	**182**	**937**

R	T	P
0	0	0
121	50	0
3	0	0
0	1	0
0	7	0
124	**58**	**0**

MT 64 [W]

Out	In	Total
0	0	0
258	841	1099
5	8	13
0	13	13
0	5	5
263	**867**	**1130**

P	R	L
0	0	0
0	218	623
0	3	5
0	4	9
0	0	5
0	**225**	**642**

Fake Approach [E]

Out	In	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	**0**	**0**

Gallatin Rd [S]

L	T	P
0	0	0
137	101	0
2	0	0
0	2	0
0	10	0
139	**113**	**0**

Out	In	Total
0	0	0
268	238	506
3	2	5
5	2	7
7	10	17
283	**252**	**535**

Turning Movement Peak Hour Data Plot (4:15 PM)

US 191 Corridor Study
Four Corners to Beaver Creek

Appendix D:

Existing Conditions Analysis

US 191 Corridor Study

Vistro File: F:\...\191 LOS.vistro

Report File: F:\...\Aug 2019 AM.pdf

Scenario 1 Aug 2019 AM

12/4/2019

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Right	0.546	10.3	B
2	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	0.176	25.4	D
3	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	NB Left	0.716	32.2	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	10.3
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.546

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	147	71	141	562	87	140
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	15.70	16.30	27.60	7.90	6.80	6.40
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	147	71	141	562	87	140
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	40	19	38	153	24	38
Total Analysis Volume [veh/h]	160	77	153	611	95	152
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	50	50	50	50	50	50
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	7	7
g / C, Green / Cycle	0.61	0.61	0.61	0.61	0.15	0.15
(v / s)_i Volume / Saturation Flow Rate	0.15	0.05	0.11	0.44	0.06	0.11
s, saturation flow rate [veh/h]	1098	1525	1368	1395	1577	1412
c, Capacity [veh/h]	712	923	829	845	240	215
d1, Uniform Delay [s]	6.80	4.06	4.34	6.87	18.96	19.96
k, delay calibration	0.11	0.11	0.11	0.15	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.16	0.04	0.11	1.68	1.05	4.20
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.22	0.08	0.18	0.72	0.40	0.71
d, Delay for Lane Group [s/veh]	6.96	4.10	4.45	8.55	20.01	24.17
Lane Group LOS	A	A	A	A	C	C
Critical Lane Group	No	No	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	0.57	0.14	0.30	2.16	0.98	1.79
50th-Percentile Queue Length [ft/ln]	14.16	3.53	7.60	53.95	24.54	44.67
95th-Percentile Queue Length [veh/ln]	1.02	0.25	0.55	3.88	1.77	3.22
95th-Percentile Queue Length [ft/ln]	25.48	6.36	13.67	97.11	44.17	80.40

Movement, Approach, & Intersection Results

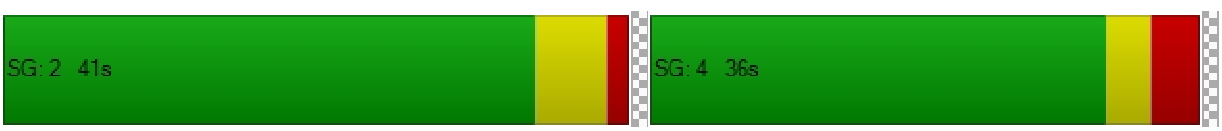
d_M, Delay for Movement [s/veh]	6.96	4.10	4.45	8.55	20.01	24.17
Movement LOS	A	A	A	A	C	C
d_A, Approach Delay [s/veh]	6.03		7.73		22.57	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	10.34					
Intersection LOS	B					
Intersection V/C	0.546					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.523	5.393	4.132
Bicycle LOS	E	F	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	25.4
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.176

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	6	179	6	49	576	26	38	11	14	8	3	24
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	16.70	7.30	0.00	6.10	12.10	11.50	5.30	0.00	7.10	0.00	0.00	4.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	6	179	6	49	576	26	38	11	14	8	3	24
Peak Hour Factor	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	47	2	13	152	7	10	3	4	2	1	6
Total Analysis Volume [veh/h]	6	189	6	52	608	27	40	12	15	8	3	25
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.04	0.01	0.00	0.18	0.05	0.03	0.04	0.01	0.03
d_M, Delay for Movement [s/veh]	9.11	0.00	0.00	7.77	0.00	0.00	25.43	23.34	16.95	21.95	19.90	9.92
Movement LOS	A	A	A	A	A	A	D	C	C	C	C	A
95th-Percentile Queue Length [veh/ln]	0.02	0.00	0.00	0.12	0.00	0.00	0.98	0.98	0.98	0.25	0.25	0.25
95th-Percentile Queue Length [ft/ln]	0.51	0.00	0.00	2.99	0.00	0.00	24.46	24.46	24.46	6.29	6.29	6.29
d_A, Approach Delay [s/veh]	0.27			0.59			23.16			13.42		
Approach LOS	A			A			C			B		
d_I, Intersection Delay [s/veh]	2.52											
Intersection LOS	D											

Intersection Level Of Service Report
Intersection 3: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	32.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.716

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	63	218	278	532	357	95	126	284	76	321	289	400
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	6.40	7.40	2.80	4.30	15.40	13.70	17.50	3.50	6.50	3.10	8.00	4.90
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	63	218	278	532	357	95	126	284	76	321	289	400
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	18	61	78	149	100	27	35	80	21	90	81	112
Total Analysis Volume [veh/h]	71	245	312	598	401	107	142	319	85	361	325	449
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	4	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			4,6									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	10	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	35	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	4.3	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	2.7	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	24	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	5.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	103	103	103	103	103	103	103	103	103	103	103	103
L, Total Lost Time per Cycle [s]	6.00	6.70	7.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	6	15	64	26	34	34	42	17	17	42	30	62
g / C, Green / Cycle	0.06	0.15	0.62	0.25	0.34	0.34	0.41	0.17	0.17	0.41	0.29	0.61
(v / s)_i Volume / Saturation Flow Rate	0.05	0.09	0.24	0.21	0.19	0.19	0.15	0.14	0.14	0.30	0.22	0.35
s, saturation flow rate [veh/h]	1424	2823	1309	2814	1383	1284	947	1531	1423	1198	1475	1287
c, Capacity [veh/h]	87	413	815	705	464	431	318	254	236	475	426	782
d1, Uniform Delay [s]	47.62	40.99	9.60	36.60	27.99	27.99	22.48	41.35	41.44	25.04	33.32	12.15
k, delay calibration	0.11	0.11	0.20	0.11	0.11	0.11	0.18	0.11	0.11	0.32	0.16	0.42
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	16.40	1.37	0.53	2.94	1.09	1.18	1.64	6.45	7.39	7.23	4.18	2.56
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.81	0.59	0.38	0.85	0.57	0.57	0.45	0.82	0.83	0.76	0.76	0.57
d, Delay for Lane Group [s/veh]	64.02	42.35	10.13	39.55	29.08	29.17	24.12	47.80	48.83	32.27	37.49	14.71
Lane Group LOS	E	D	B	D	C	C	C	D	D	C	D	B
Critical Lane Group	No	No	Yes	Yes	No	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	2.18	2.95	3.34	7.30	5.35	4.99	2.36	5.48	5.23	7.61	7.74	6.28
50th-Percentile Queue Length [ft/ln]	54.49	73.82	83.56	182.42	133.81	124.69	59.02	137.07	130.75	190.31	193.50	157.06
95th-Percentile Queue Length [veh/ln]	3.92	5.32	6.02	11.73	9.15	8.65	4.25	9.32	8.98	12.14	12.30	10.39
95th-Percentile Queue Length [ft/ln]	98.09	132.88	150.41	293.17	228.67	216.25	106.24	233.07	224.51	303.43	307.57	259.82

Movement, Approach, & Intersection Results

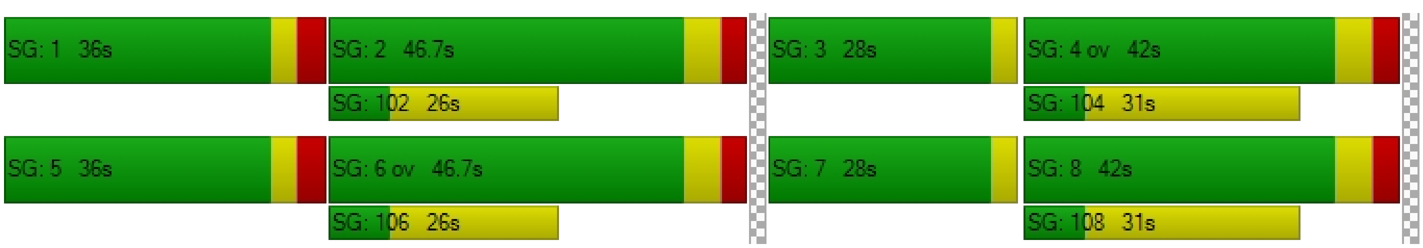
d_M, Delay for Movement [s/veh]	64.02	42.35	10.13	39.55	29.11	29.17	24.12	48.16	48.83	32.27	37.49	14.71
Movement LOS	E	D	B	D	C	C	C	D	D	C	D	B
d_A, Approach Delay [s/veh]	28.79			34.76			42.01			26.82		
Approach LOS	C			C			D			C		
d_I, Intersection Delay [s/veh]	32.18											
Intersection LOS	C											
Intersection V/C	0.716											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	2.787	2.830	2.386	2.760
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.078	2.472	2.010	3.432
Bicycle LOS	B	B	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



US 191 Corridor Study

Vistro File: F:\...\191 LOS.vistro

Report File: F:\...\Aug 2019 Noon.pdf

Scenario 2 Aug 2019 Noon

12/4/2019

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Right	0.356	13.2	B
6	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	0.141	21.8	C
11	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	NB Left	0.587	24.6	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	13.2
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.356

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	185	107	96	192	182	171
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	20.00	9.30	19.70	13.10	13.20	21.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	185	107	96	192	182	171
Peak Hour Factor	0.9520	0.9520	0.9520	0.9520	0.9520	0.9520
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	49	28	25	50	48	45
Total Analysis Volume [veh/h]	194	112	101	202	191	180
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	53	53	53	53	53	53
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	11	11
g / C, Green / Cycle	0.57	0.57	0.57	0.57	0.21	0.21
(v / s)_i Volume / Saturation Flow Rate	0.19	0.08	0.08	0.17	0.14	0.16
s, saturation flow rate [veh/h]	996	1459	1330	1200	1344	1117
c, Capacity [veh/h]	626	825	752	678	280	233
d1, Uniform Delay [s]	8.51	5.43	5.43	6.03	19.38	19.82
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.28	0.07	0.08	0.24	2.90	5.38
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.31	0.14	0.13	0.30	0.68	0.77
d, Delay for Lane Group [s/veh]	8.78	5.51	5.51	6.27	22.28	25.20
Lane Group LOS	A	A	A	A	C	C
Critical Lane Group	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.94	0.33	0.30	0.68	2.23	2.28
50th-Percentile Queue Length [ft/ln]	23.40	8.32	7.53	16.95	55.81	57.04
95th-Percentile Queue Length [veh/ln]	1.68	0.60	0.54	1.22	4.02	4.11
95th-Percentile Queue Length [ft/ln]	42.11	14.97	13.56	30.51	100.46	102.68

Movement, Approach, & Intersection Results

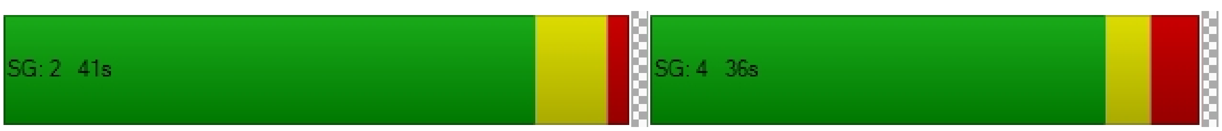
d_M, Delay for Movement [s/veh]	8.78	5.51	5.51	6.27	22.28	25.20
Movement LOS	A	A	A	A	C	C
d_A, Approach Delay [s/veh]	7.59		6.02		23.70	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	13.20					
Intersection LOS	B					
Intersection V/C	0.356					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.637	4.632	4.132
Bicycle LOS	E	E	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	21.8
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.141

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	9	335	13	39	281	34	32	7	10	10	7	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	10.80	7.70	7.70	10.70	2.90	6.30	0.00	0.00	10.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	9	335	13	39	281	34	32	7	10	10	7	27
Peak Hour Factor	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	95	4	11	79	10	9	2	3	3	2	8
Total Analysis Volume [veh/h]	10	379	15	44	318	38	36	8	11	11	8	31
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.04	0.00	0.00	0.14	0.03	0.02	0.04	0.03	0.05
d_M, Delay for Movement [s/veh]	7.99	0.00	0.00	8.30	0.00	0.00	21.77	19.77	12.62	20.17	18.73	11.53
Movement LOS	A	A	A	A	A	A	C	C	B	C	C	B
95th-Percentile Queue Length [veh/ln]	0.02	0.00	0.00	0.12	0.00	0.00	0.66	0.66	0.66	0.40	0.40	0.40
95th-Percentile Queue Length [ft/ln]	0.62	0.00	0.00	3.02	0.00	0.00	16.46	16.46	16.46	9.90	9.90	9.90
d_A, Approach Delay [s/veh]	0.20			0.91			19.65			14.58		
Approach LOS	A			A			C			B		
d_I, Intersection Delay [s/veh]	2.48											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 11: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	24.6
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.587

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	56	285	314	400	253	112	166	261	44	289	273	402
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.80	10.20	3.50	4.60	12.20	8.10	10.20	5.80	4.20	2.40	9.50	4.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	56	285	314	400	253	112	166	261	44	289	273	402
Peak Hour Factor	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	14	72	79	101	64	28	42	66	11	73	69	102
Total Analysis Volume [veh/h]	57	288	317	404	256	113	168	264	44	292	276	406
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	4	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			4,6									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	10	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	35	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	4.3	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	2.7	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	24	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	5.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	86	86	86	86	86	86	86	86	86	86	86	86
L, Total Lost Time per Cycle [s]	6.00	6.70	7.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	4	15	53	20	30	30	31	14	14	31	19	46
g / C, Green / Cycle	0.05	0.17	0.62	0.23	0.35	0.35	0.36	0.16	0.16	0.36	0.23	0.54
(v / s)_i Volume / Saturation Flow Rate	0.03	0.09	0.22	0.13	0.12	0.12	0.14	0.09	0.10	0.22	0.17	0.28
s, saturation flow rate [veh/h]	1643	3064	1446	3119	1581	1420	1189	1670	1588	1348	1619	1438
c, Capacity [veh/h]	86	534	893	721	559	501	391	270	257	522	366	775
d1, Uniform Delay [s]	40.03	32.37	8.05	29.22	20.52	20.53	20.74	33.37	33.41	21.54	31.05	12.75
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.19
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	8.38	0.85	0.24	0.68	0.37	0.42	0.75	1.97	2.14	0.94	3.15	0.98
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.66	0.54	0.35	0.56	0.35	0.35	0.43	0.58	0.59	0.56	0.75	0.52
d, Delay for Lane Group [s/veh]	48.41	33.22	8.29	29.90	20.89	20.95	21.49	35.34	35.55	22.48	34.20	13.72
Lane Group LOS	D	C	A	C	C	C	C	D	D	C	C	B
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	1.36	2.73	2.59	3.65	2.83	2.56	2.39	3.11	3.01	4.50	5.50	4.81
50th-Percentile Queue Length [ft/ln]	34.12	68.30	64.74	91.37	70.74	63.97	59.87	77.77	75.27	112.39	137.56	120.16
95th-Percentile Queue Length [veh/ln]	2.46	4.92	4.66	6.58	5.09	4.61	4.31	5.60	5.42	7.97	9.35	8.40
95th-Percentile Queue Length [ft/ln]	61.41	122.93	116.53	164.47	127.33	115.14	107.76	139.99	135.48	199.32	233.74	210.04

Movement, Approach, & Intersection Results

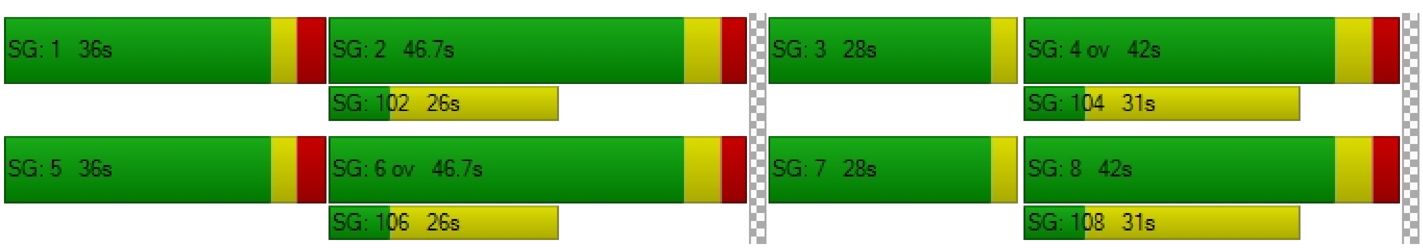
d_M, Delay for Movement [s/veh]	48.41	33.22	8.29	29.90	20.90	20.95	21.49	35.43	35.55	22.48	34.20	13.72
Movement LOS	D	C	A	C	C	C	C	D	D	C	C	B
d_A, Approach Delay [s/veh]	22.59			25.61			30.52			22.15		
Approach LOS	C			C			C			C		
d_I, Intersection Delay [s/veh]	24.56											
Intersection LOS	C											
Intersection V/C	0.587											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	2.733	2.778	2.355	2.681
Crosswalk LOS	B	C	B	B
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.106	2.197	1.952	3.167
Bicycle LOS	B	B	A	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



US 191 Corridor Study

Vistro File: F:\...\191 LOS.vistro

Report File: F:\...\Aug 2019 PM.pdf

Scenario 3 Aug 2019 PM

12/4/2019

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Left	0.531	24.5	C
6	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	0.358	57.4	F
11	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	NB Left	0.789	36.2	D

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	24.5
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.531

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	153	183	95	167	506	235
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	8.60	10.40	11.60	1.80	8.10	5.10
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	153	183	95	167	506	235
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	41	49	25	44	135	63
Total Analysis Volume [veh/h]	163	195	101	178	538	250
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	71	71	71	71	71	71
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	29	29
g / C, Green / Cycle	0.42	0.42	0.42	0.42	0.41	0.41
(v / s)_i Volume / Saturation Flow Rate	0.15	0.13	0.07	0.13	0.38	0.19
s, saturation flow rate [veh/h]	1102	1446	1431	1320	1404	1285
c, Capacity [veh/h]	492	613	606	559	571	523
d1, Uniform Delay [s]	17.36	13.61	12.67	13.61	20.23	15.49
k, delay calibration	0.11	0.11	0.11	0.11	0.34	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.39	0.30	0.13	0.32	19.82	0.68
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.33	0.32	0.17	0.32	0.94	0.48
d, Delay for Lane Group [s/veh]	17.75	13.91	12.80	13.94	40.04	16.17
Lane Group LOS	B	B	B	B	D	B
Critical Lane Group	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.76	1.75	0.84	1.60	11.01	2.90
50th-Percentile Queue Length [ft/ln]	43.93	43.74	21.02	40.04	275.33	72.46
95th-Percentile Queue Length [veh/ln]	3.16	3.15	1.51	2.88	16.46	5.22
95th-Percentile Queue Length [ft/ln]	79.08	78.73	37.84	72.07	411.39	130.42

Movement, Approach, & Intersection Results

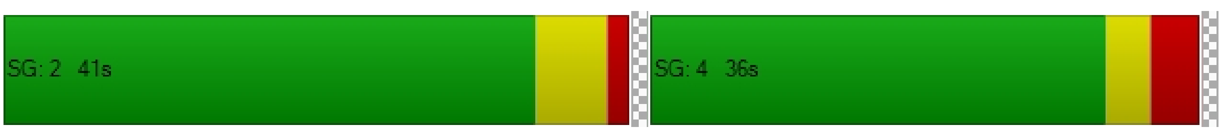
d_M, Delay for Movement [s/veh]	17.75	13.91	12.80	13.94	40.04	16.17
Movement LOS	B	B	B	B	D	B
d_A, Approach Delay [s/veh]	15.66		13.53		32.47	
Approach LOS	B		B		C	
d_I, Intersection Delay [s/veh]	24.54					
Intersection LOS	C					
Intersection V/C	0.531					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.723	4.593	4.132
Bicycle LOS	E	E	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	57.4
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.358

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	35	758	10	32	287	53	32	5	26	4	2	35
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	8.60	7.40	10.00	6.30	2.80	0.00	6.30	0.00	0.00	0.00	0.00	8.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	35	758	10	32	287	53	32	5	26	4	2	35
Peak Hour Factor	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	10	215	3	9	81	15	9	1	7	1	1	10
Total Analysis Volume [veh/h]	40	858	11	36	325	60	36	6	29	5	2	40
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.01	0.00	0.05	0.00	0.00	0.36	0.04	0.04	0.05	0.02	0.12
d_M, Delay for Movement [s/veh]	8.28	0.00	0.00	9.99	0.00	0.00	57.40	47.23	26.57	42.02	35.63	18.41
Movement LOS	A	A	A	A	A	A	F	E	D	E	E	C
95th-Percentile Queue Length [veh/ln]	0.11	0.00	0.00	0.15	0.00	0.00	2.01	2.01	2.01	0.64	0.64	0.64
95th-Percentile Queue Length [ft/ln]	2.73	0.00	0.00	3.74	0.00	0.00	50.24	50.24	50.24	15.96	15.96	15.96
d_A, Approach Delay [s/veh]	0.36			0.85			43.95			21.66		
Approach LOS	A			A			E			C		
d_I, Intersection Delay [s/veh]	3.33											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 11: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	36.2
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.789

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	98	482	430	504	287	132	166	334	53	293	379	620
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	10.30	2.60	1.20	4.10	1.60	10.80	2.10	1.90	1.70	2.10	3.30
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	98	482	430	504	287	132	166	334	53	293	379	620
Peak Hour Factor	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	25	125	112	131	75	34	43	87	14	76	98	161
Total Analysis Volume [veh/h]	102	501	447	524	298	137	173	347	55	305	394	644
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	4	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			4,6									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	10	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	35	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	4.3	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	2.7	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	24	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	5.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	119	119	119	119	119	119	119	119	119	119	119	119
L, Total Lost Time per Cycle [s]	6.00	6.70	7.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	9	23	76	30	44	44	46	24	24	46	32	69
g / C, Green / Cycle	0.08	0.20	0.64	0.25	0.37	0.37	0.39	0.20	0.20	0.39	0.26	0.57
(v / s)_i Volume / Saturation Flow Rate	0.06	0.16	0.31	0.16	0.14	0.14	0.16	0.12	0.12	0.24	0.23	0.44
s, saturation flow rate [veh/h]	1627	3061	1457	3206	1693	1515	1086	1721	1640	1272	1721	1449
c, Capacity [veh/h]	127	601	933	804	625	559	306	348	332	475	456	832
d1, Uniform Delay [s]	54.25	46.19	11.15	40.15	27.55	27.55	28.80	43.20	43.25	28.51	41.92	19.53
k, delay calibration	0.11	0.11	0.44	0.11	0.11	0.11	0.29	0.11	0.11	0.28	0.25	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.05	3.10	1.53	0.90	0.36	0.40	4.37	1.58	1.69	3.70	10.78	6.94
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.80	0.83	0.48	0.65	0.37	0.37	0.57	0.59	0.59	0.64	0.86	0.77
d, Delay for Lane Group [s/veh]	65.29	49.28	12.68	41.06	27.91	27.96	33.16	44.78	44.94	32.21	52.70	26.47
Lane Group LOS	E	D	B	D	C	C	C	D	D	C	D	C
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.41	7.38	6.24	6.98	4.85	4.35	3.77	5.64	5.43	7.01	12.36	14.62
50th-Percentile Queue Length [ft/ln]	85.13	184.57	156.00	174.43	121.30	108.69	94.29	141.05	135.85	175.35	308.90	365.59
95th-Percentile Queue Length [veh/ln]	6.13	11.84	10.34	11.31	8.46	7.77	6.79	9.54	9.26	11.36	18.12	20.90
95th-Percentile Queue Length [ft/ln]	153.24	295.97	258.42	282.72	211.61	194.18	169.73	238.44	231.43	283.93	453.01	522.38

Movement, Approach, & Intersection Results

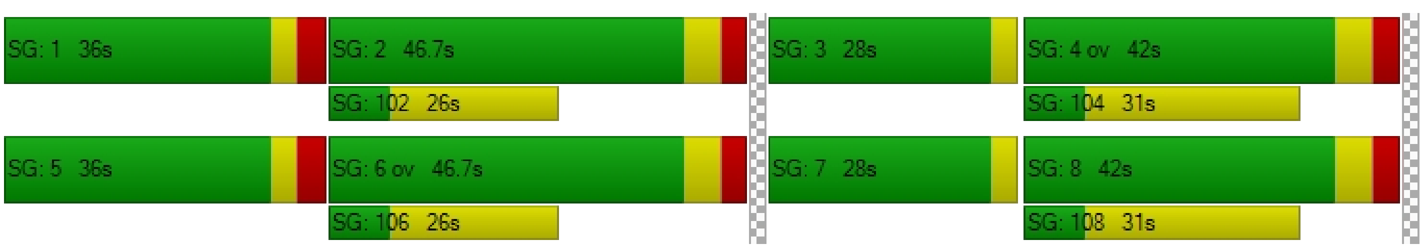
d_M, Delay for Movement [s/veh]	65.29	49.28	12.68	41.06	27.92	27.96	33.16	44.85	44.94	32.21	52.70	26.47
Movement LOS	E	D	B	D	C	C	C	D	D	C	D	C
d_A, Approach Delay [s/veh]	35.26			35.10			41.34			35.47		
Approach LOS	D			D			D			D		
d_I, Intersection Delay [s/veh]	36.18											
Intersection LOS	D											
Intersection V/C	0.789											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	2.825	2.892	2.425	2.818
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.426	2.351	2.034	3.776
Bicycle LOS	B	B	B	D

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



US 191 Corridor Study

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Report File: F:\...\Dec Thurs 2019 AM.pdf

Scenario 7 Dec Thurs 2019 AM

1/10/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Right	0.593	11.9	B
2	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	0.421	43.5	E
3	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	NB Left	0.726	33.7	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	11.9
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.593

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	217	50	81	623	72	174
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.10	18.00	12.30	4.20	7.00	4.60
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	217	50	81	623	72	174
Peak Hour Factor	0.9360	0.9360	0.9360	0.9360	0.9360	0.9360
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	58	13	22	166	19	46
Total Analysis Volume [veh/h]	232	53	87	666	77	186
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	51	51	51	51	51	51
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	9	9
g / C, Green / Cycle	0.59	0.59	0.59	0.59	0.17	0.17
(v / s)_i Volume / Saturation Flow Rate	0.18	0.04	0.06	0.46	0.05	0.13
s, saturation flow rate [veh/h]	1277	1501	1580	1438	1574	1433
c, Capacity [veh/h]	818	886	933	849	274	250
d1, Uniform Delay [s]	6.89	4.43	4.52	7.96	18.26	19.96
k, delay calibration	0.11	0.11	0.11	0.19	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.19	0.03	0.04	2.85	0.55	4.39
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.28	0.06	0.09	0.78	0.28	0.75
d, Delay for Lane Group [s/veh]	7.08	4.46	4.57	10.81	18.81	24.35
Lane Group LOS	A	A	A	B	B	C
Critical Lane Group	No	No	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	0.85	0.12	0.19	3.13	0.77	2.23
50th-Percentile Queue Length [ft/ln]	21.21	2.89	4.84	78.26	19.30	55.79
95th-Percentile Queue Length [veh/ln]	1.53	0.21	0.35	5.63	1.39	4.02
95th-Percentile Queue Length [ft/ln]	38.18	5.21	8.71	140.86	34.74	100.42

Movement, Approach, & Intersection Results

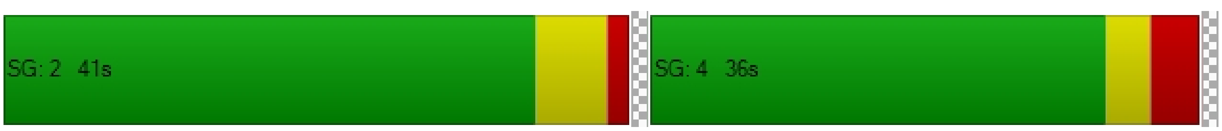
d_M, Delay for Movement [s/veh]	7.08	4.46	4.57	10.81	18.81	24.35
Movement LOS	A	A	A	B	B	C
d_A, Approach Delay [s/veh]	6.59		10.09		22.73	
Approach LOS	A		B		C	
d_I, Intersection Delay [s/veh]	11.88					
Intersection LOS	B					
Intersection V/C	0.593					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.603	5.375	4.132
Bicycle LOS	E	F	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	43.5
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.421

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			55.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	29	152	4	65	599	69	67	12	21	12	3	24
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	7.30	0.00	0.00	5.60	1.40	0.00	0.00	0.00	8.30	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	29	152	4	65	599	69	67	12	21	12	3	24
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	8	43	1	18	168	19	19	3	6	3	1	7
Total Analysis Volume [veh/h]	33	171	4	73	673	78	75	13	24	13	3	27
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	2	2
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.04	0.00	0.00	0.05	0.01	0.00	0.42	0.06	0.05	0.09	0.02	0.03
d_M, Delay for Movement [s/veh]	9.31	0.00	0.00	7.69	0.00	0.00	43.50	40.77	31.15	30.46	26.06	10.81
Movement LOS	A	A	A	A	A	A	E	E	D	D	D	B
95th-Percentile Queue Length [veh/ln]	0.12	0.00	0.00	0.16	0.00	0.00	2.81	2.81	2.81	0.45	0.45	0.45
95th-Percentile Queue Length [ft/ln]	2.96	0.00	0.00	4.08	0.00	0.00	70.33	70.33	70.33	11.34	11.34	11.34
d_A, Approach Delay [s/veh]	1.48			0.68			40.54			17.81		
Approach LOS	A			A			E			C		
d_I, Intersection Delay [s/veh]	5.20											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 3: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	33.7
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.726

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	2	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	45.00			45.00			45.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	45	186	244	521	342	89	137	315	73	335	278	334
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	11.10	6.00	2.80	5.00	12.00	12.40	3.60	3.50	4.10	3.60	1.80	4.80
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	45	186	244	521	342	89	137	315	73	335	278	334
Peak Hour Factor	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	52	69	147	96	25	39	89	21	94	78	94
Total Analysis Volume [veh/h]	51	210	275	587	386	100	154	355	82	378	313	377
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	7	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			6,7									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	6	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	25	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	3.0	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	0.0	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	0	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	1.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	105	105	105	105	105	105	105	105	105	105	105	105
L, Total Lost Time per Cycle [s]	6.00	6.70	3.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	5	15	45	25	35	35	45	18	18	45	33	65
g / C, Green / Cycle	0.04	0.14	0.43	0.24	0.34	0.34	0.43	0.18	0.18	0.43	0.31	0.62
(v / s)_i Volume / Saturation Flow Rate	0.04	0.07	0.21	0.21	0.18	0.18	0.14	0.15	0.15	0.32	0.20	0.29
s, saturation flow rate [veh/h]	1368	2857	1309	2798	1426	1326	1064	1531	1434	1179	1553	1288
c, Capacity [veh/h]	61	408	565	673	483	449	388	269	252	482	484	797
d1, Uniform Delay [s]	49.77	41.61	21.48	38.33	27.88	27.88	21.03	41.79	41.86	24.79	31.15	10.79
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.17	0.11	0.11	0.38	0.13	0.32
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	24.25	1.00	0.65	3.72	0.87	0.94	1.06	6.68	7.48	9.35	1.76	1.28
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.83	0.51	0.49	0.87	0.52	0.52	0.40	0.83	0.84	0.79	0.65	0.47
d, Delay for Lane Group [s/veh]	74.02	42.62	22.13	42.06	28.75	28.82	22.09	48.47	49.34	34.13	32.91	12.07
Lane Group LOS	E	D	C	D	C	C	C	D	D	C	C	B
Critical Lane Group	No	No	Yes	Yes	No	No	No	No	Yes	Yes	No	No
50th-Percentile Queue Length [veh/ln]	1.70	2.48	4.62	7.24	4.91	4.58	2.36	5.88	5.62	7.92	6.70	4.30
50th-Percentile Queue Length [ft/ln]	42.39	61.97	115.47	180.94	122.74	114.45	59.09	146.93	140.42	197.94	167.39	107.61
95th-Percentile Queue Length [veh/ln]	3.05	4.46	8.14	11.65	8.54	8.09	4.25	9.85	9.50	12.53	10.94	7.71
95th-Percentile Queue Length [ft/ln]	76.31	111.54	203.59	291.24	213.59	202.18	106.36	246.32	237.58	313.31	273.48	192.67

Movement, Approach, & Intersection Results

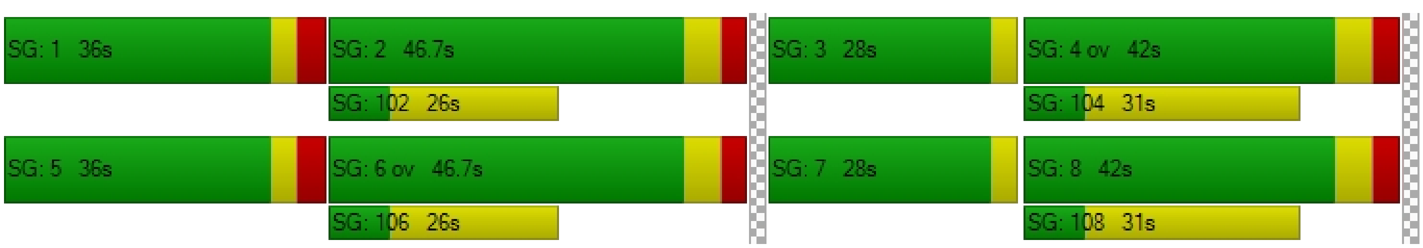
d_M, Delay for Movement [s/veh]	74.02	42.62	22.13	42.06	28.77	28.82	22.09	48.79	49.34	34.13	32.91	12.07
Movement LOS	E	D	C	D	C	C	C	D	D	C	C	B
d_A, Approach Delay [s/veh]	35.10			36.04			41.91			25.99		
Approach LOS	D			D			D			C		
d_I, Intersection Delay [s/veh]	33.66											
Intersection LOS	C											
Intersection V/C	0.726											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	2.894	2.967	2.516	2.968
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.002	2.445	2.047	3.322
Bicycle LOS	B	B	B	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



191 Corridor Study

Vistro File: F:\...\191 LOS.vistro
Scenario 15 Dec Thurs 2019 Noon

Report File: F:\...\Dec Thurs 2019 Noon.pdf
1/7/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Left	0.325	13.6	B
6	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	0.072	17.0	C
11	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	NB Left	0.491	22.8	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	13.6
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.325

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	93	49	60	186	194	120
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.40	14.30	26.70	7.60	9.80	5.80
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	93	49	60	186	194	120
Peak Hour Factor	0.8860	0.8860	0.8860	0.8860	0.8860	0.8860
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	26	14	17	52	55	34
Total Analysis Volume [veh/h]	105	55	68	210	219	135
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	53	53	53	53	53	53
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	11	11
g / C, Green / Cycle	0.57	0.57	0.57	0.57	0.20	0.20
(v / s)_i Volume / Saturation Flow Rate	0.09	0.04	0.05	0.17	0.16	0.11
s, saturation flow rate [veh/h]	1176	1397	1243	1258	1384	1277
c, Capacity [veh/h]	731	793	706	715	283	262
d1, Uniform Delay [s]	7.08	5.13	5.21	5.91	19.83	18.66
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.09	0.04	0.06	0.23	4.47	1.57
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.14	0.07	0.10	0.29	0.77	0.52
d, Delay for Lane Group [s/veh]	7.17	5.17	5.27	6.14	24.30	20.24
Lane Group LOS	A	A	A	A	C	C
Critical Lane Group	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	0.41	0.15	0.19	0.68	2.69	1.47
50th-Percentile Queue Length [ft/ln]	10.37	3.82	4.83	17.04	67.33	36.82
95th-Percentile Queue Length [veh/ln]	0.75	0.27	0.35	1.23	4.85	2.65
95th-Percentile Queue Length [ft/ln]	18.66	6.87	8.70	30.68	121.20	66.27

Movement, Approach, & Intersection Results

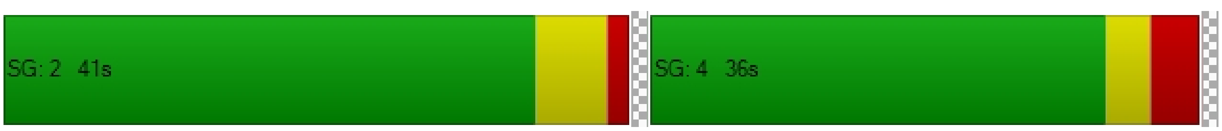
d_M, Delay for Movement [s/veh]	7.17	5.17	5.27	6.14	24.30	20.24
Movement LOS	A	A	A	A	C	C
d_A, Approach Delay [s/veh]	6.48		5.93		22.75	
Approach LOS	A		A		C	
d_I, Intersection Delay [s/veh]	13.56					
Intersection LOS	B					
Intersection V/C	0.325					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.396	4.591	4.132
Bicycle LOS	E	E	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	17.0
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.072

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			55.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	5	259	12	46	232	28	22	8	1	10	3	32
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	9.70	0.00	0.00	12.00	7.10	9.10	25.00	0.00	0.00	0.00	6.30
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	5	259	12	46	232	28	22	8	1	10	3	32
Peak Hour Factor	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	1	70	3	12	63	8	6	2	0	3	1	9
Total Analysis Volume [veh/h]	5	280	13	50	251	30	24	9	1	11	3	35
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.00	0.00	0.00	0.04	0.00	0.00	0.07	0.03	0.00	0.03	0.01	0.05
d_M, Delay for Movement [s/veh]	7.79	0.00	0.00	7.93	0.00	0.00	16.99	16.67	10.71	15.74	15.58	10.45
Movement LOS	A	A	A	A	A	A	C	C	B	C	C	B
95th-Percentile Queue Length [veh/ln]	0.01	0.00	0.00	0.12	0.00	0.00	0.33	0.33	0.33	0.28	0.28	0.28
95th-Percentile Queue Length [ft/ln]	0.29	0.00	0.00	3.05	0.00	0.00	8.23	8.23	8.23	7.07	7.07	7.07
d_A, Approach Delay [s/veh]	0.13			1.20			16.72			11.95		
Approach LOS	A			A			C			B		
d_I, Intersection Delay [s/veh]	2.23											
Intersection LOS	C											

Intersection Level Of Service Report
Intersection 11: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	22.8
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.491

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	2	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	45.00			45.00			45.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	47	233	232	349	262	89	134	241	37	228	221	305
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	10.60	6.80	3.00	3.40	8.00	14.60	9.70	4.20	10.80	3.10	5.90	6.20
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	47	233	232	349	262	89	134	241	37	228	221	305
Peak Hour Factor	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	12	60	60	90	68	23	35	62	10	59	57	79
Total Analysis Volume [veh/h]	49	241	240	361	271	92	138	249	38	236	228	315
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	7	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			6,7									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	6	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	25	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	3.0	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	0.0	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	0	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	1.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	74	74	74	74	74	74	74	74	74	74	74	74
L, Total Lost Time per Cycle [s]	6.00	6.70	3.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	4	15	33	15	26	26	24	10	10	24	15	36
g / C, Green / Cycle	0.05	0.20	0.45	0.20	0.35	0.35	0.33	0.14	0.14	0.33	0.20	0.49
(v / s)_i Volume / Saturation Flow Rate	0.03	0.08	0.17	0.11	0.12	0.12	0.11	0.09	0.09	0.17	0.14	0.22
s, saturation flow rate [veh/h]	1527	3153	1452	3150	1639	1499	1227	1692	1615	1360	1668	1415
c, Capacity [veh/h]	80	639	652	629	574	525	409	229	218	503	332	698
d1, Uniform Delay [s]	34.37	25.50	13.46	26.81	17.70	17.72	18.85	30.32	30.37	19.67	27.53	12.24
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	7.34	0.37	0.35	0.83	0.33	0.37	0.48	2.94	3.19	0.68	2.52	0.46
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.61	0.38	0.37	0.57	0.33	0.33	0.34	0.64	0.65	0.47	0.69	0.45
d, Delay for Lane Group [s/veh]	41.71	25.87	13.81	27.64	18.04	18.08	19.33	33.26	33.56	20.35	30.05	12.70
Lane Group LOS	D	C	B	C	B	B	B	C	C	C	C	B
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	0.97	1.70	2.29	2.70	2.14	1.98	1.59	2.45	2.39	2.90	3.63	2.86
50th-Percentile Queue Length [ft/ln]	24.19	42.53	57.18	67.44	53.56	49.42	39.87	61.22	59.70	72.49	90.79	71.59
95th-Percentile Queue Length [veh/ln]	1.74	3.06	4.12	4.86	3.86	3.56	2.87	4.41	4.30	5.22	6.54	5.15
95th-Percentile Queue Length [ft/ln]	43.54	76.55	102.93	121.39	96.42	88.95	71.76	110.20	107.47	130.47	163.43	128.86

Movement, Approach, & Intersection Results

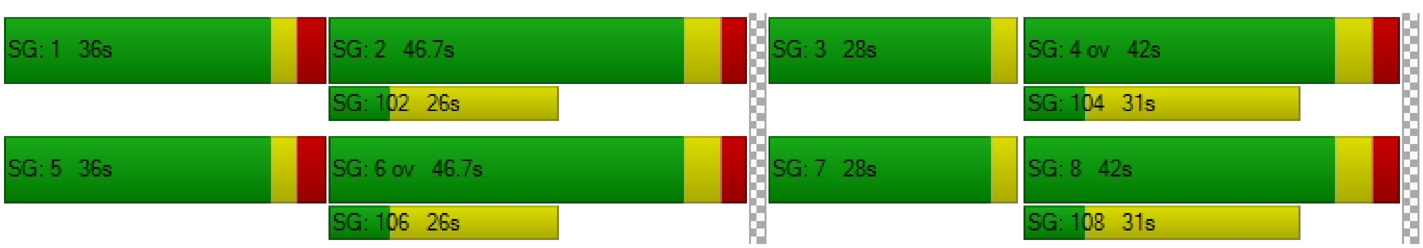
d_M, Delay for Movement [s/veh]	41.71	25.87	13.81	27.64	18.05	18.08	19.33	33.38	33.56	20.35	30.05	12.70
Movement LOS	D	C	B	C	B	B	B	C	C	C	C	B
d_A, Approach Delay [s/veh]		21.87			22.84			28.84			20.10	
Approach LOS		C			C			C			C	
d_I, Intersection Delay [s/veh]	22.80											
Intersection LOS	C											
Intersection V/C	0.491											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	2.769	2.842	2.421	2.776
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	1.997	2.157	1.910	2.845
Bicycle LOS	A	B	A	C

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



US 191 Corridor Study

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Report File: F:\...\Dec Thurs 2019 PM.pdf

Scenario 8 Dec Thurs 2019 PM

1/10/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Left	0.562	45.5	D
6	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	0.224	39.9	E
11	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	NB Left	0.728	34.2	C

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	45.5
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.562

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	139	113	58	124	642	225
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.40	10.60	13.80	2.40	3.00	3.10
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	139	113	58	124	642	225
Peak Hour Factor	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	35	29	15	32	163	57
Total Analysis Volume [veh/h]	141	115	59	126	653	229
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	72	72	72	72	72	72
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	30	30
g / C, Green / Cycle	0.42	0.42	0.42	0.42	0.42	0.42
(v / s)_i Volume / Saturation Flow Rate	0.12	0.08	0.04	0.10	0.45	0.18
s, saturation flow rate [veh/h]	1215	1443	1403	1313	1464	1306
c, Capacity [veh/h]	549	603	586	549	609	543
d1, Uniform Delay [s]	16.22	13.28	12.76	13.52	21.08	14.93
k, delay calibration	0.11	0.11	0.11	0.11	0.46	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.24	0.15	0.07	0.21	55.94	0.52
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.26	0.19	0.10	0.23	1.07	0.42
d, Delay for Lane Group [s/veh]	16.46	13.43	12.83	13.73	77.02	15.45
Lane Group LOS	B	B	B	B	F	B
Critical Lane Group	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	1.45	1.01	0.50	1.13	18.87	2.59
50th-Percentile Queue Length [ft/ln]	36.19	25.23	12.43	28.24	471.82	64.65
95th-Percentile Queue Length [veh/ln]	2.61	1.82	0.89	2.03	27.29	4.65
95th-Percentile Queue Length [ft/ln]	65.14	45.42	22.37	50.83	682.13	116.37

Movement, Approach, & Intersection Results

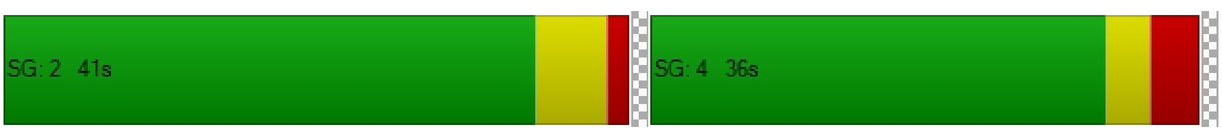
d_M, Delay for Movement [s/veh]	16.46	13.43	12.83	13.73	77.02	15.45
Movement LOS	B	B	B	B	F	B
d_A, Approach Delay [s/veh]	15.10		13.45		61.04	
Approach LOS	B		B		E	
d_I, Intersection Delay [s/veh]	45.49					
Intersection LOS	D					
Intersection V/C	0.562					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.555	4.438	4.132
Bicycle LOS	E	E	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	39.9
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.224

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			55.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	67	706	4	30	216	103	28	7	11	4	4	28
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	3.80	0.00	3.30	3.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	67	706	4	30	216	103	28	7	11	4	4	28
Peak Hour Factor	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	18	189	1	8	58	28	8	2	3	1	1	8
Total Analysis Volume [veh/h]	72	758	4	32	232	111	30	8	12	4	4	30
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.06	0.01	0.00	0.04	0.00	0.00	0.22	0.05	0.01	0.03	0.03	0.07
d_M, Delay for Movement [s/veh]	8.12	0.00	0.00	9.43	0.00	0.00	39.93	34.41	17.49	34.60	31.69	15.68
Movement LOS	A	A	A	A	A	A	E	D	C	D	D	C
95th-Percentile Queue Length [veh/ln]	0.19	0.00	0.00	0.12	0.00	0.00	1.12	1.12	1.12	0.45	0.45	0.45
95th-Percentile Queue Length [ft/ln]	4.67	0.00	0.00	2.95	0.00	0.00	28.05	28.05	28.05	11.21	11.21	11.21
d_A, Approach Delay [s/veh]	0.70			0.80			33.66			19.36		
Approach LOS	A			A			D			C		
d_I, Intersection Delay [s/veh]	2.55											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 11: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	34.2
Analysis Method:	HCM 6th Edition	Level Of Service:	C
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.728

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	2	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	45.00			45.00			45.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	74	454	452	436	284	106	151	287	56	298	299	541
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.10	4.00	1.10	1.60	3.60	3.70	3.90	0.30	1.80	1.00	1.00	2.00
Growth Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	74	454	452	436	284	106	151	287	56	298	299	541
Peak Hour Factor	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	19	118	118	114	74	28	39	75	15	78	78	141
Total Analysis Volume [veh/h]	77	473	471	454	296	110	157	299	58	310	311	564
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	7	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			6,7									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	6	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	25	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	3.0	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	0.0	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	0	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	1.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	113	113	113	113	113	113	113	113	113	113	113	113
L, Total Lost Time per Cycle [s]	6.00	6.70	3.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	7	20	52	30	44	44	43	15	15	43	30	67
g / C, Green / Cycle	0.06	0.18	0.46	0.27	0.39	0.39	0.38	0.13	0.13	0.38	0.27	0.59
(v / s)_i Volume / Saturation Flow Rate	0.05	0.15	0.32	0.14	0.13	0.13	0.13	0.10	0.11	0.22	0.18	0.39
s, saturation flow rate [veh/h]	1613	3227	1475	3196	1700	1545	1195	1746	1649	1409	1736	1464
c, Capacity [veh/h]	98	584	681	849	656	596	375	229	216	523	461	868
d1, Uniform Delay [s]	52.33	44.39	24.06	35.52	24.35	24.36	25.87	47.62	47.69	27.63	37.14	15.23
k, delay calibration	0.11	0.11	0.35	0.11	0.11	0.11	0.16	0.11	0.11	0.20	0.11	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	12.83	2.74	4.03	0.53	0.28	0.31	1.13	6.23	6.94	2.01	1.81	3.76
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.79	0.81	0.69	0.54	0.32	0.32	0.42	0.80	0.81	0.59	0.68	0.65
d, Delay for Lane Group [s/veh]	65.16	47.13	28.08	36.05	24.64	24.67	26.99	53.84	54.63	29.65	38.95	18.99
Lane Group LOS	E	D	C	D	C	C	C	D	D	C	D	B
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.44	6.35	9.98	5.21	3.86	3.52	2.88	5.22	5.04	6.36	7.60	9.33
50th-Percentile Queue Length [ft/ln]	61.07	158.82	249.43	130.24	96.56	87.99	72.09	130.56	125.99	159.03	190.11	233.29
95th-Percentile Queue Length [veh/ln]	4.40	10.49	15.16	8.95	6.95	6.34	5.19	8.97	8.72	10.50	12.13	14.34
95th-Percentile Queue Length [ft/ln]	109.93	262.16	378.93	223.82	173.80	158.39	129.77	224.26	218.04	262.44	303.17	358.53

Movement, Approach, & Intersection Results

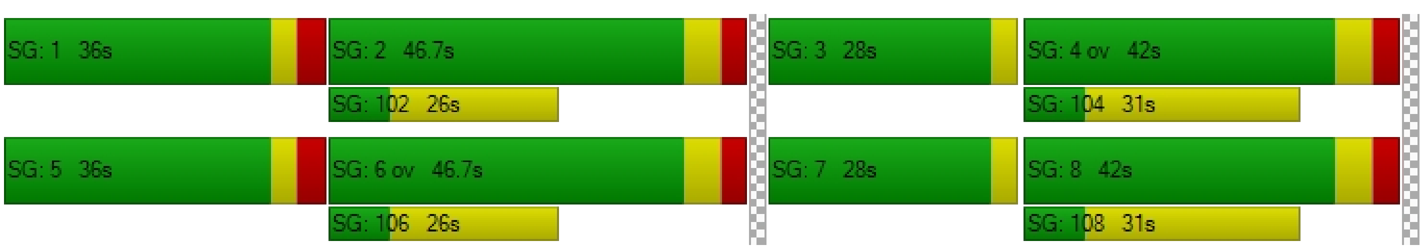
d_M, Delay for Movement [s/veh]	65.16	47.13	28.08	36.05	24.65	24.67	26.99	54.15	54.63	29.65	38.95	18.99
Movement LOS	E	D	C	D	C	C	C	D	D	C	D	B
d_A, Approach Delay [s/veh]	39.71			30.67			45.91			27.02		
Approach LOS	D			C			D			C		
d_I, Intersection Delay [s/veh]	34.22											
Intersection LOS	C											
Intersection V/C	0.728											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	2.929	3.016	2.501	3.004
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.402	2.269	1.984	3.515
Bicycle LOS	B	B	A	D

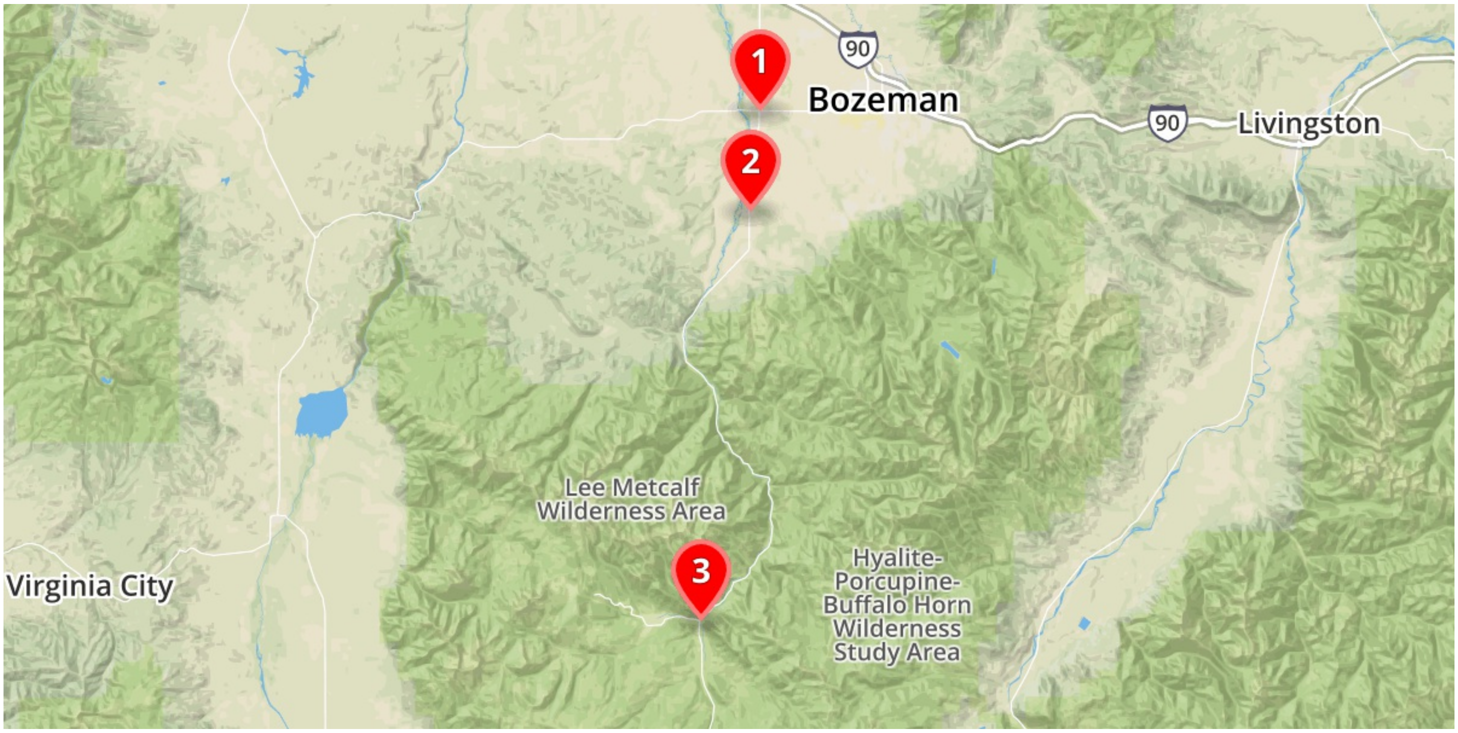
Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Travel Time Summary

3 Locations | Bozeman, MT, Gallatin Gateway, MT | Thu Aug 22, 2019 - Fri Aug 23, 2019 | 12:00AM - 12:00AM (24.0h)



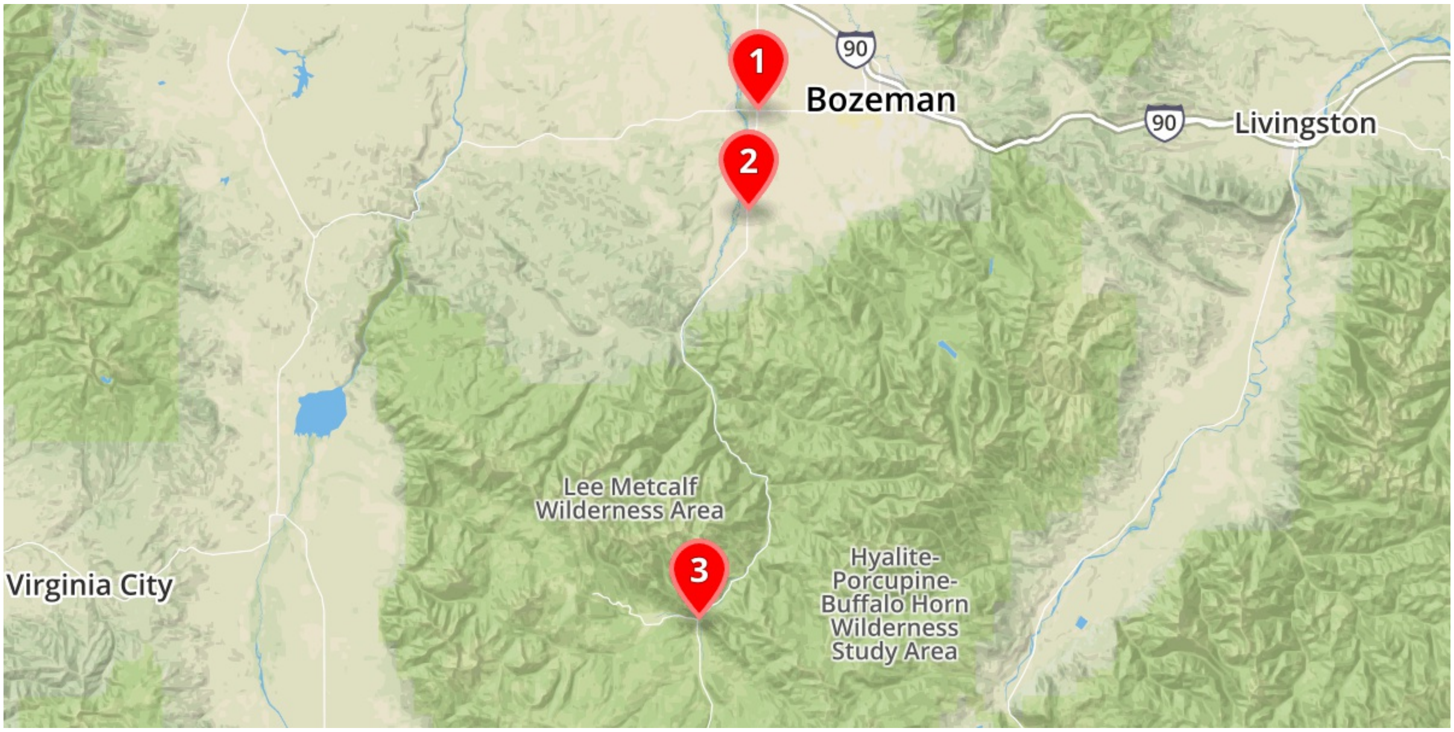
Start Location		End Location		# of Trips	Travel Time (minutes)						Distance (mis)[1]	Speed (mph)[2]					
					Median	85th Percentile	95th Percentile	Mean	Min	Max		Median	85th Percentile	95th Percentile	Mean	Min	Max
1	US 191_Hwy 84_Hwy 85	2	US 191_Mill St	247	6.17	6.65	6.89	6.24	5.35	7.50	5.6	54.90	56.58	58.61	54.39	45.14	63.28
2	US 191_Mill St	1	US 191_Hwy 84_Hwy 85	272	6.68	7.32	7.81	6.71	5.40	8.27	5.6	50.64	55.54	56.95	50.83	40.94	62.68
1	US 191_Hwy 84_Hwy 85	3	US 191_Hwy 64	270	40.48	43.01	44.20	40.24	34.18	48.00	33.9	50.31	54.93	57.03	50.83	42.43	59.58
3	US 191_Hwy 64	1	US 191_Hwy 84_Hwy 85	339	41.18	45.00	46.82	41.24	33.17	51.38	33.9	49.44	54.46	58.18	49.77	39.63	61.39
2	US 191_Mill St	3	US 191_Hwy 64	180	33.98	36.81	37.82	33.83	28.32	40.08	28.3	49.96	55.32	57.56	50.50	42.36	59.96
3	US 191_Hwy 64	2	US 191_Mill St	191	33.72	37.22	38.86	33.74	27.17	41.82	28.3	50.35	56.28	59.10	50.79	40.60	62.49

[1] Distance is the length of the Fastest Route between the locations in Google Maps. If Google Maps is unavailable or if Google Maps reports a distance longer than twice the aerial (as the bird flies) distance, the aerial distance is used and is denoted by an asterisk (*). See help.miovision.com/kb/distance for more information.

[2] Speed is the distance between the points divided by the travel time. This value is known as the space mean speed. This report was configured to include trips with calculated speeds between 1.0 mph and 90.0 mph. If you want a report that includes trips with a different range of speeds, or all trips, contact the person who generated the report.

Travel Time Reliability Summary

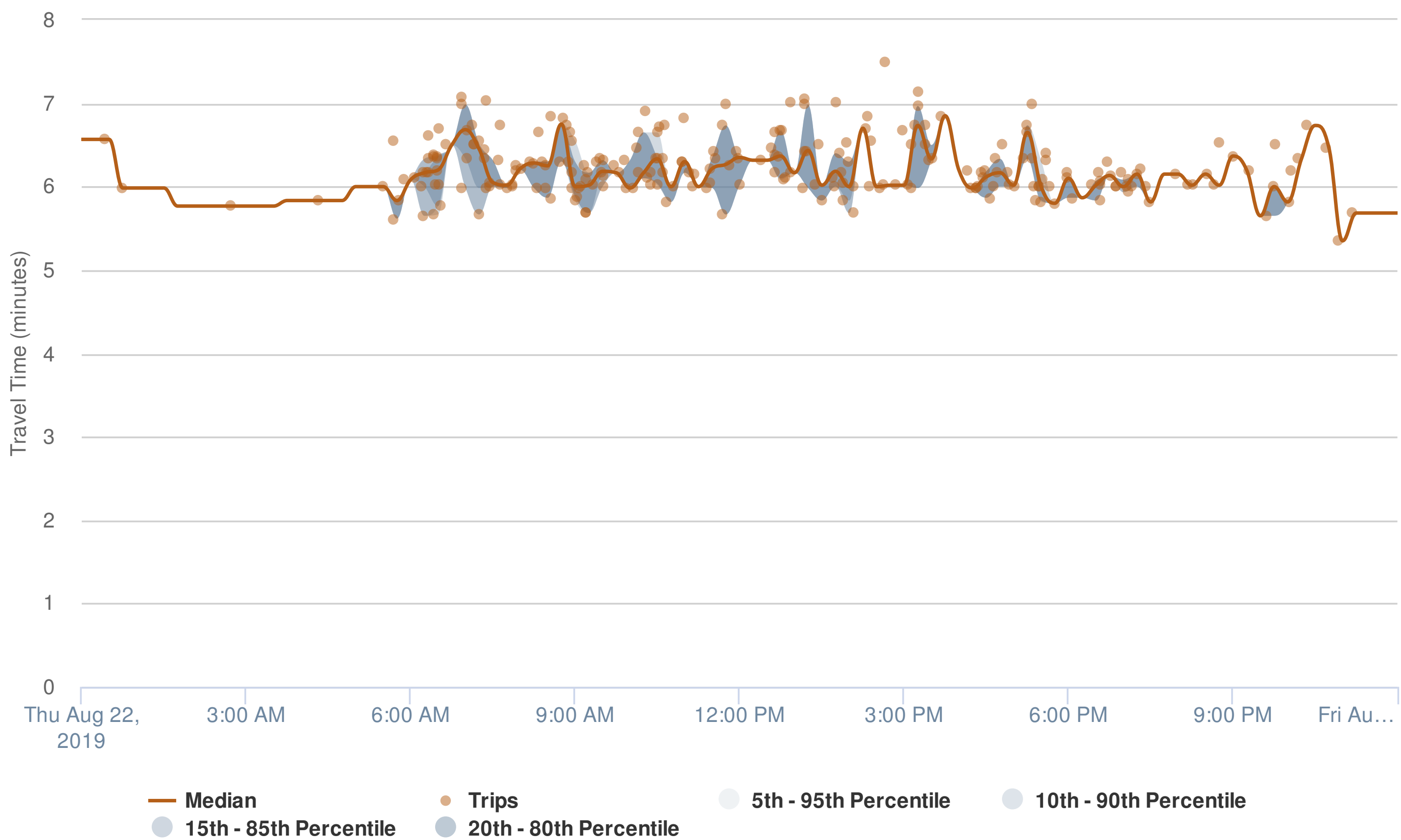
3 Locations | Bozeman, MT, Gallatin Gateway, MT | Thu Aug 22, 2019 - Fri Aug 23, 2019 | 12:00AM - 12:00AM (24.0h)

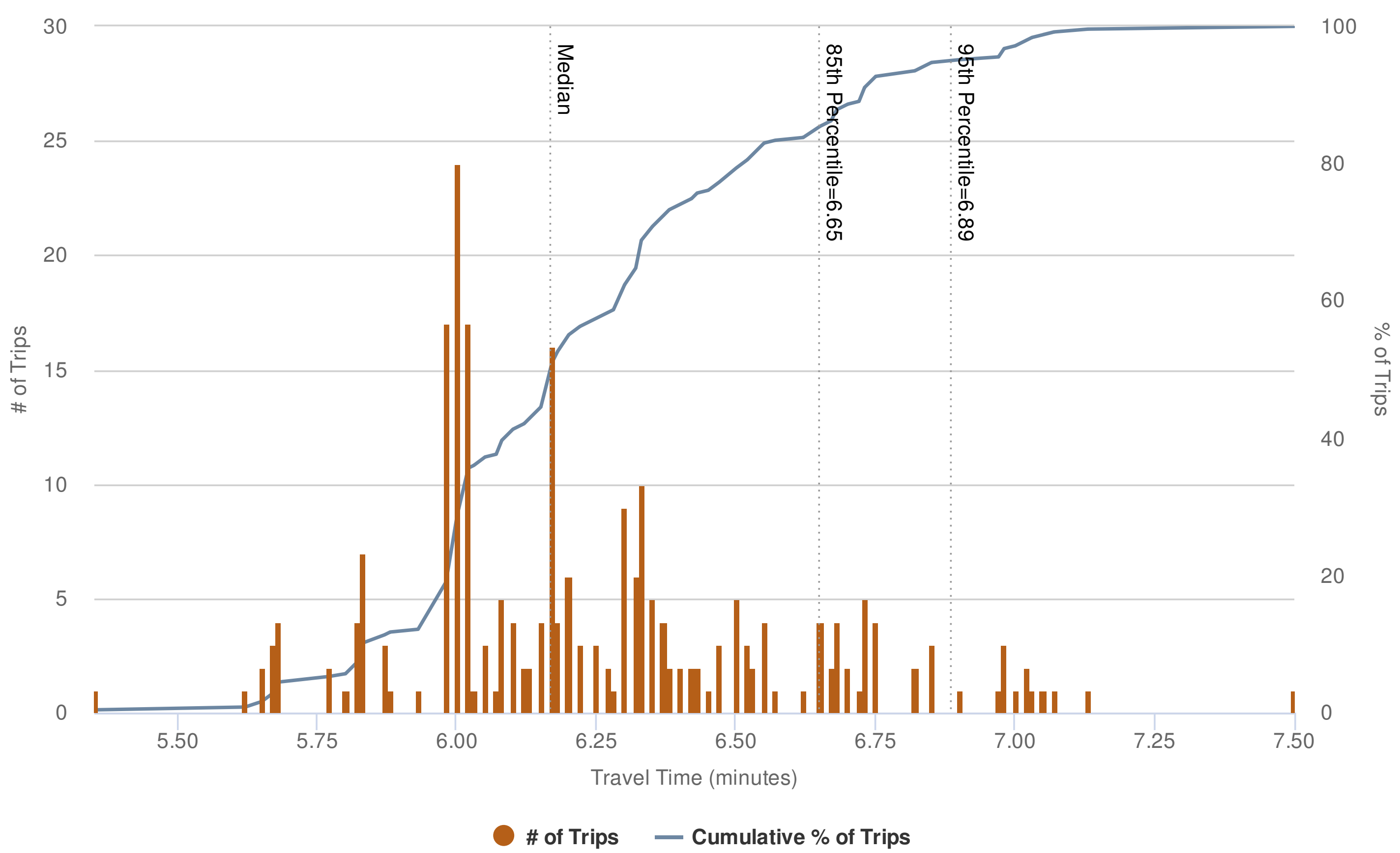


Start Location		End Location		Planning Time Index AM (6am - 9am)	Planning Time Index PM (4pm - 7pm)	Travel Time Index AM (6am - 9am)	Travel Time Index PM (4pm - 7pm)	Buffer Time Index AM (6am - 9am)	Buffer Time Index PM (4pm - 7pm)
1	US 191_Hwy 84_Hwy 85	2	US 191_Mill St	1.14	1.08	1.05	1.02	0.09	0.05
2	US 191_Mill St	1	US 191_Hwy 84_Hwy 85	1.17	1.23	1.05	1.09	0.11	0.13
1	US 191_Hwy 84_Hwy 85	3	US 191_Hwy 64	1.10	1.01	1.04	0.97	0.06	0.04
3	US 191_Hwy 64	1	US 191_Hwy 84_Hwy 85	1.18	1.16	1.13	1.04	0.04	0.12
2	US 191_Mill St	3	US 191_Hwy 64	1.17	0.99	1.06	0.95	0.10	0.04
3	US 191_Hwy 64	2	US 191_Mill St	1.16	1.13	1.12	1.03	0.04	0.10

US 191_Hwy 84_Hwy 85 to US 191_Mill St

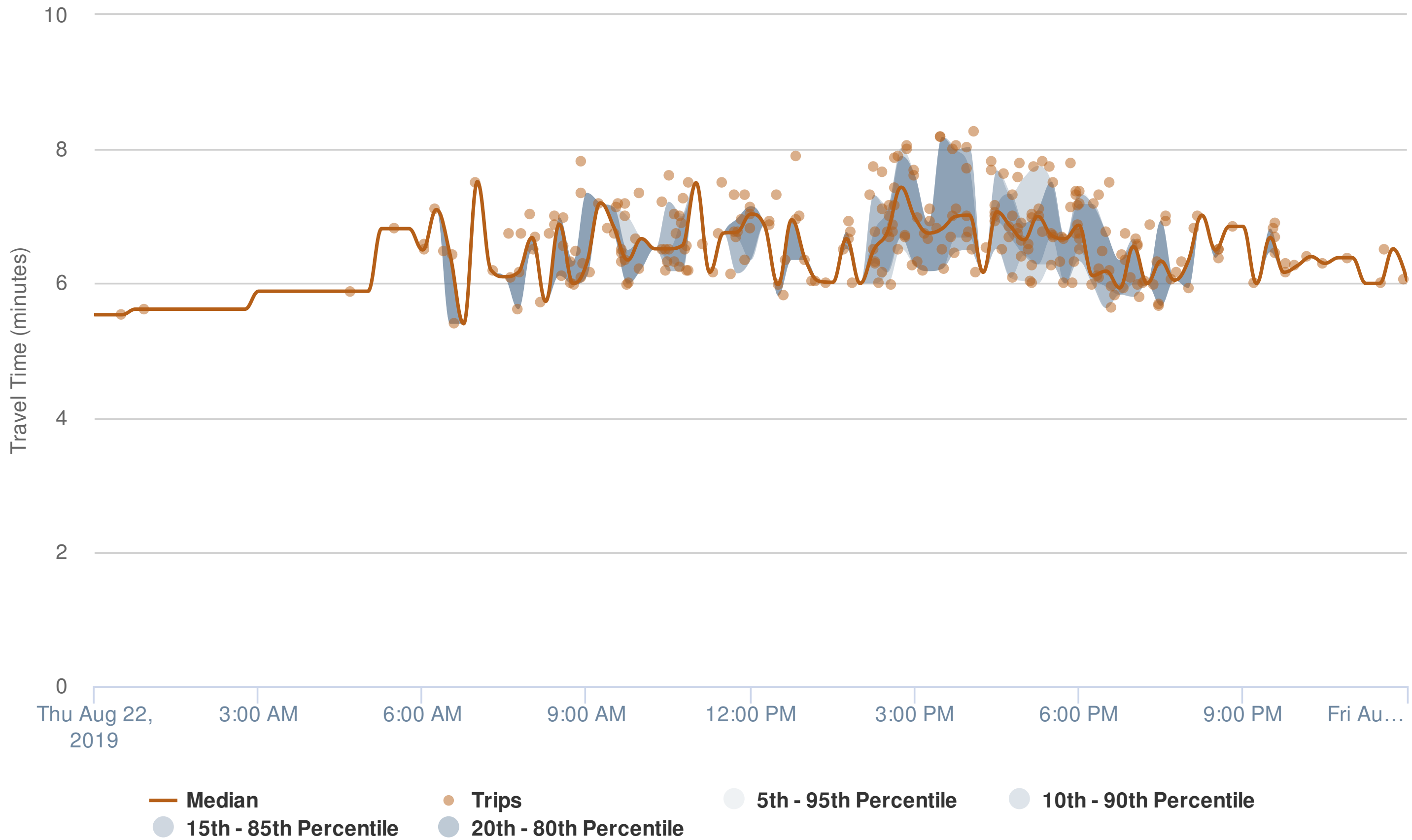
1 to 2 | (45.671128, -111.185718) to (45.591191, -111.197111)

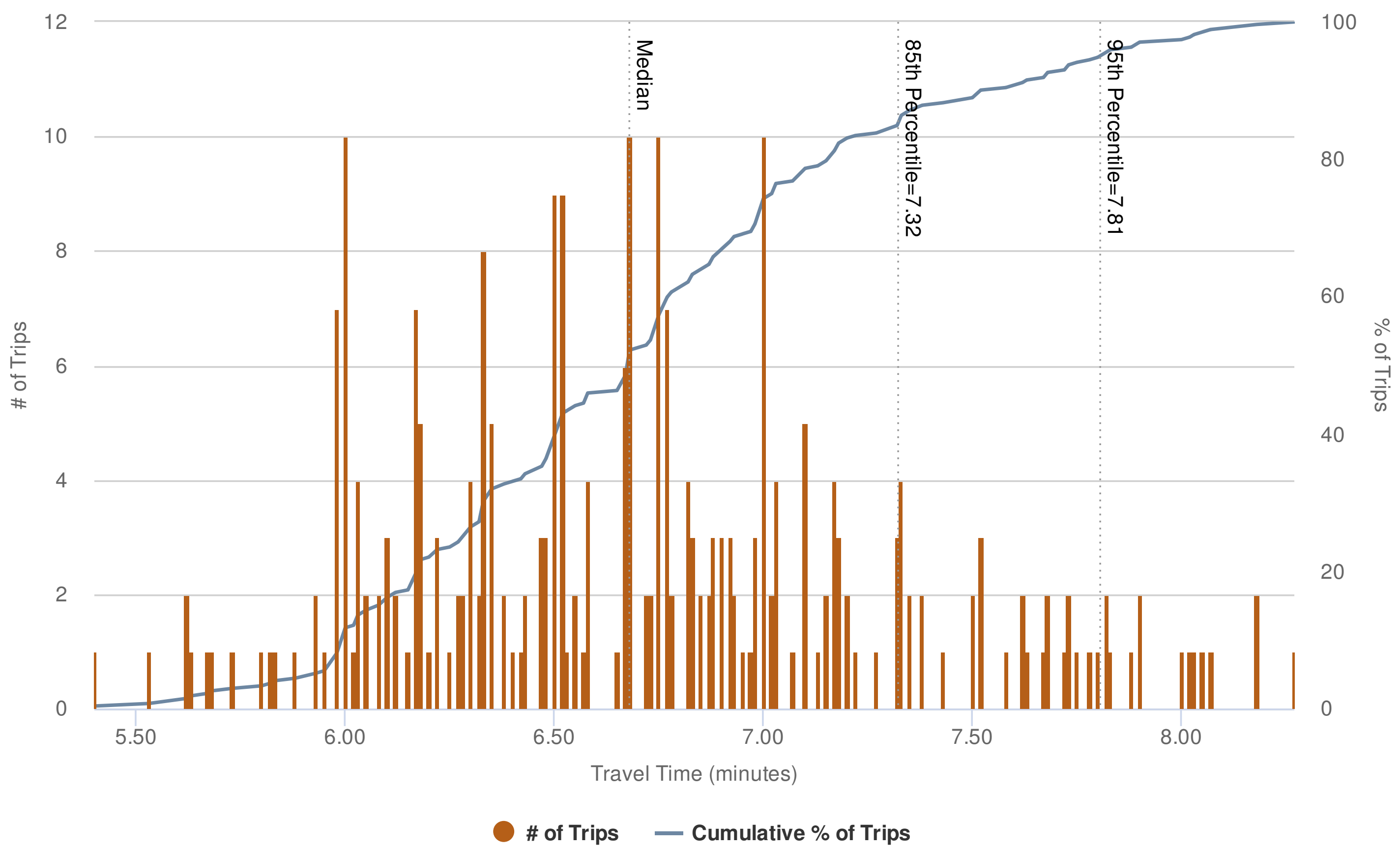




US 191_Mill St to US 191_Hwy 84_Hwy 85

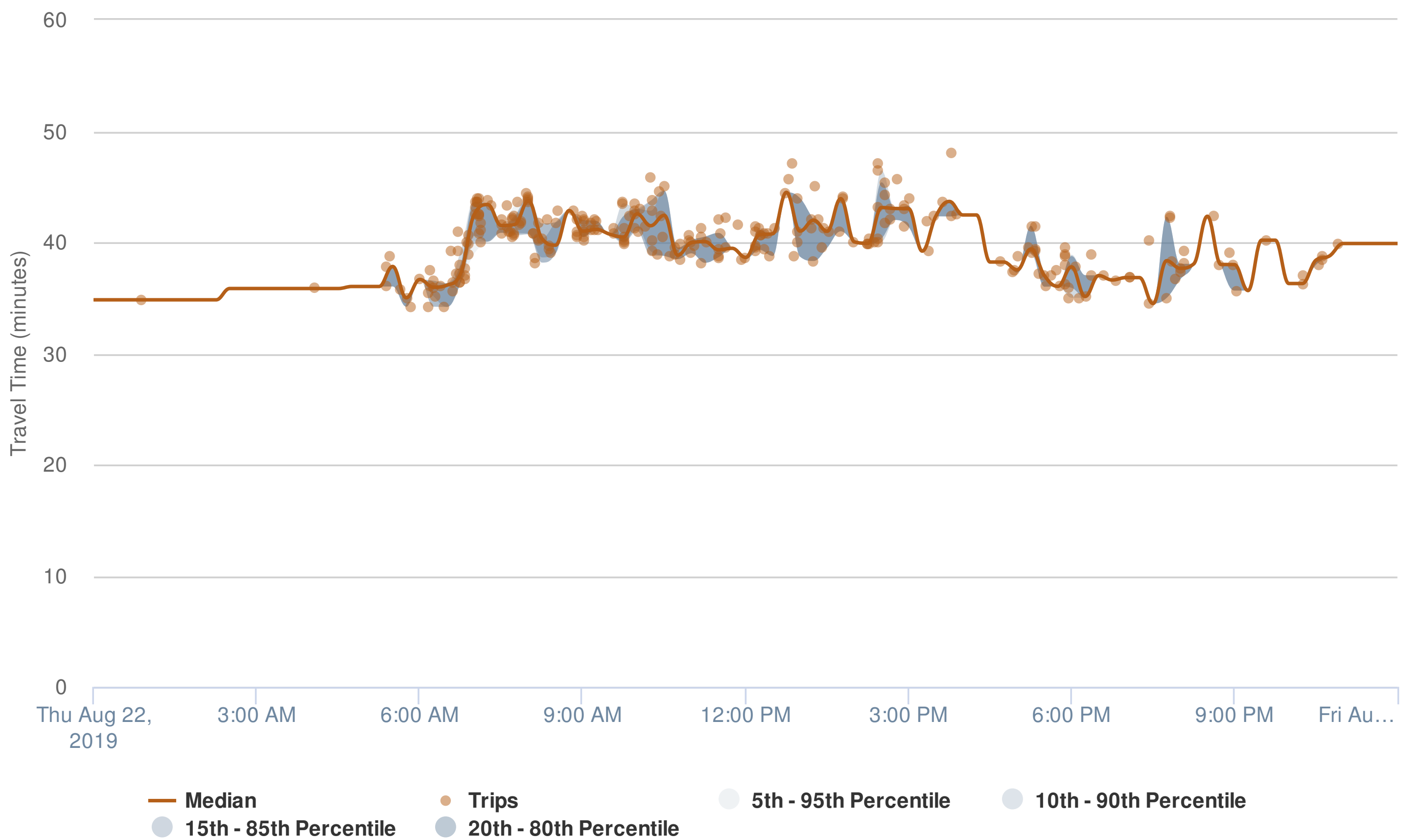
2 to 1 | (45.591191, -111.197111) to (45.671128, -111.185718)

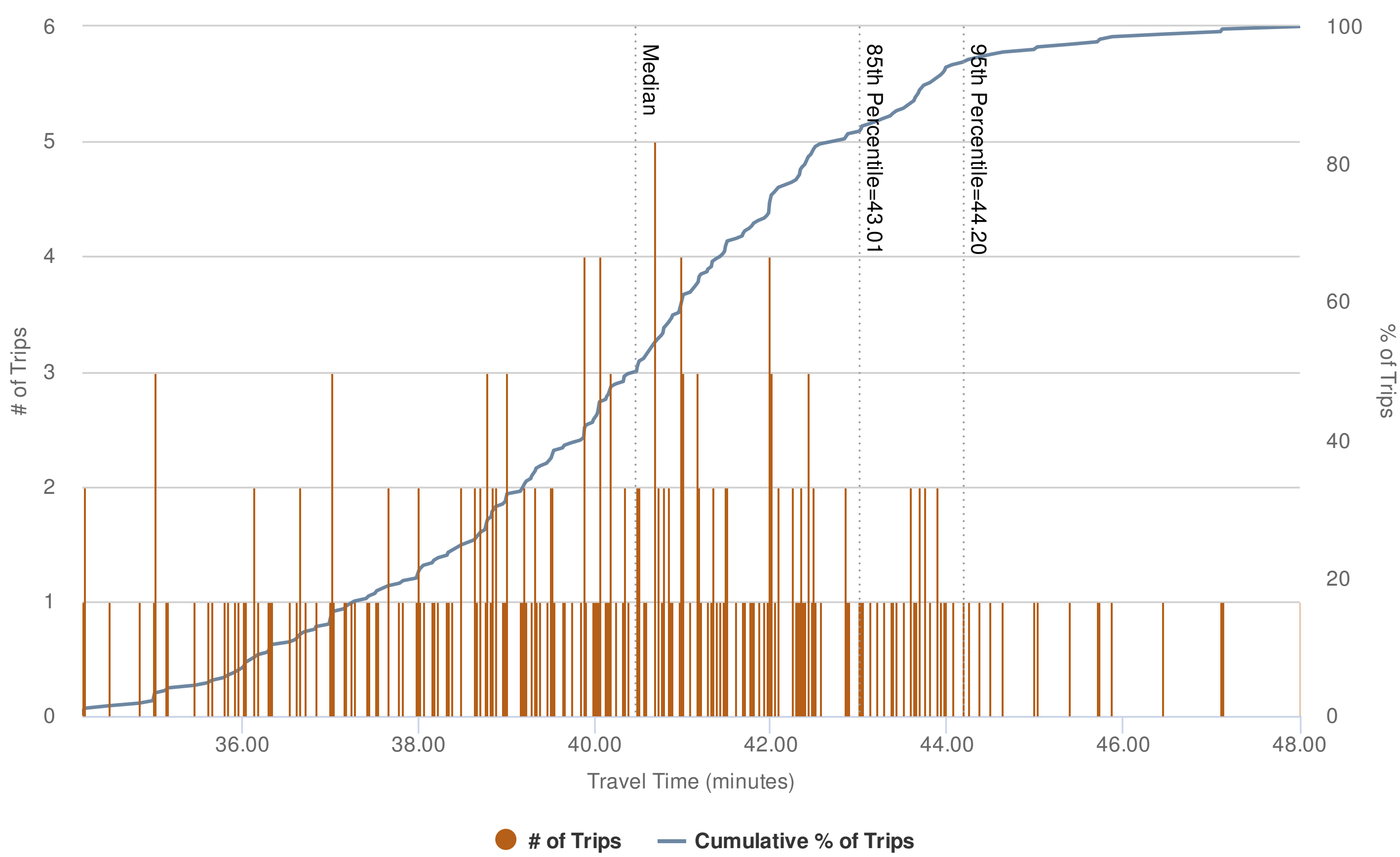




US 191_Hwy 84_Hwy 85 to US 191_Hwy 64

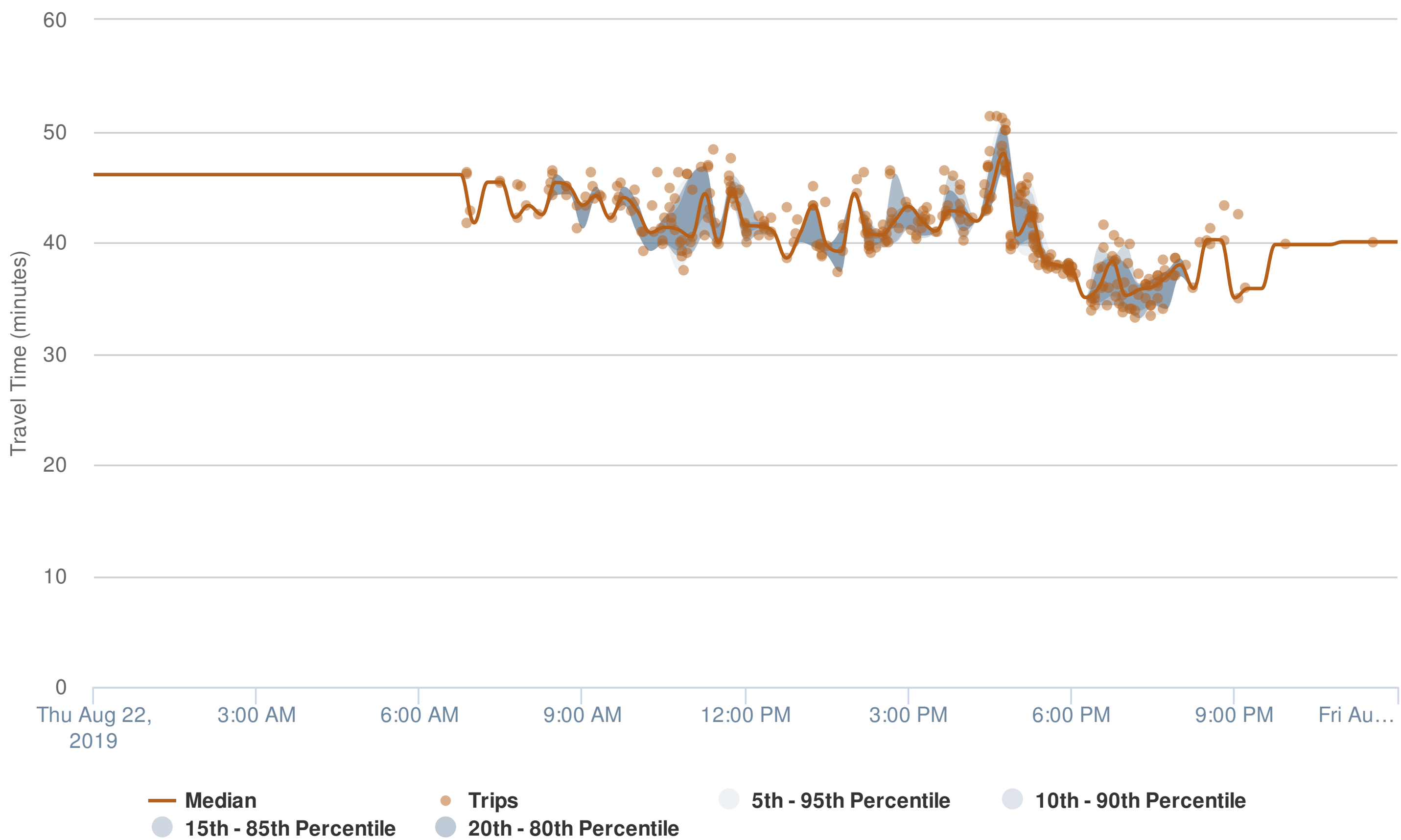
1 to 3 | (45.671128, -111.185718) to (45.264635, -111.253275)

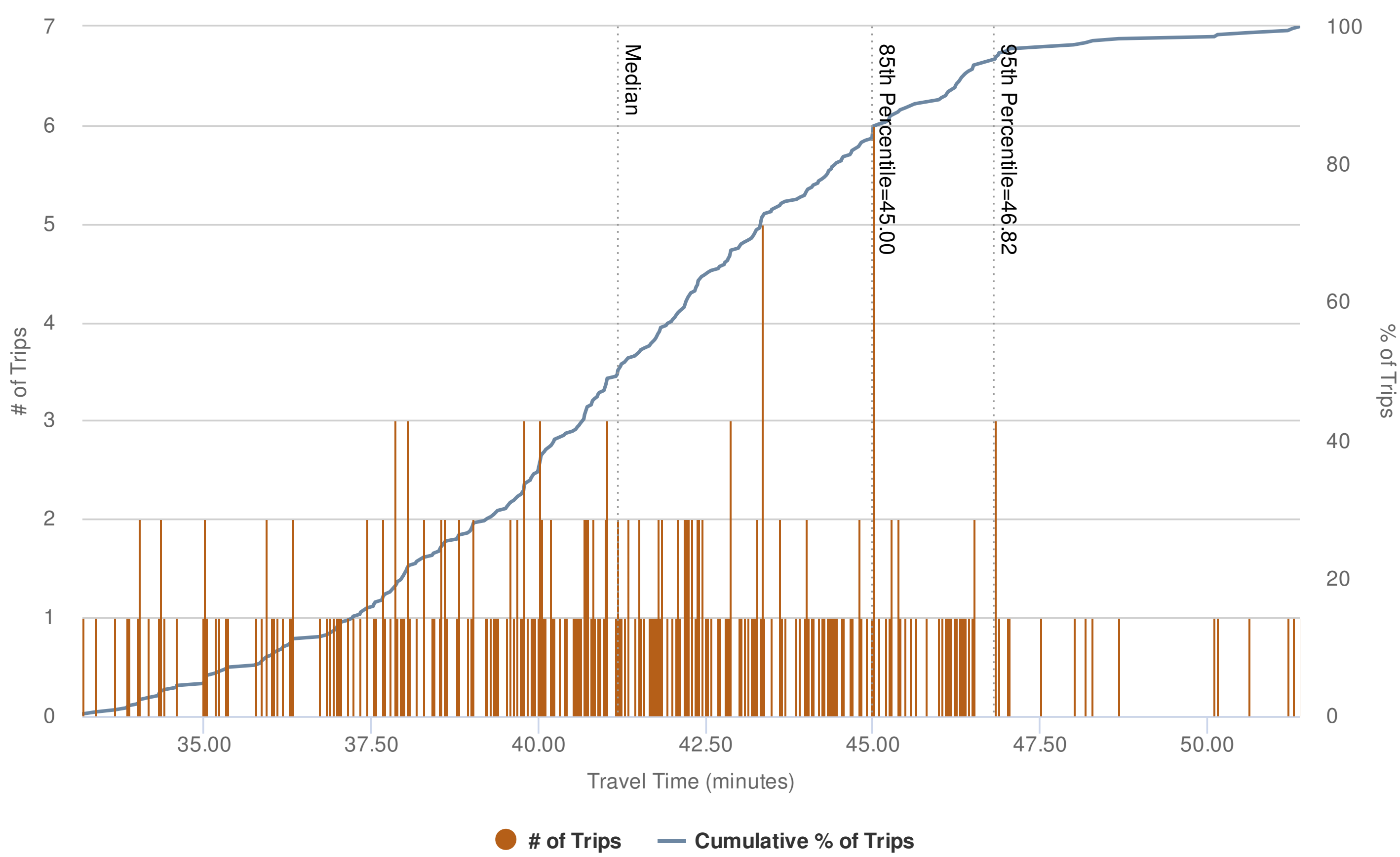




US 191_Hwy 64 to US 191_Hwy 84_Hwy 85

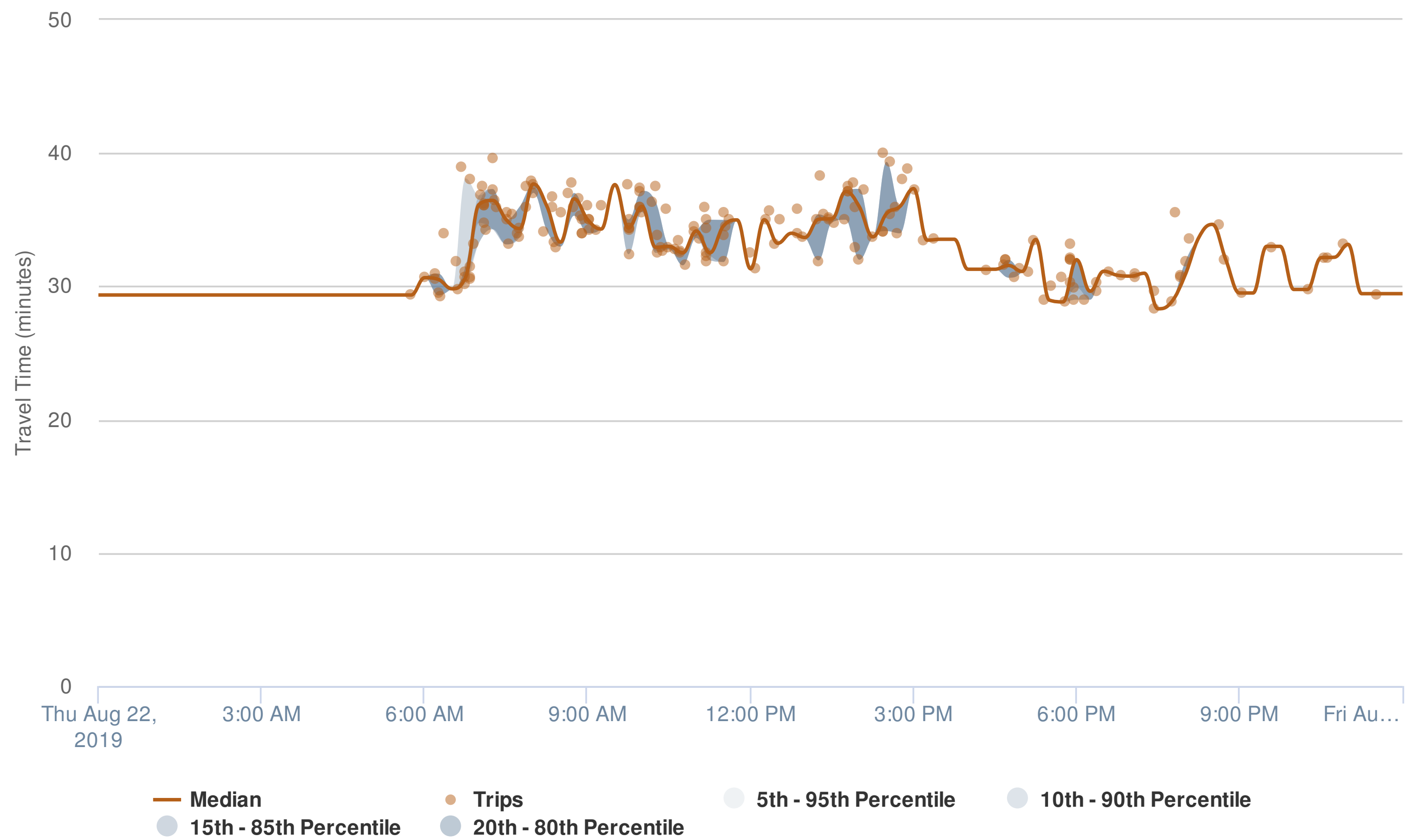
3 to 1 | (45.264635, -111.253275) to (45.671128, -111.185718)

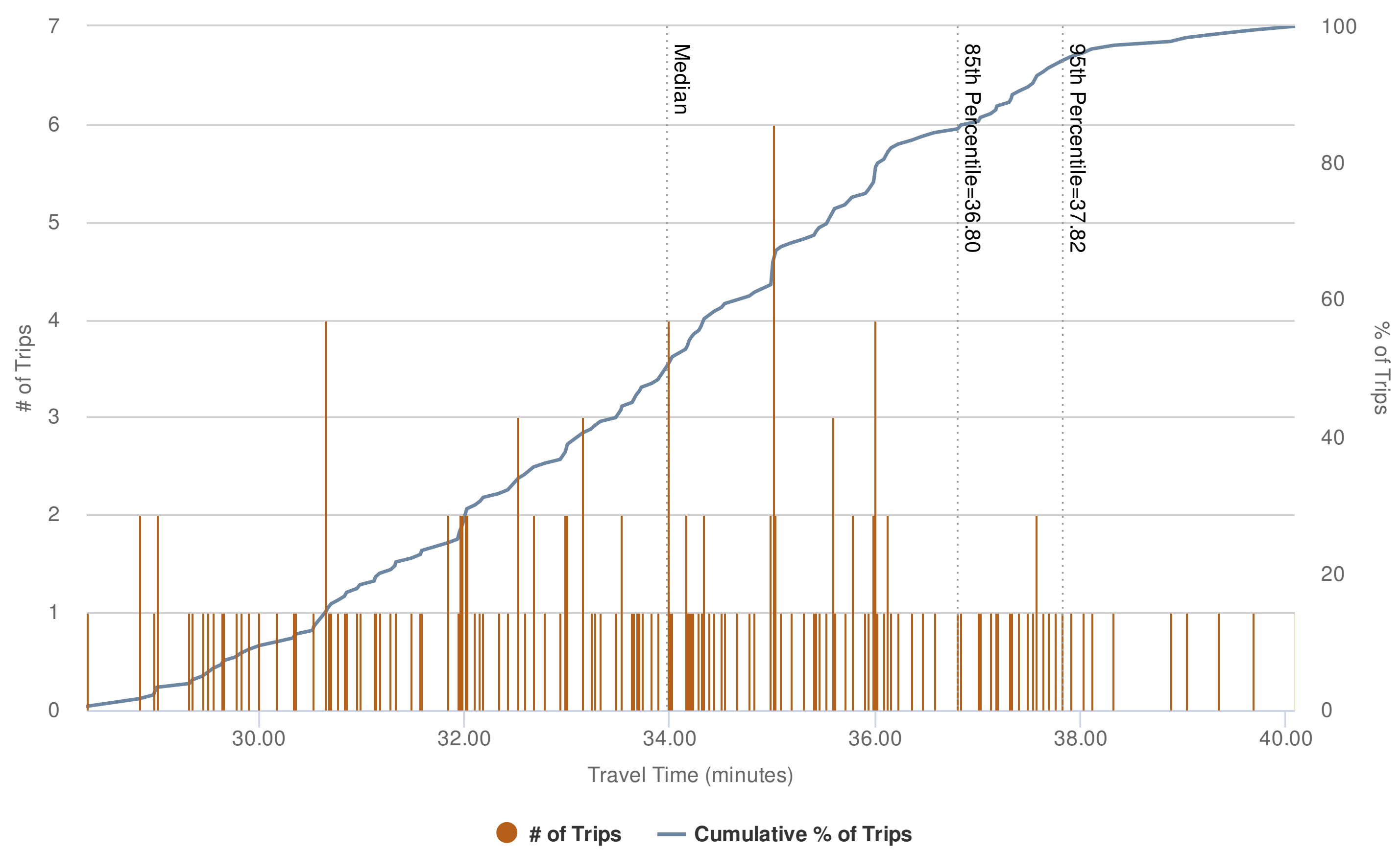




US 191_Mill St to US 191_Hwy 64

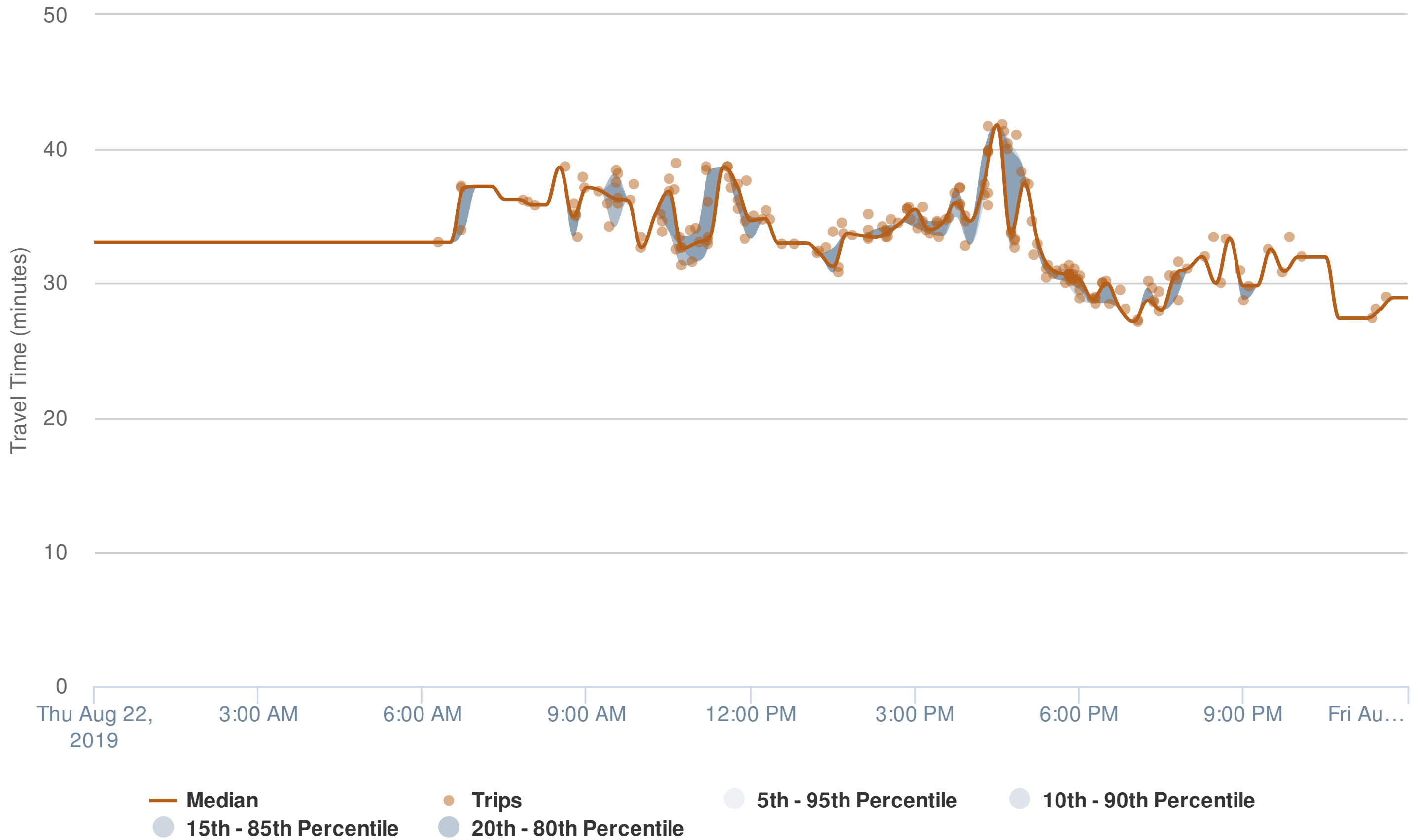
2 to 3 | (45.591191, -111.197111) to (45.264635, -111.253275)

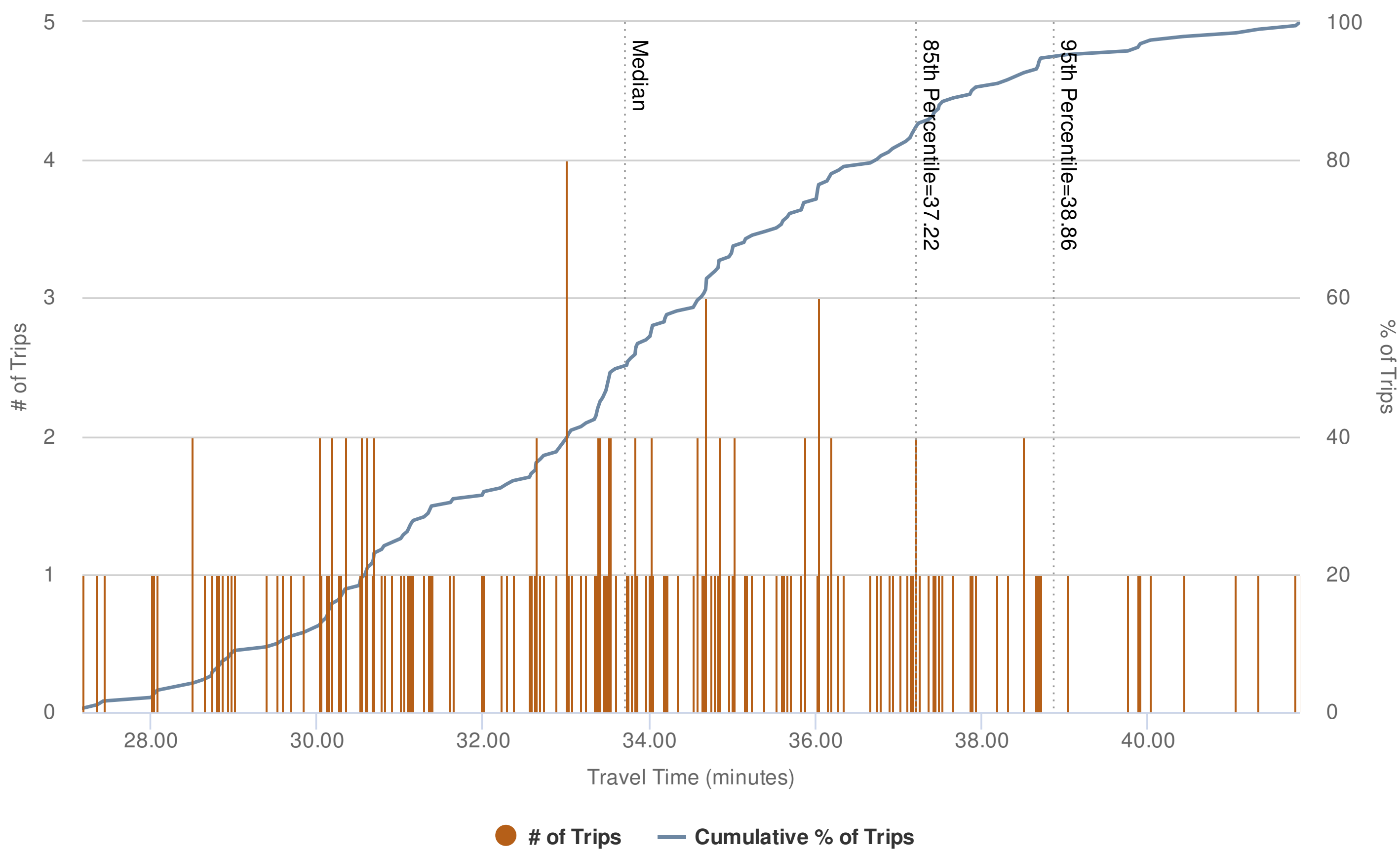




US 191_Hwy 64 to US 191_Mill St

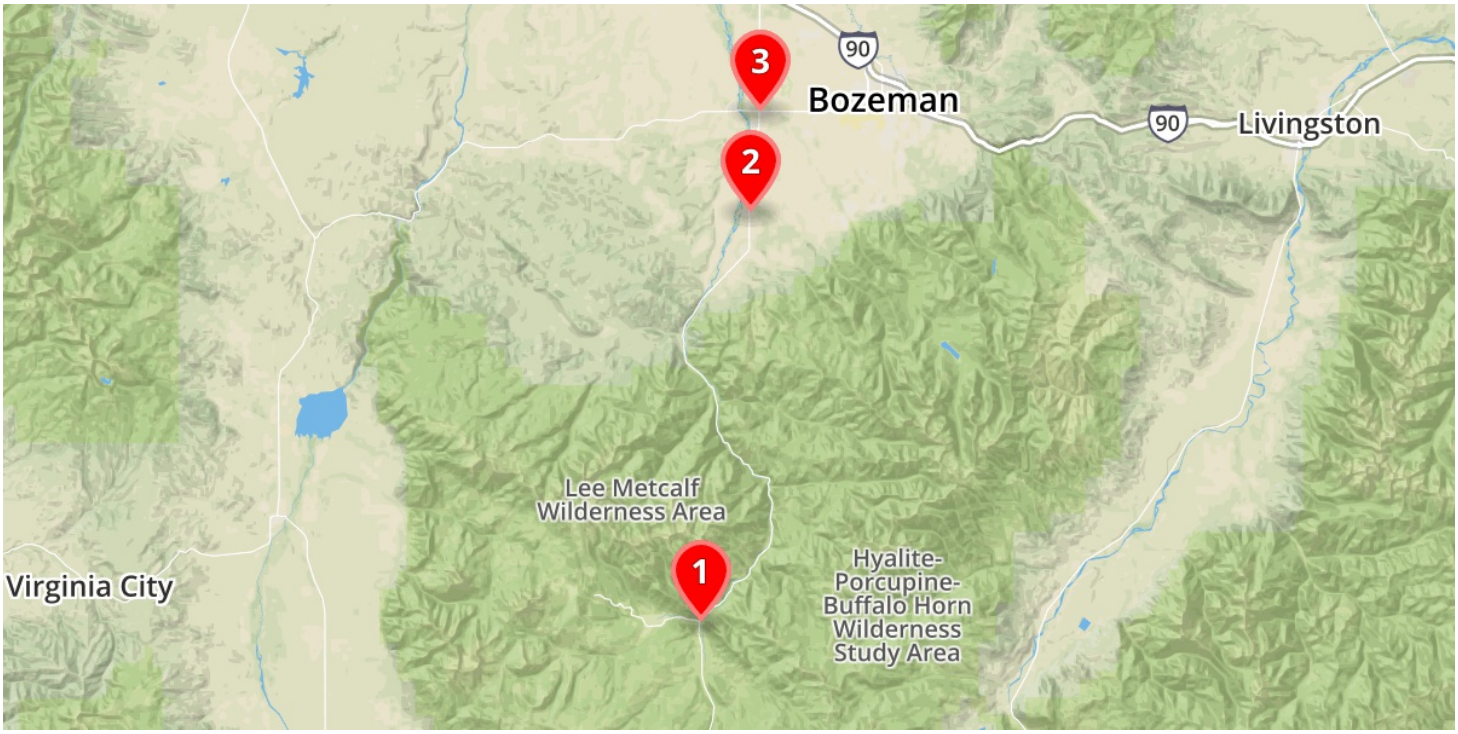
3 to 2 | (45.264635, -111.253275) to (45.591191, -111.197111)





Travel Time Summary

3 Locations | Bozeman, MT, Gallatin Gateway, MT | Sat Aug 24, 2019 - Sun Aug 25, 2019 | 12:00AM - 12:00AM (24.0h)



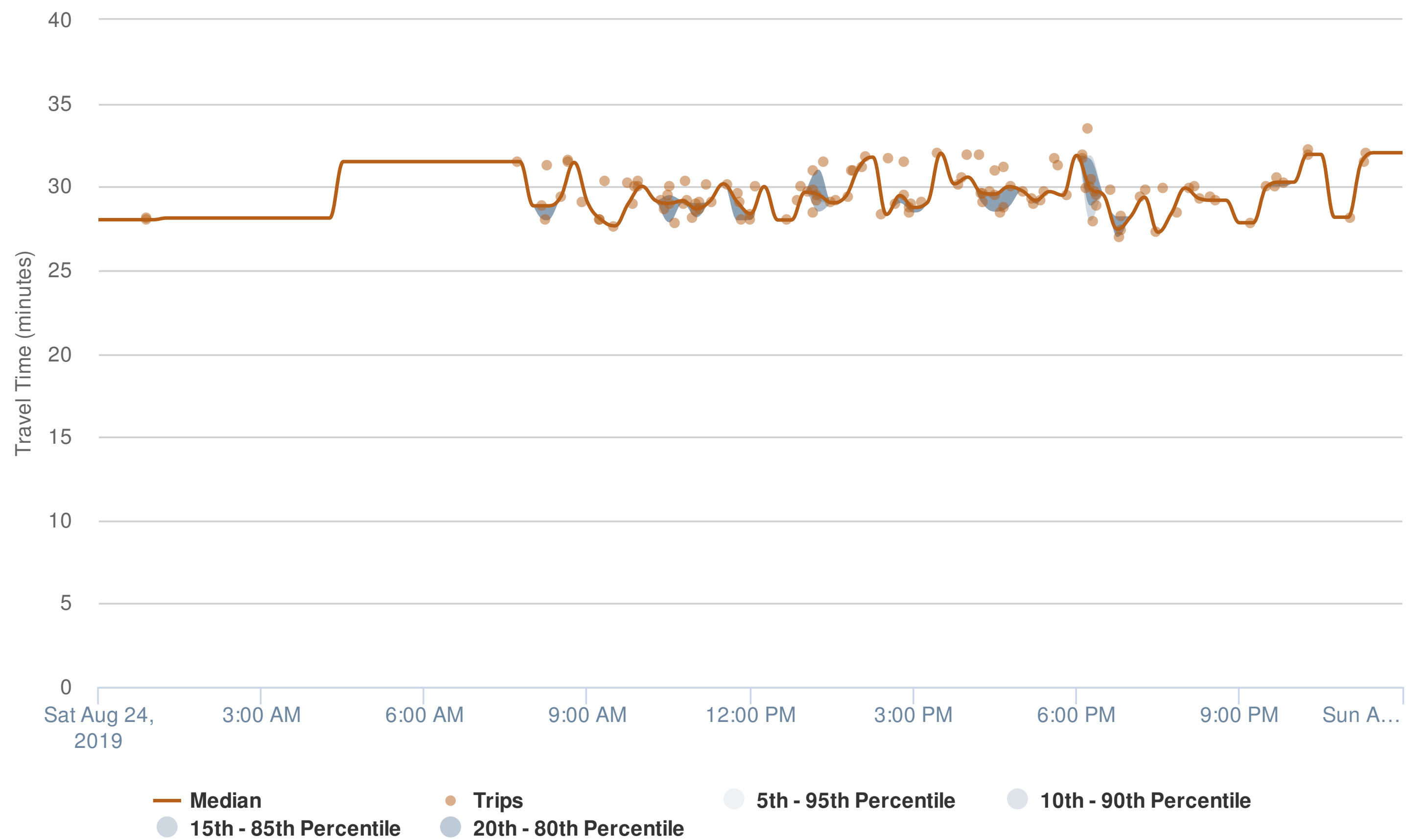
Start Location		End Location		# of Trips	Travel Time (minutes)						Distance (mis)[1]	Speed (mph)[2]					
					Median	85th Percentile	95th Percentile	Mean	Min	Max		Median	85th Percentile	95th Percentile	Mean	Min	Max
1	US 191_Hwy 64_Travel Time	2	US 191_Mill St_Travel Time	125	29.52	31.28	31.87	29.67	26.98	33.50	28.3	57.52	59.86	60.76	57.31	50.68	62.92
2	US 191_Mill St_Travel Time	1	US 191_Hwy 64_Travel Time	121	30.88	32.37	33.98	30.98	26.98	36.12	28.3	54.98	57.75	59.23	54.96	47.01	62.93
1	US 191_Hwy 64_Travel Time	3	US 191_Hwy 84_Hwy 85_Travel Time	227	36.58	39.18	40.50	36.95	33.33	42.02	33.9	55.66	58.18	59.73	55.26	48.46	61.09
3	US 191_Hwy 84_Hwy 85_Travel Time	1	US 191_Hwy 64_Travel Time	175	37.32	39.68	42.22	37.61	33.00	45.67	33.9	54.57	57.49	58.65	54.33	44.59	61.71
2	US 191_Mill St_Travel Time	3	US 191_Hwy 84_Hwy 85_Travel Time	196	6.42	6.98	7.25	6.46	5.63	7.70	5.6	52.75	56.41	58.02	52.61	43.95	60.08
3	US 191_Hwy 84_Hwy 85_Travel Time	2	US 191_Mill St_Travel Time	185	6.13	6.52	6.68	6.16	5.35	6.88	5.6	55.20	57.61	59.02	55.05	49.19	63.28

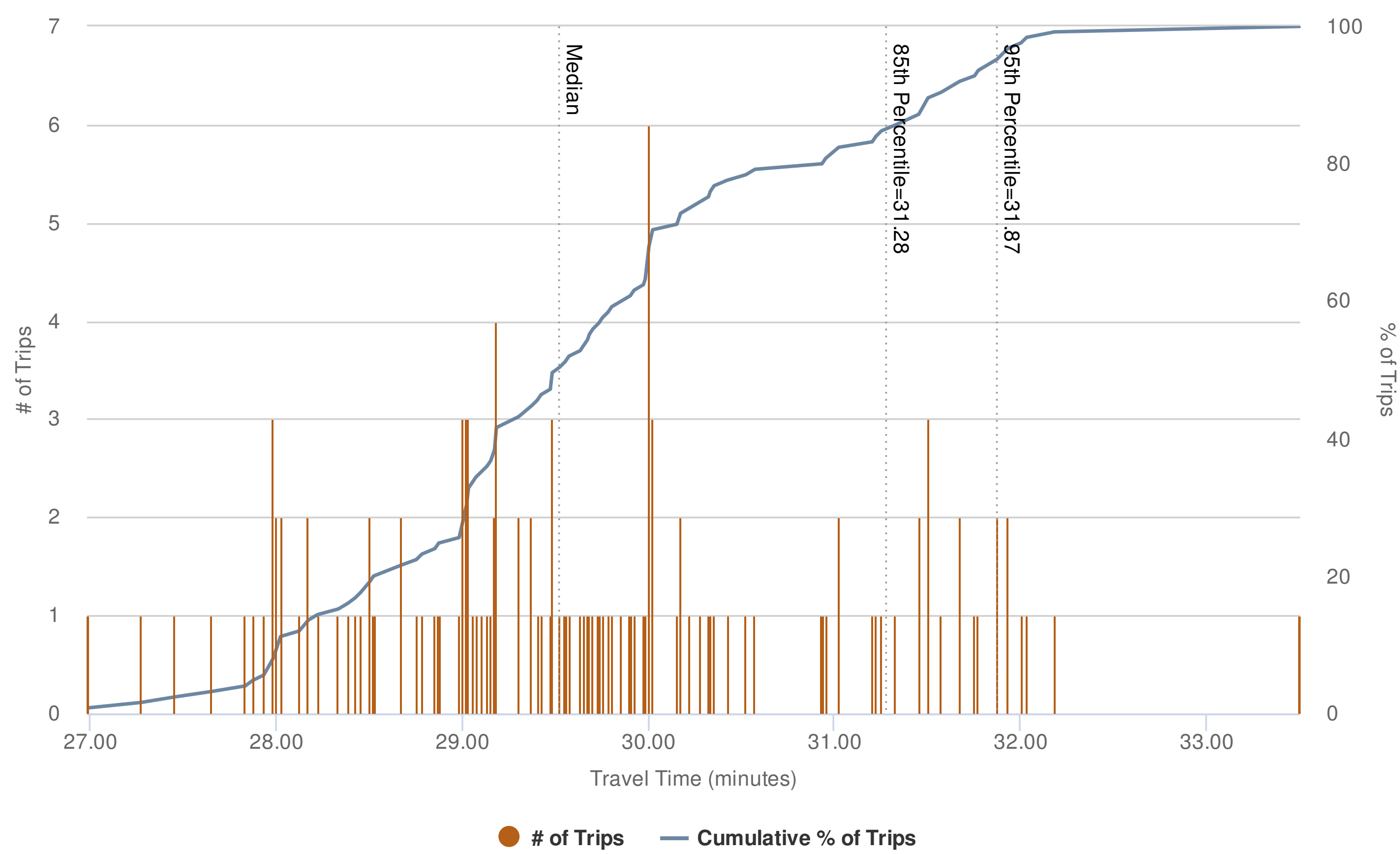
[1] Distance is the length of the Fastest Route between the locations in Google Maps. If Google Maps is unavailable or if Google Maps reports a distance longer than twice the aerial (as the bird flies) distance, the aerial distance is used and is denoted by an asterisk (*). See help.miovision.com/kb/distance for more information.

[2] Speed is the distance between the points divided by the travel time. This value is known as the space mean speed. This report was configured to include trips with calculated speeds between 1.0 mph and 90.0 mph. If you want a report that includes trips with a different range of speeds, or all trips, contact the person who generated the report.

US 191_Hwy 64_Travel Time to US 191_Mill St_Travel Time

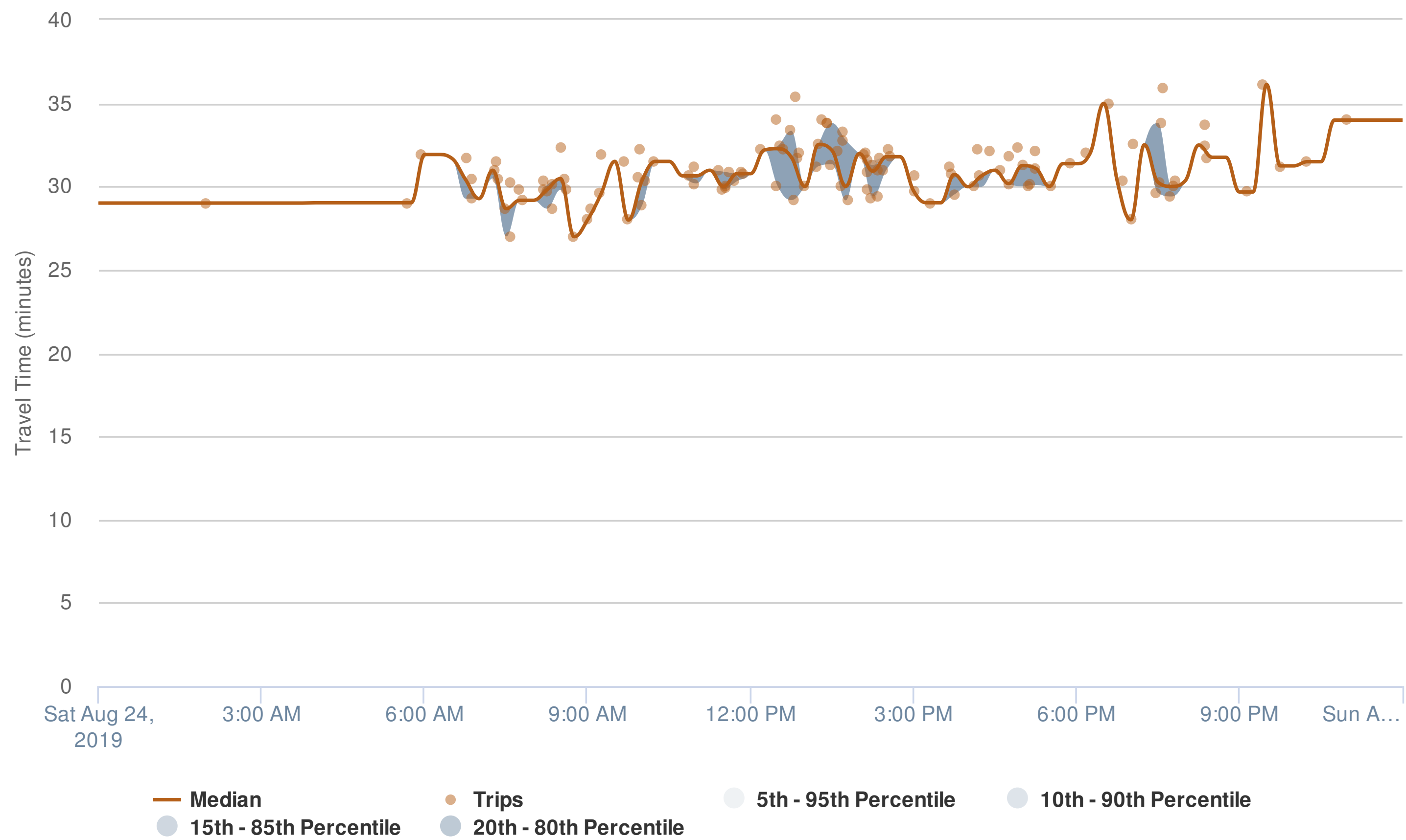
1 to 2 | (45.264635, -111.253275) to (45.591191, -111.197111)

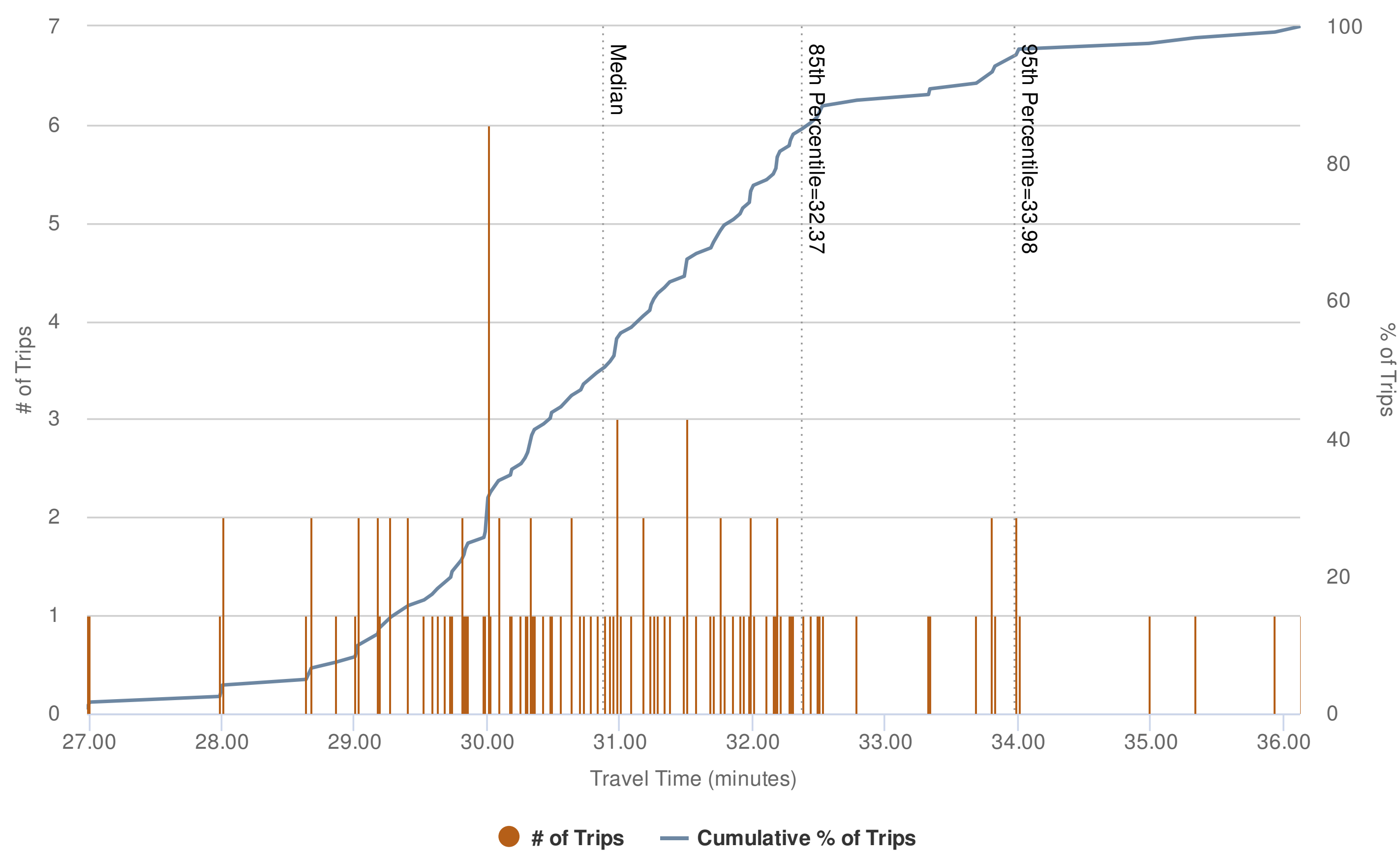




US 191_Mill St_Travel Time to US 191_Hwy 64_Travel Time

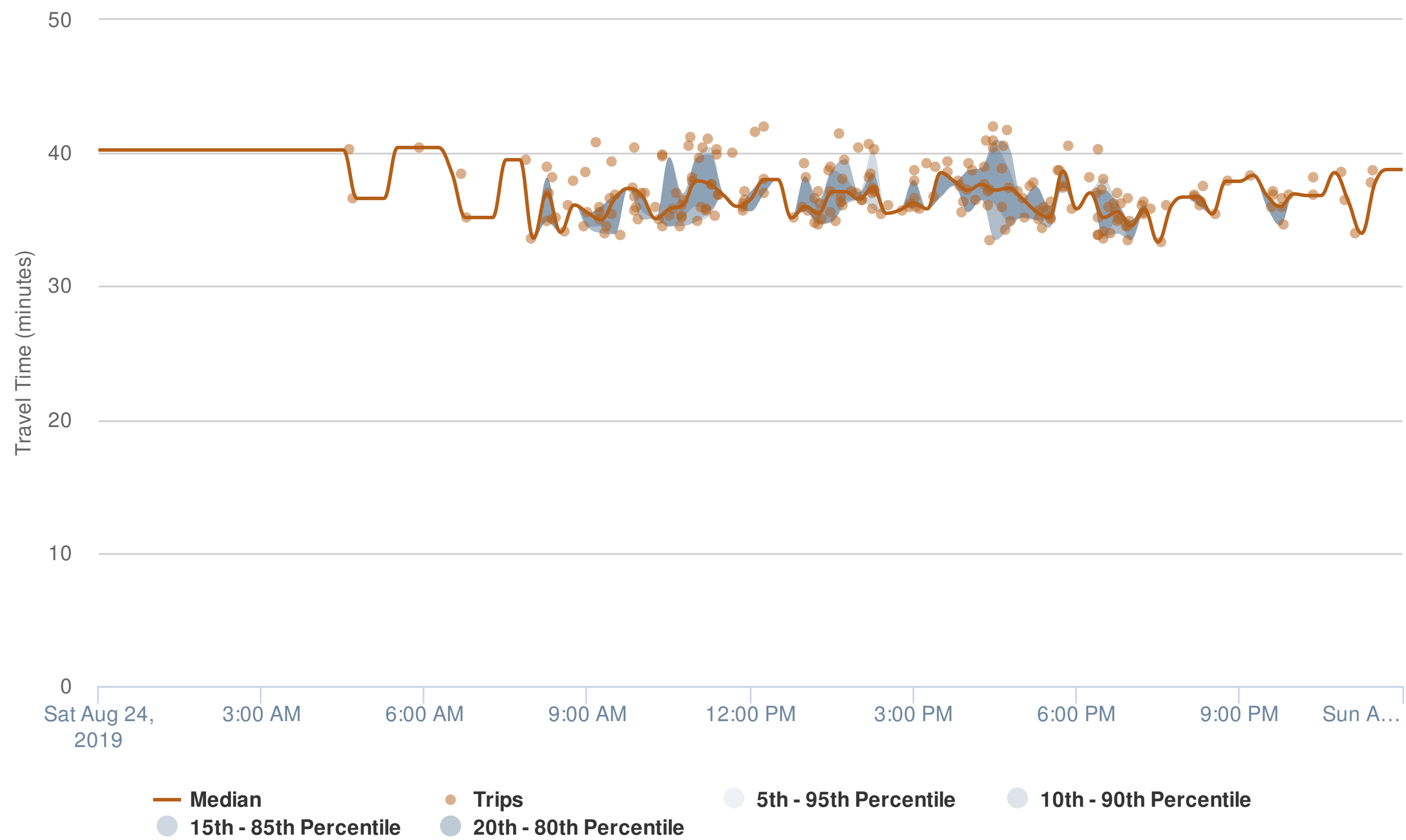
2 to 1 | (45.591191, -111.197111) to (45.264635, -111.253275)

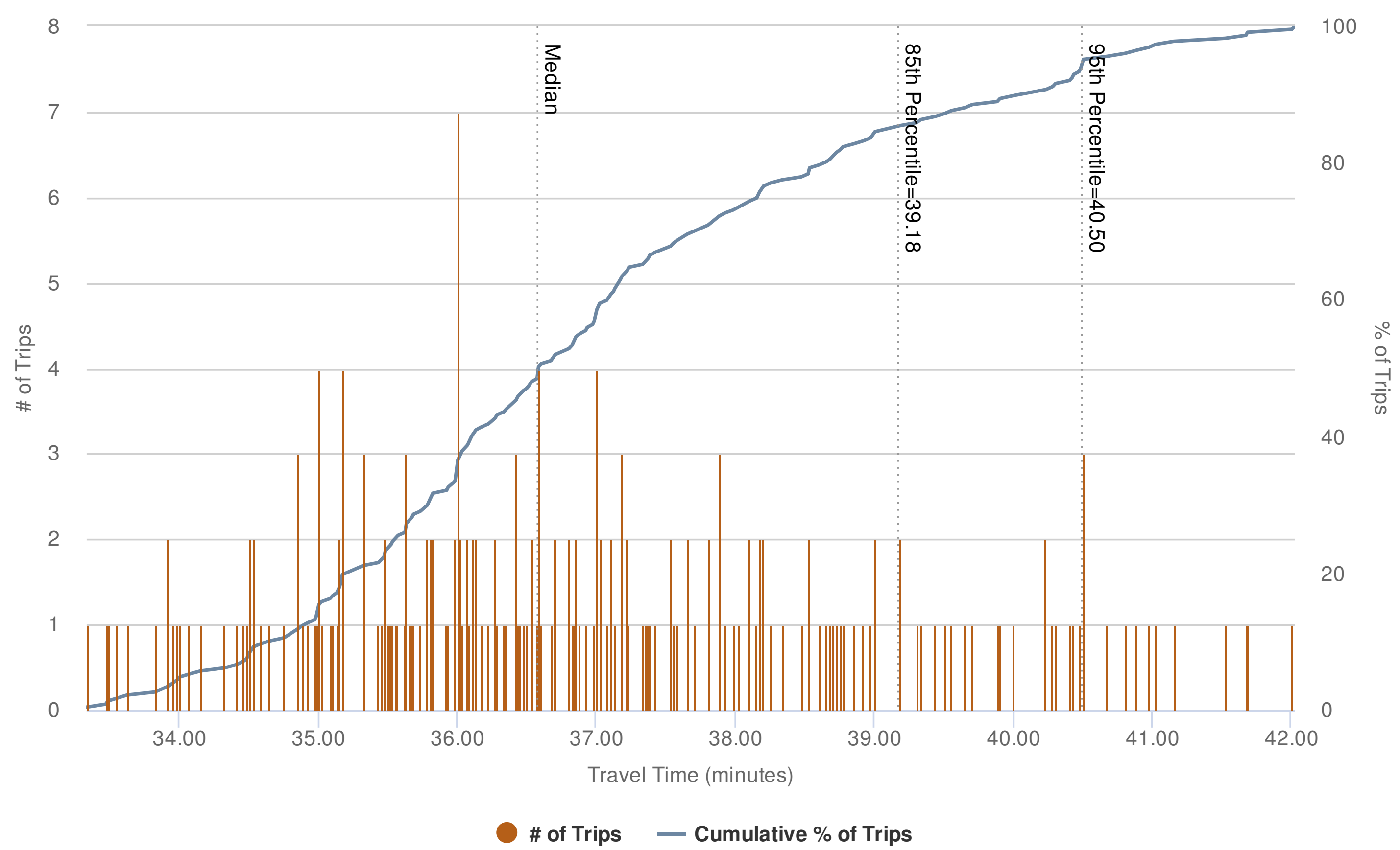




US 191_Hwy 64_Travel Time to US 191_Hwy 84_Hwy 85_Travel Time

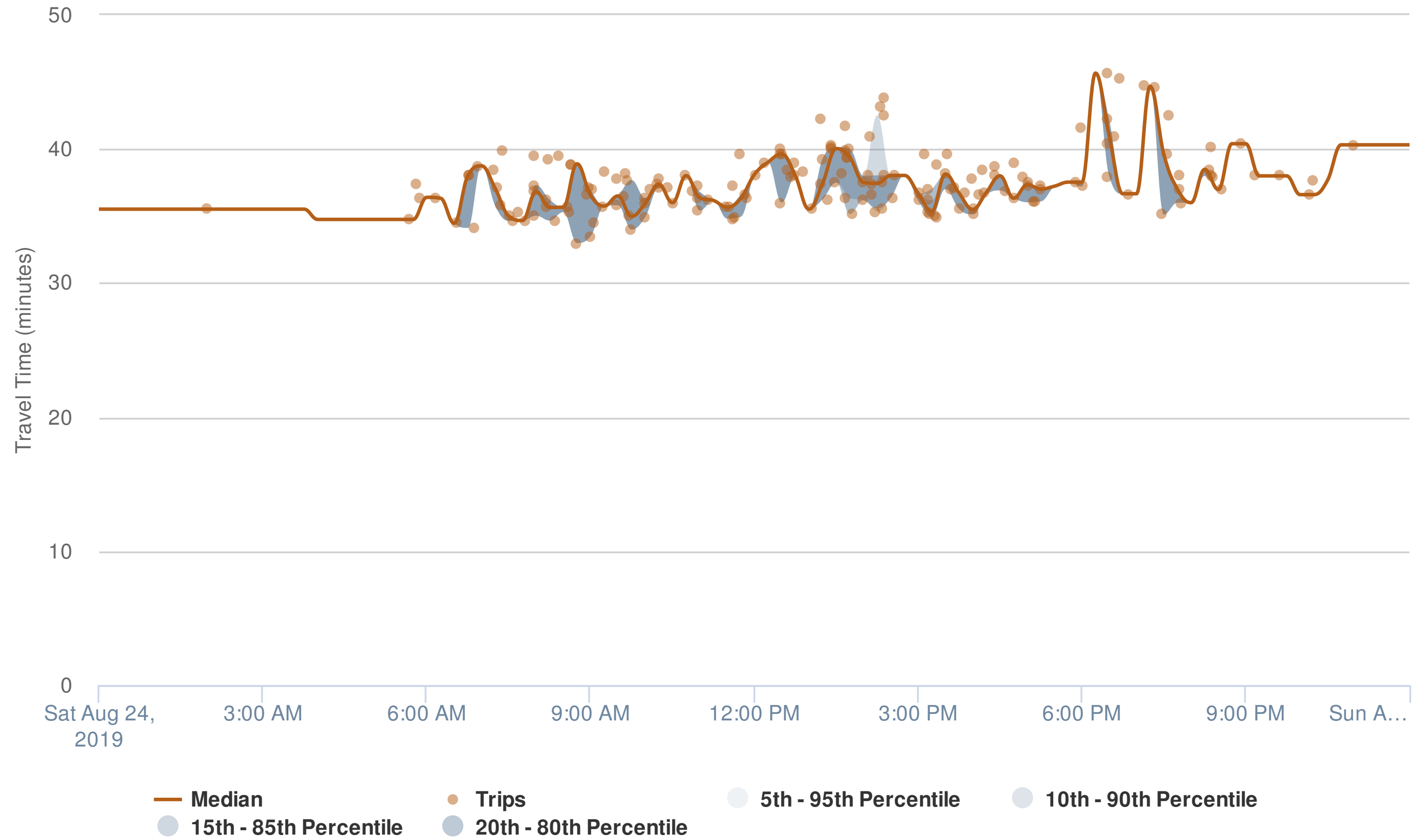
1 to 3 | (45.264635, -111.253275) to (45.671128, -111.185718)

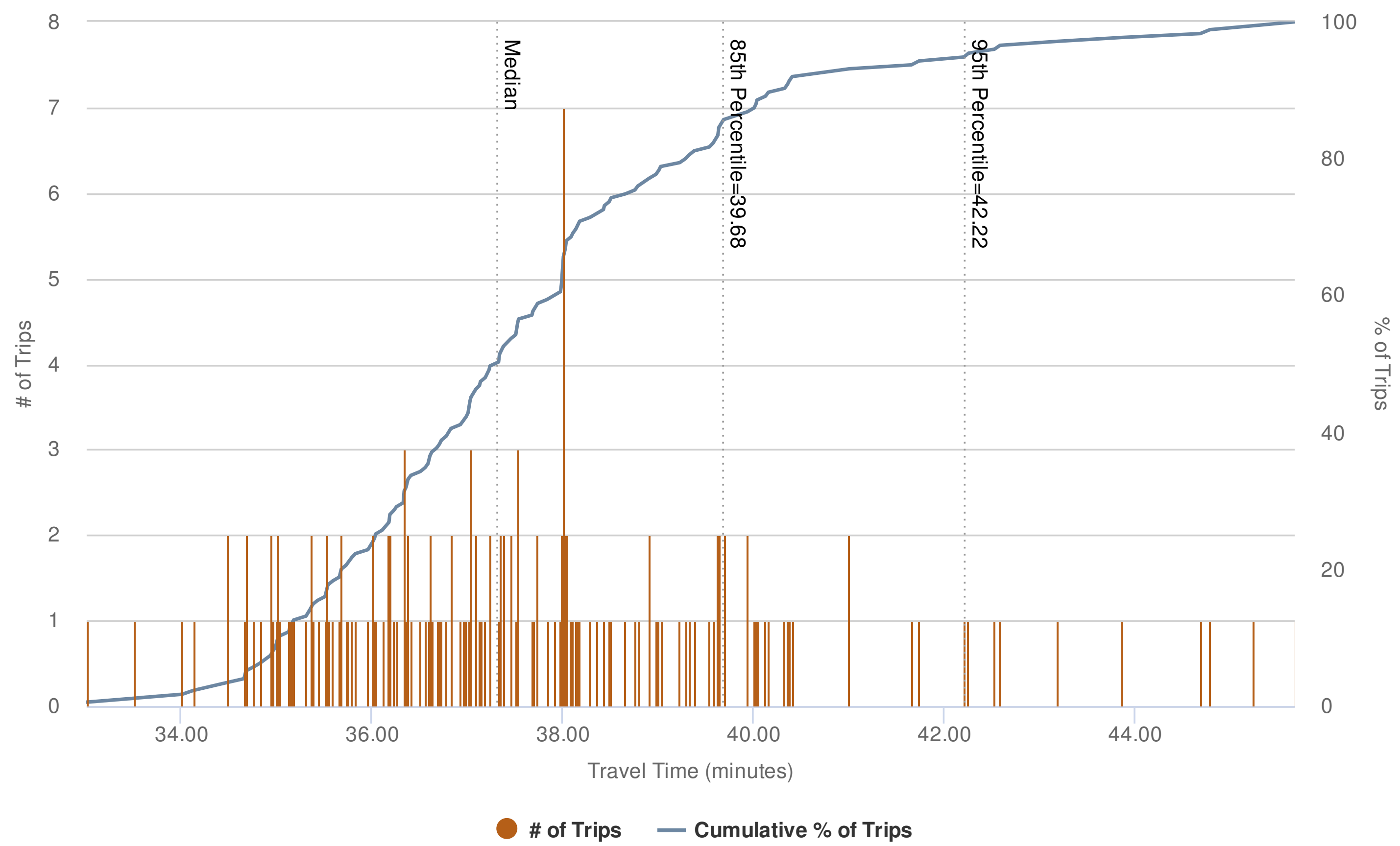




US 191_Hwy 84_Hwy 85_Travel Time to US 191_Hwy 64_Travel Time

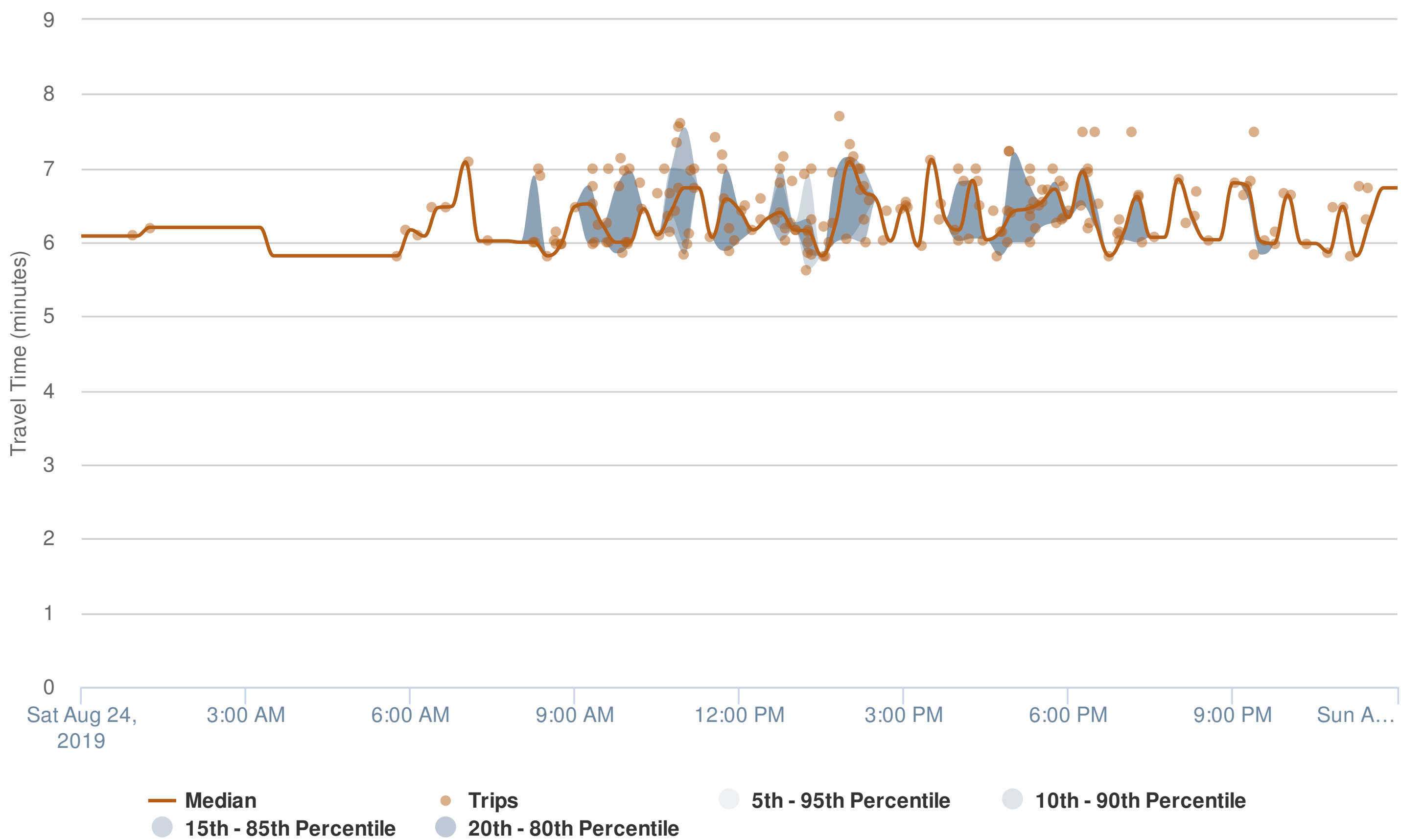
3 to 1 | (45.671128, -111.185718) to (45.264635, -111.253275)

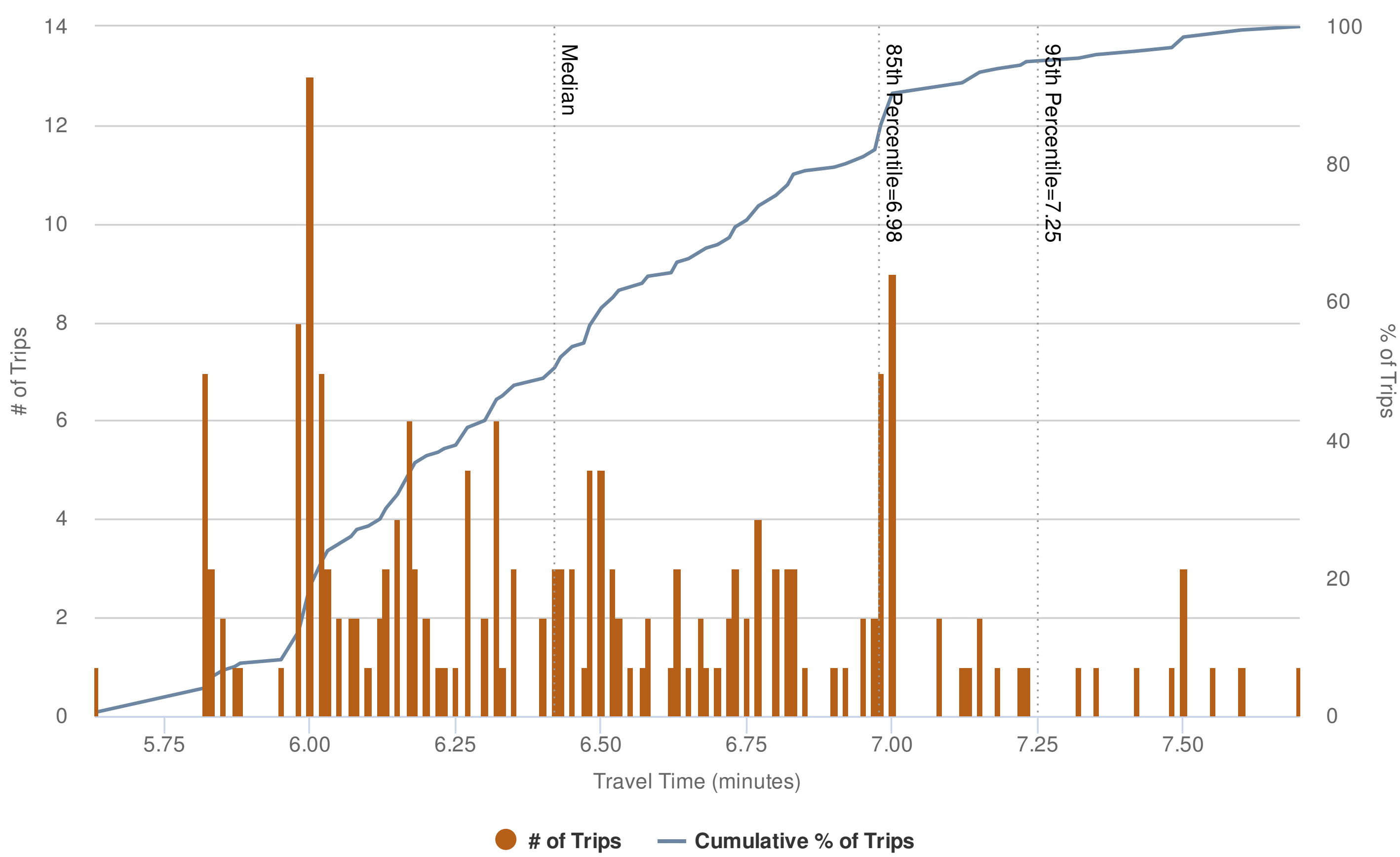




US 191_Mill St_Travel Time to US 191_Hwy 84_Hwy 85_Travel Time

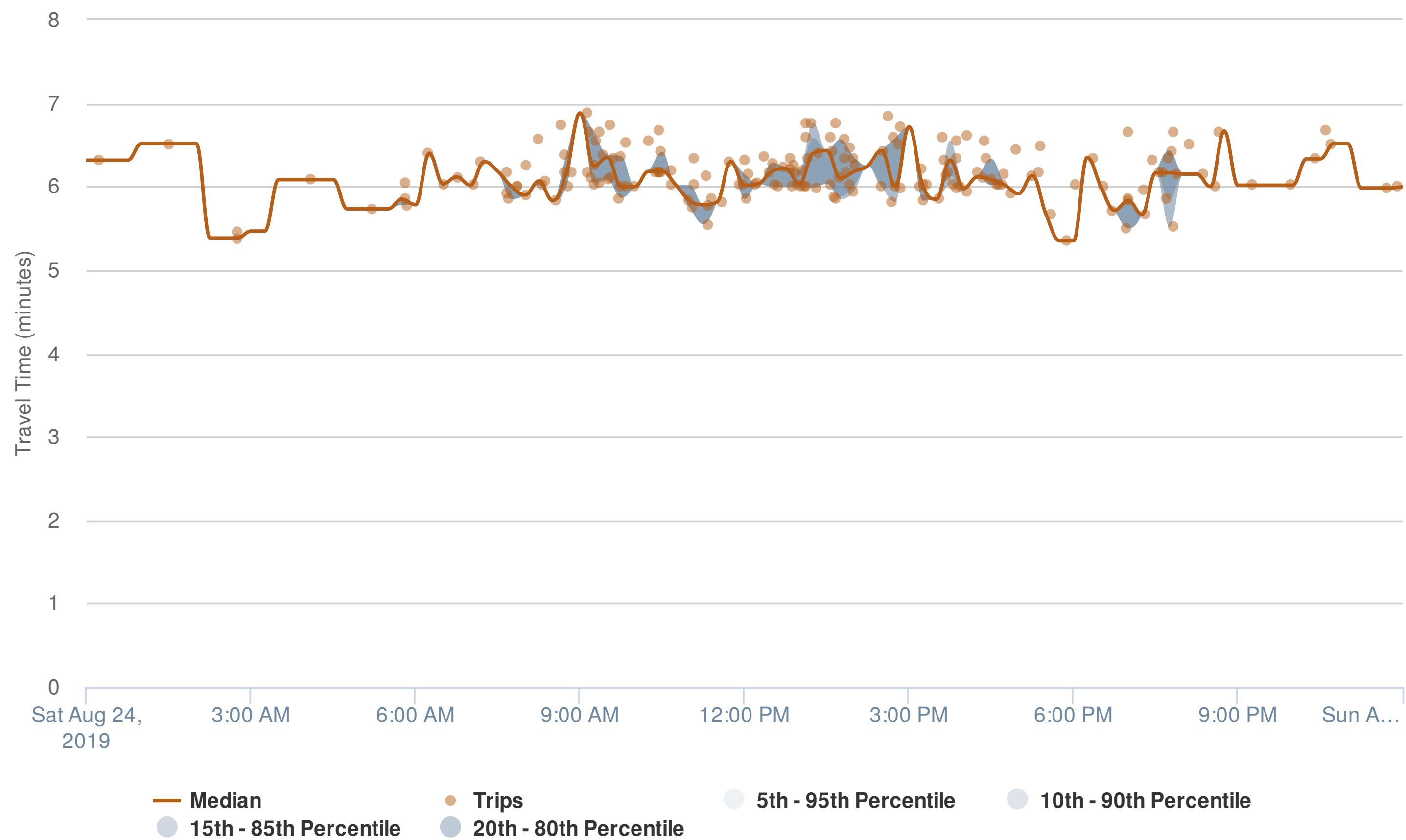
2 to 3 | (45.591191, -111.197111) to (45.671128, -111.185718)

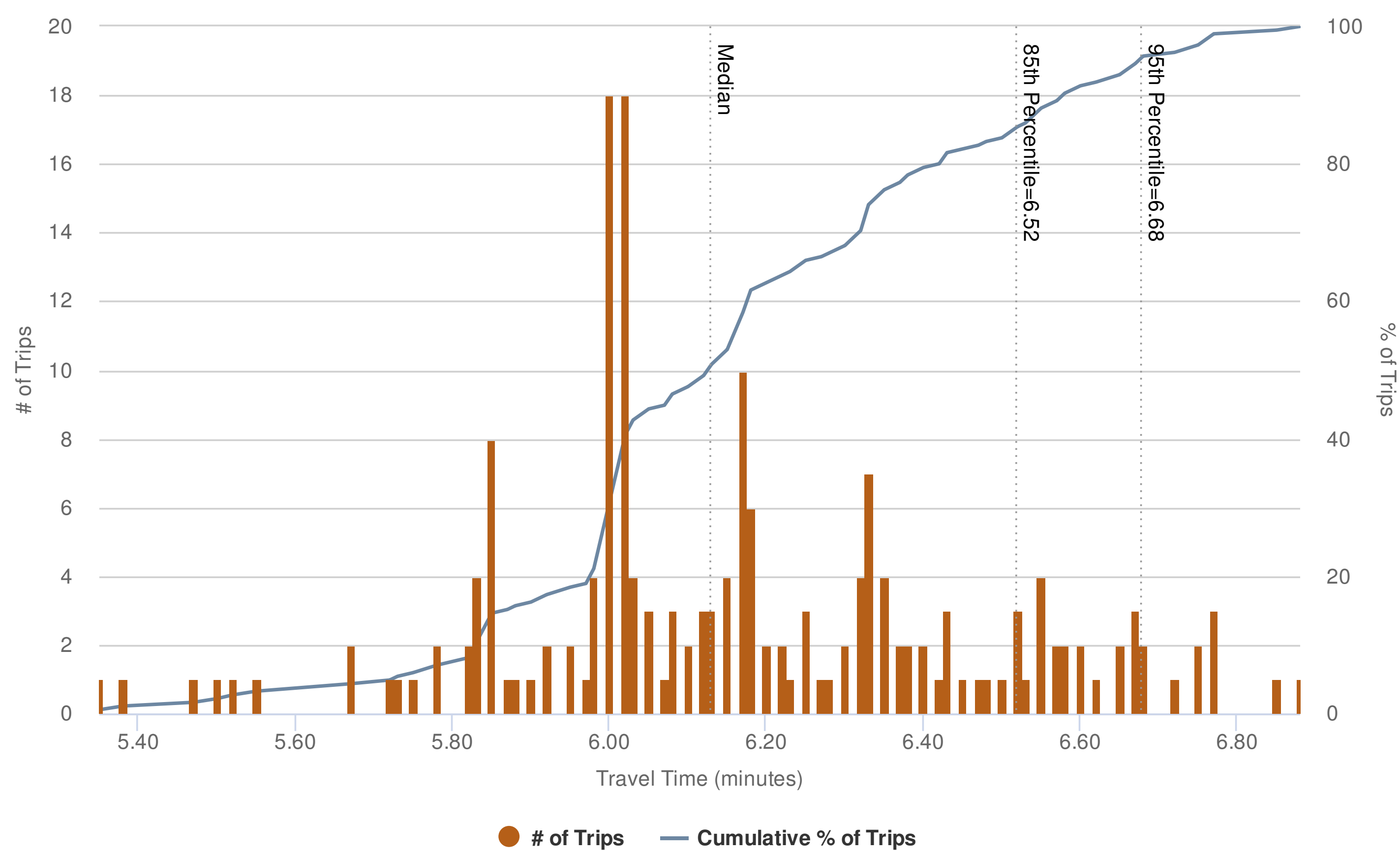




US 191_Hwy 84_Hwy 85_Travel Time to US 191_Mill St_Travel Time

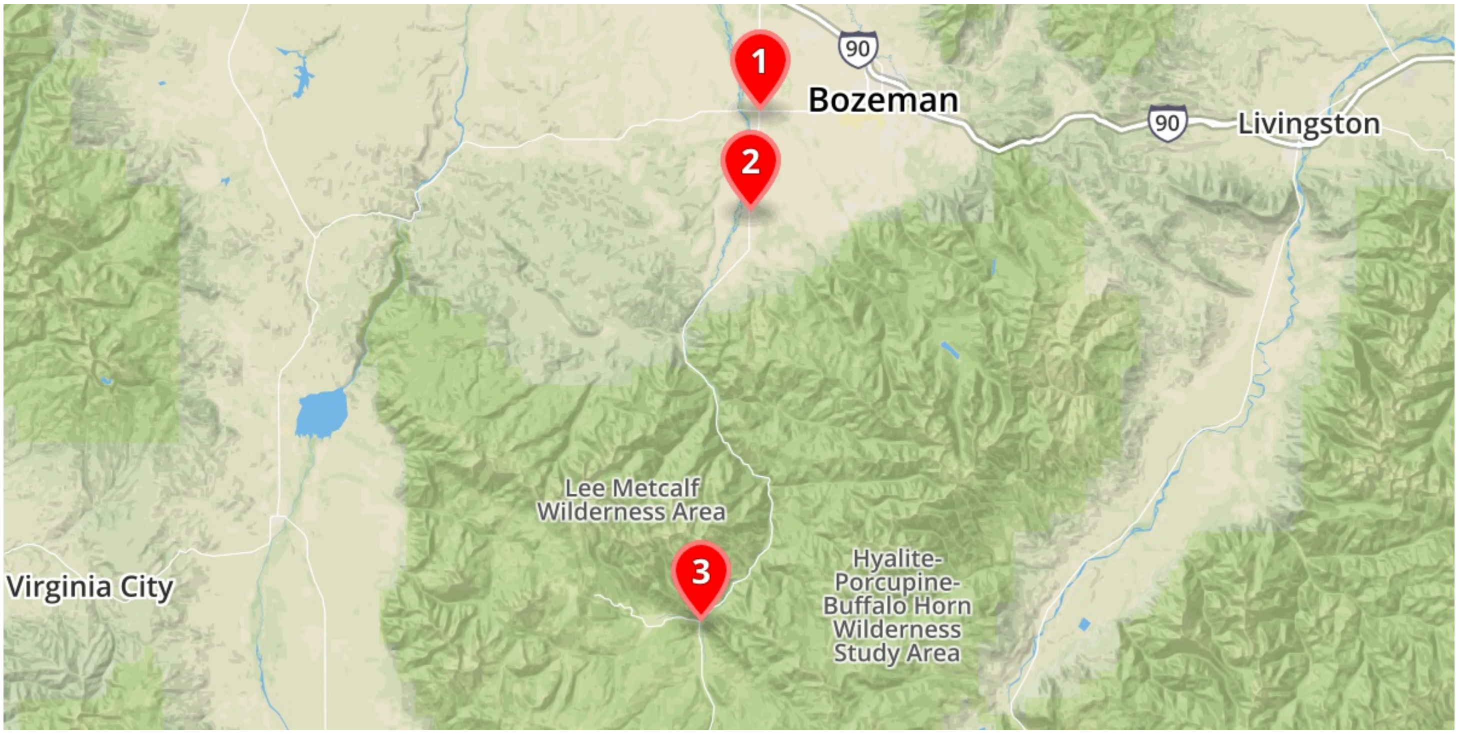
3 to 2 | (45.671128, -111.185718) to (45.591191, -111.197111)





Travel Time Summary

3 Locations | Bozeman, MT, Gallatin Gateway, MT | Thu Dec 19, 2019 - Fri Dec 20, 2019 | 12:00AM - 12:15AM (24.3h)



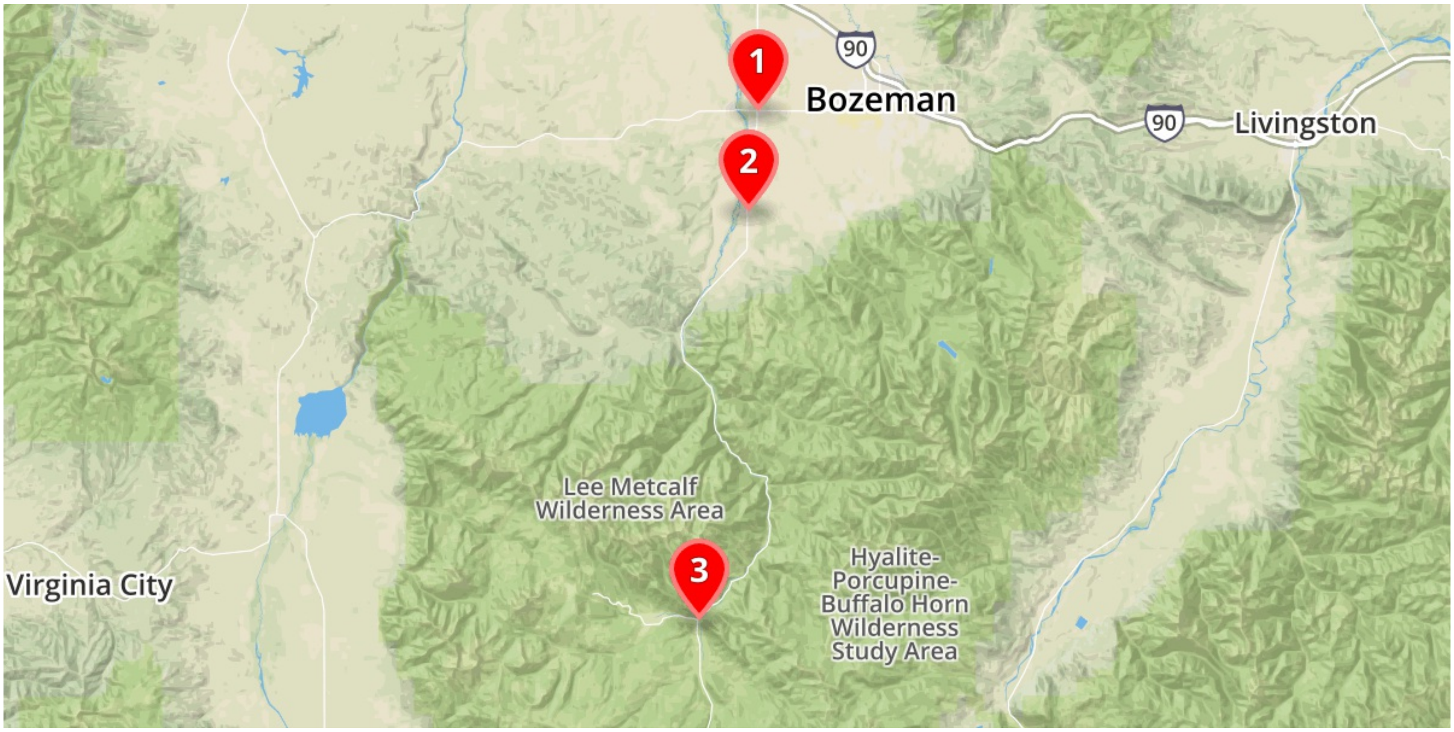
Start Location		End Location		# of Trips	Travel Time (minutes)						Distance (mis)[1]	Speed (mph)[2]					
					Median	85th Percentile	95th Percentile	Mean	Min	Max		Median	85th Percentile	95th Percentile	Mean	Min	Max
1	US 191_Hwy 84_Hwy 85	2	US 191_Mill St	180	6.18	6.84	7.07	6.34	5.52	8.23	5.6	54.71	56.53	57.99	53.61	41.08	61.32
2	US 191_Mill St	1	US 191_Hwy 84_Hwy 85	183	6.65	7.50	8.05	6.77	5.23	10.15	5.6	50.87	55.97	56.52	50.49	33.33	64.64
1	US 191_Hwy 84_Hwy 85	3	US 191_MT 64	252	37.02	39.37	41.51	37.39	33.45	43.52	33.9	55.00	57.55	58.48	54.60	46.79	60.87
3	US 191_MT 64	1	US 191_Hwy 84_Hwy 85	264	36.65	38.69	39.52	36.71	32.27	41.68	33.9	55.56	58.20	59.84	55.58	48.85	63.10
2	US 191_Mill St	3	US 191_MT 64	156	30.63	32.57	34.39	30.86	27.15	36.17	28.3	55.44	58.44	59.65	55.19	46.94	62.54
3	US 191_MT 64	2	US 191_Mill St	165	29.80	31.46	32.25	29.85	27.33	33.55	28.3	56.98	59.96	60.99	57.01	50.61	62.12

[1] Distance is the length of the Fastest Route between the locations in Google Maps. If Google Maps is unavailable or if Google Maps reports a distance longer than twice the aerial (as the bird flies) distance, the aerial distance is used and is denoted by an asterisk (*). See help.miovision.com/kb/distance for more information.

[2] Speed is the distance between the points divided by the travel time. This value is known as the space mean speed. This report was configured to include trips with calculated speeds between 1.0 mph and 90.0 mph. If you want a report that includes trips with a different range of speeds, or all trips, contact the person who generated the report.

Travel Time Reliability Summary

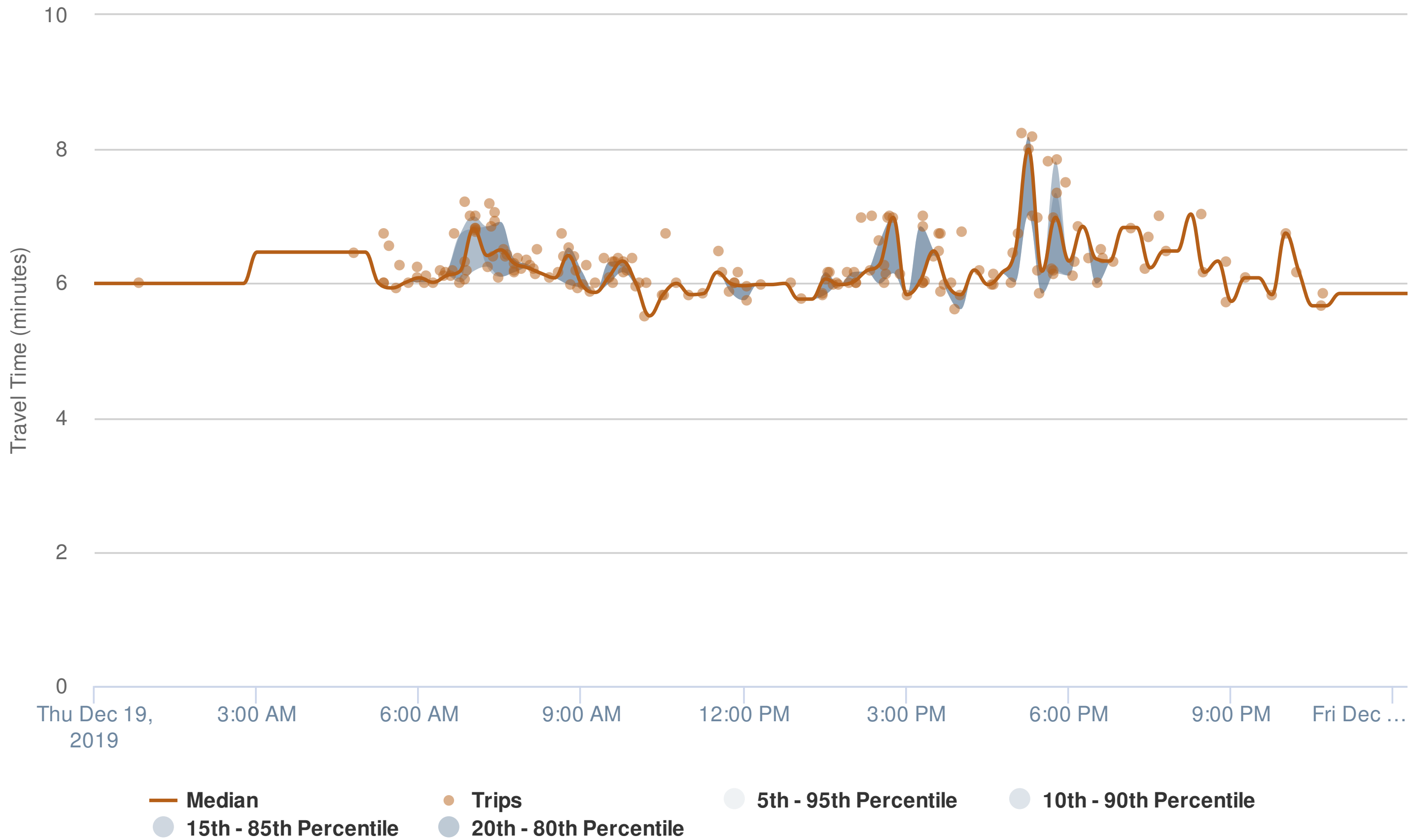
3 Locations | Bozeman, MT, Gallatin Gateway, MT | Thu Dec 19, 2019 - Fri Dec 20, 2019 | 12:00AM - 12:15AM (24.3h)

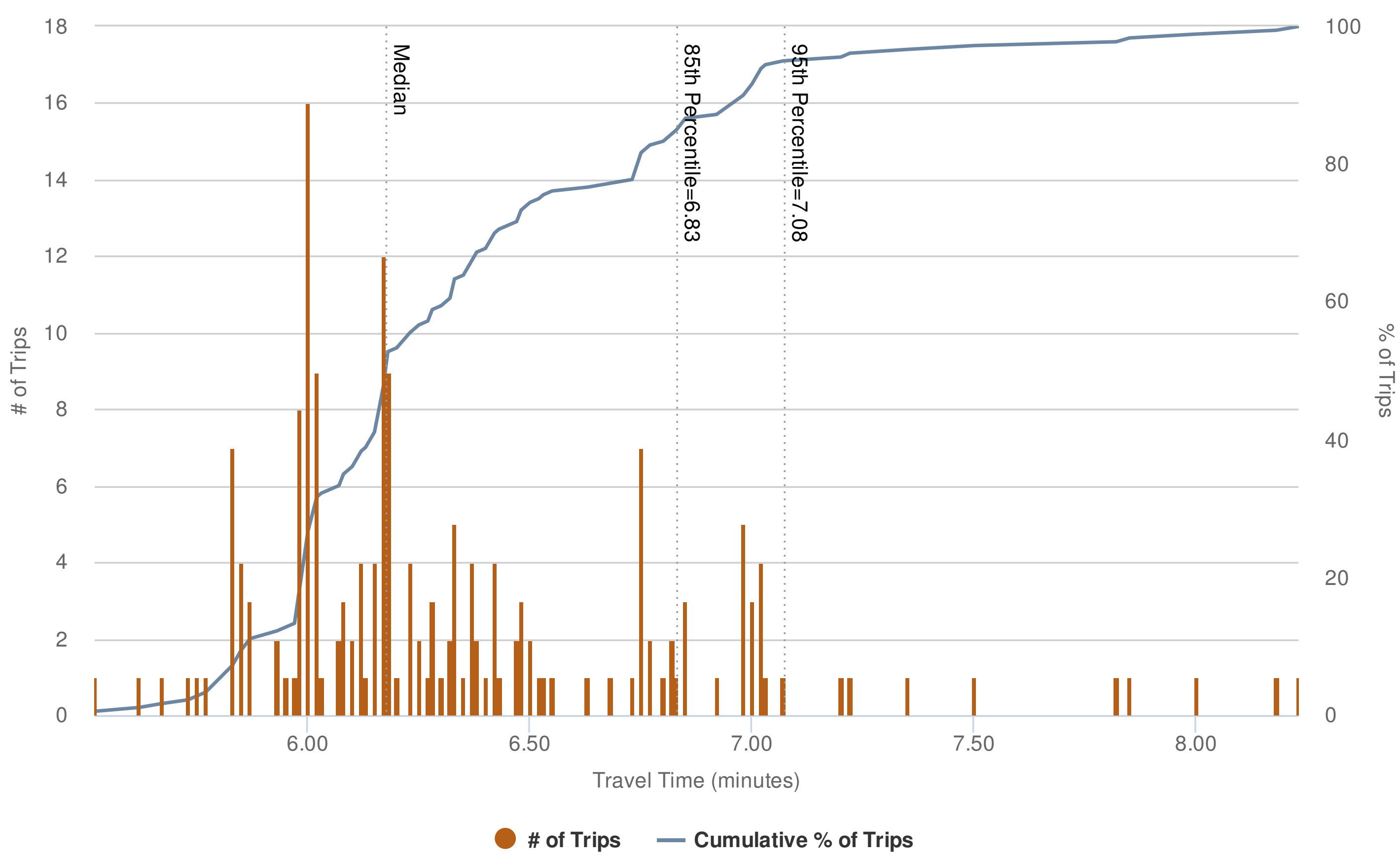


Start Location		End Location		Planning Time Index AM (6am - 9am)	Planning Time Index PM (4pm - 7pm)	Travel Time Index AM (6am - 9am)	Travel Time Index PM (4pm - 7pm)	Buffer Time Index AM (6am - 9am)	Buffer Time Index PM (4pm - 7pm)
1	US 191_Hwy 84_Hwy 85	2	US 191_Mill St	1.16	1.21	1.08	1.13	0.08	0.07
2	US 191_Mill St	1	US 191_Hwy 84_Hwy 85	1.21	1.39	1.08	1.16	0.12	0.20
1	US 191_Hwy 84_Hwy 85	3	US 191_MT 64	1.15	1.17	1.06	1.08	0.08	0.09
3	US 191_MT 64	1	US 191_Hwy 84_Hwy 85	1.12	1.13	1.06	1.09	0.06	0.04
2	US 191_Mill St	3	US 191_MT 64	1.12	1.18	1.07	1.10	0.05	0.07
3	US 191_MT 64	2	US 191_Mill St	1.05	1.13	1.04	1.09	0.01	0.04

US 191_Hwy 84_Hwy 85 to US 191_Mill St

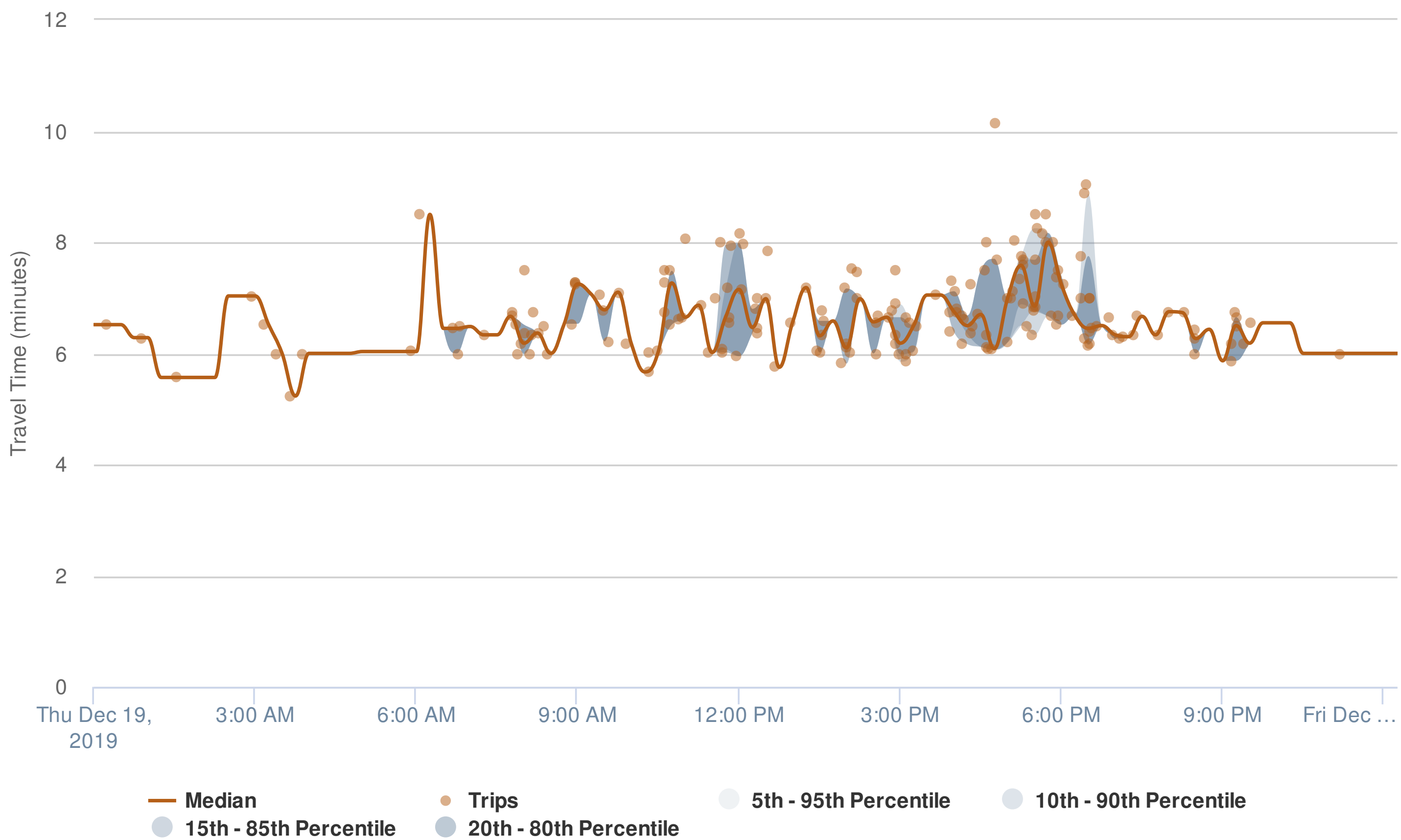
1 to 2 | (45.671128, -111.185718) to (45.591191, -111.197111)

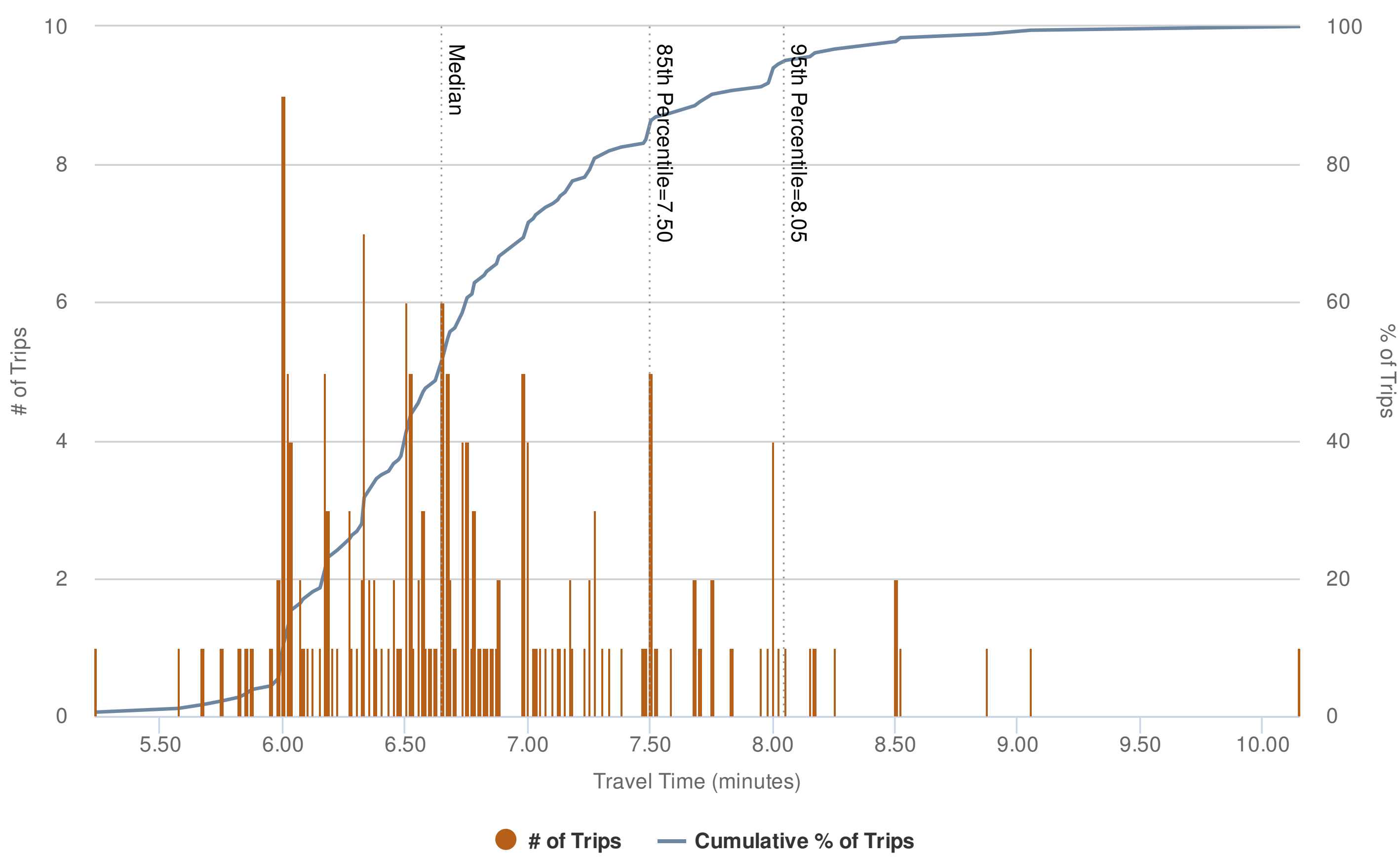




US 191_Mill St to US 191_Hwy 84_Hwy 85

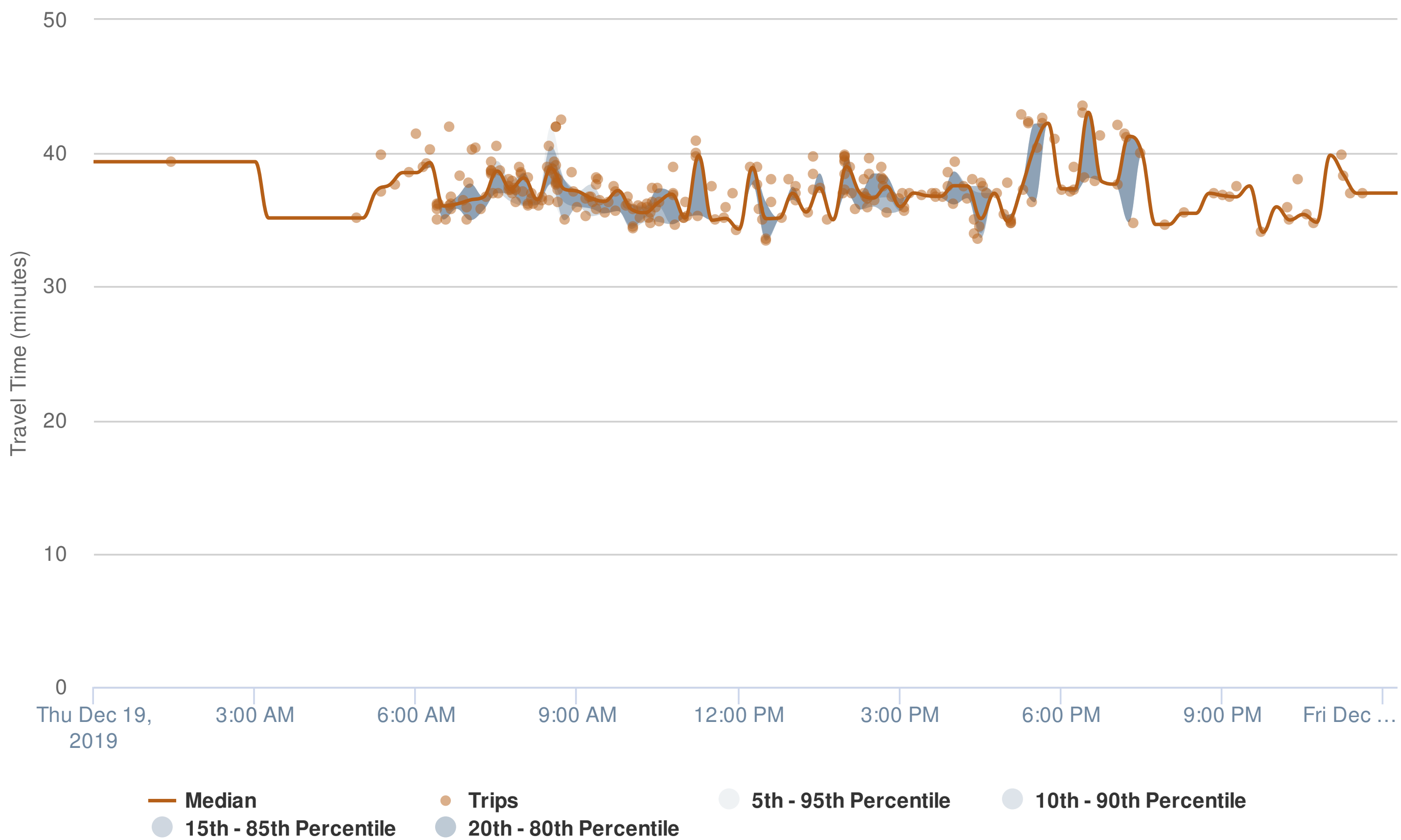
2 to 1 | (45.591191, -111.197111) to (45.671128, -111.185718)

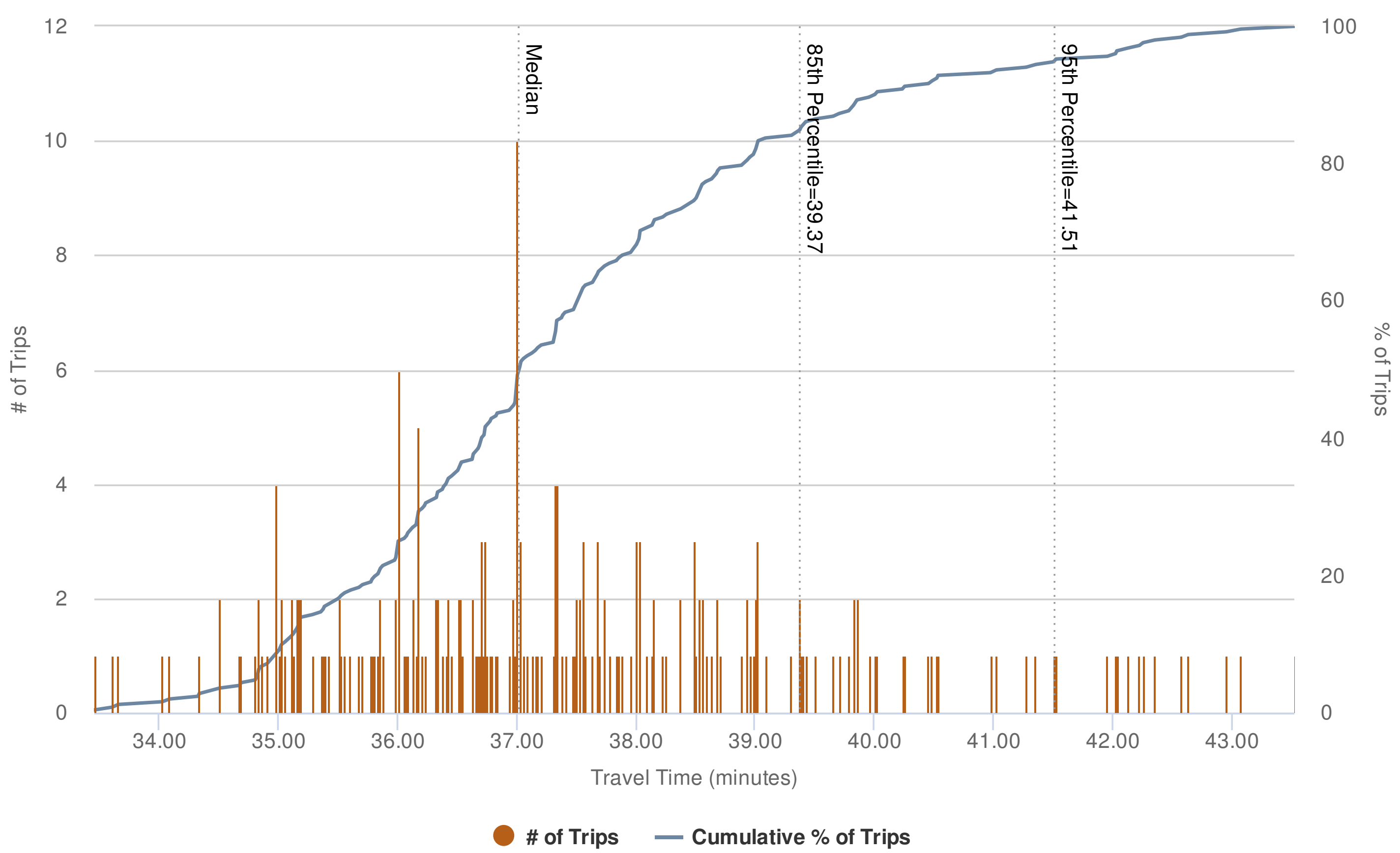




US 191_Hwy 84_Hwy 85 to US 191_MT 64

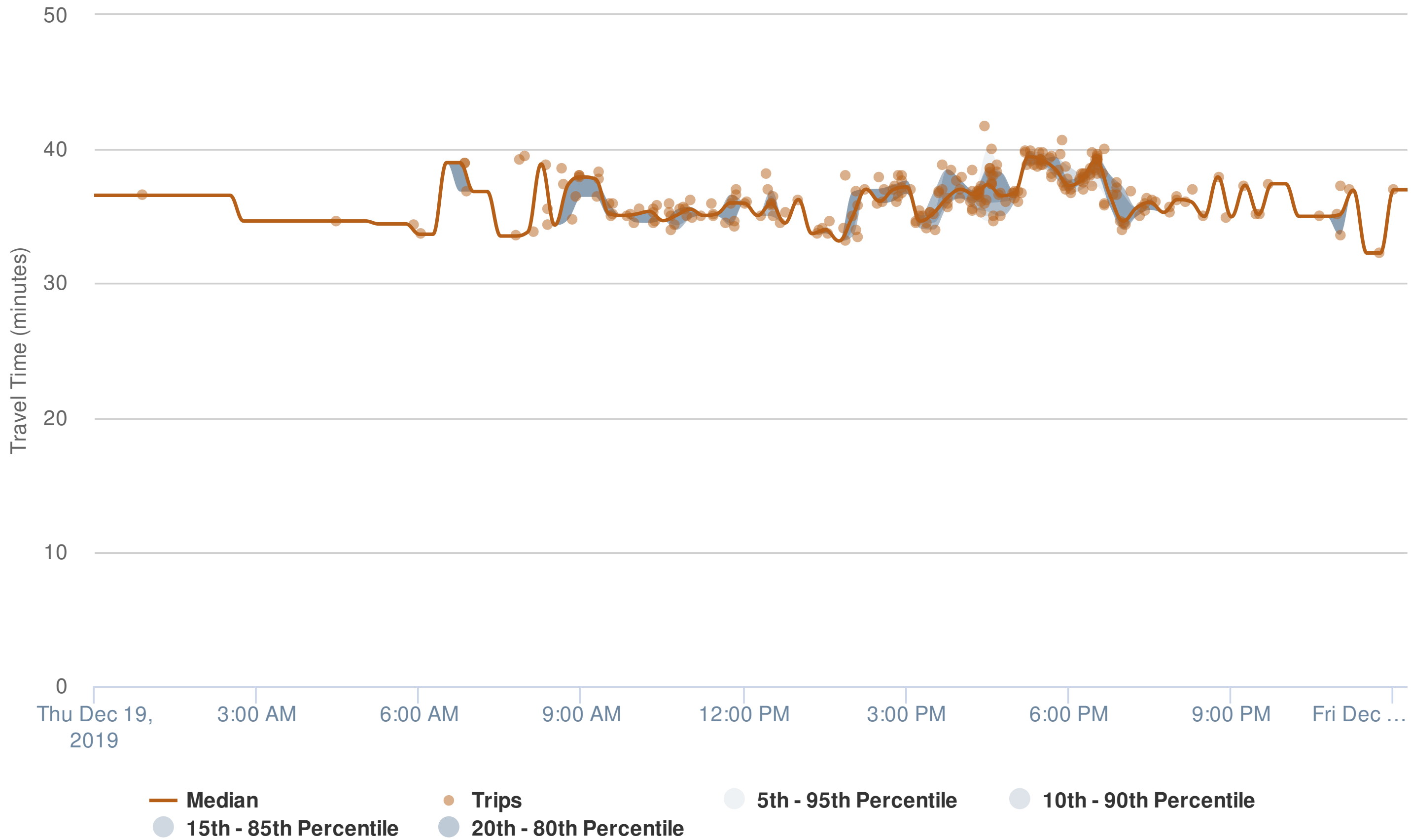
1 to 3 | (45.671128, -111.185718) to (45.264635, -111.253275)

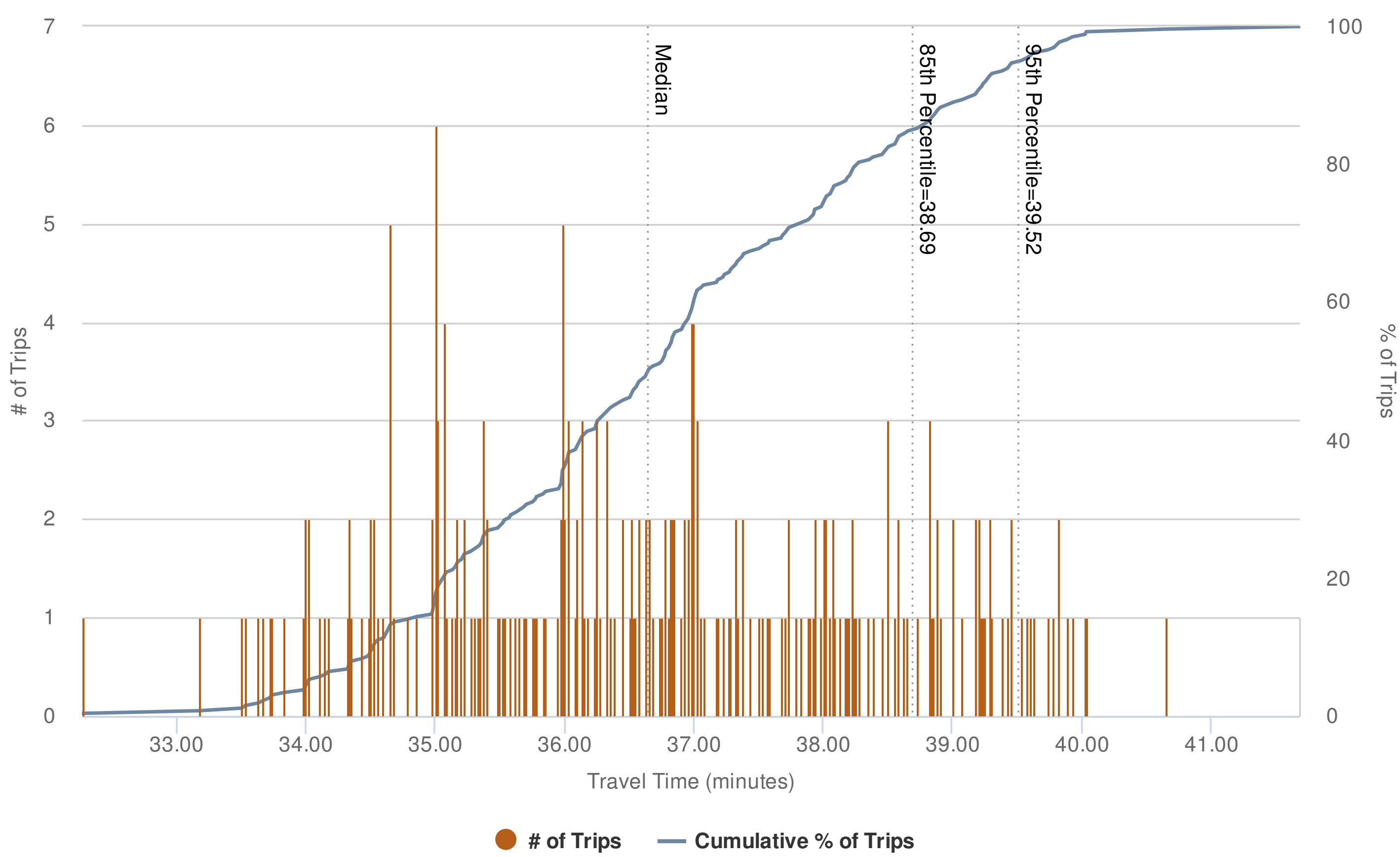




US 191_MT 64 to US 191_Hwy 84_Hwy 85

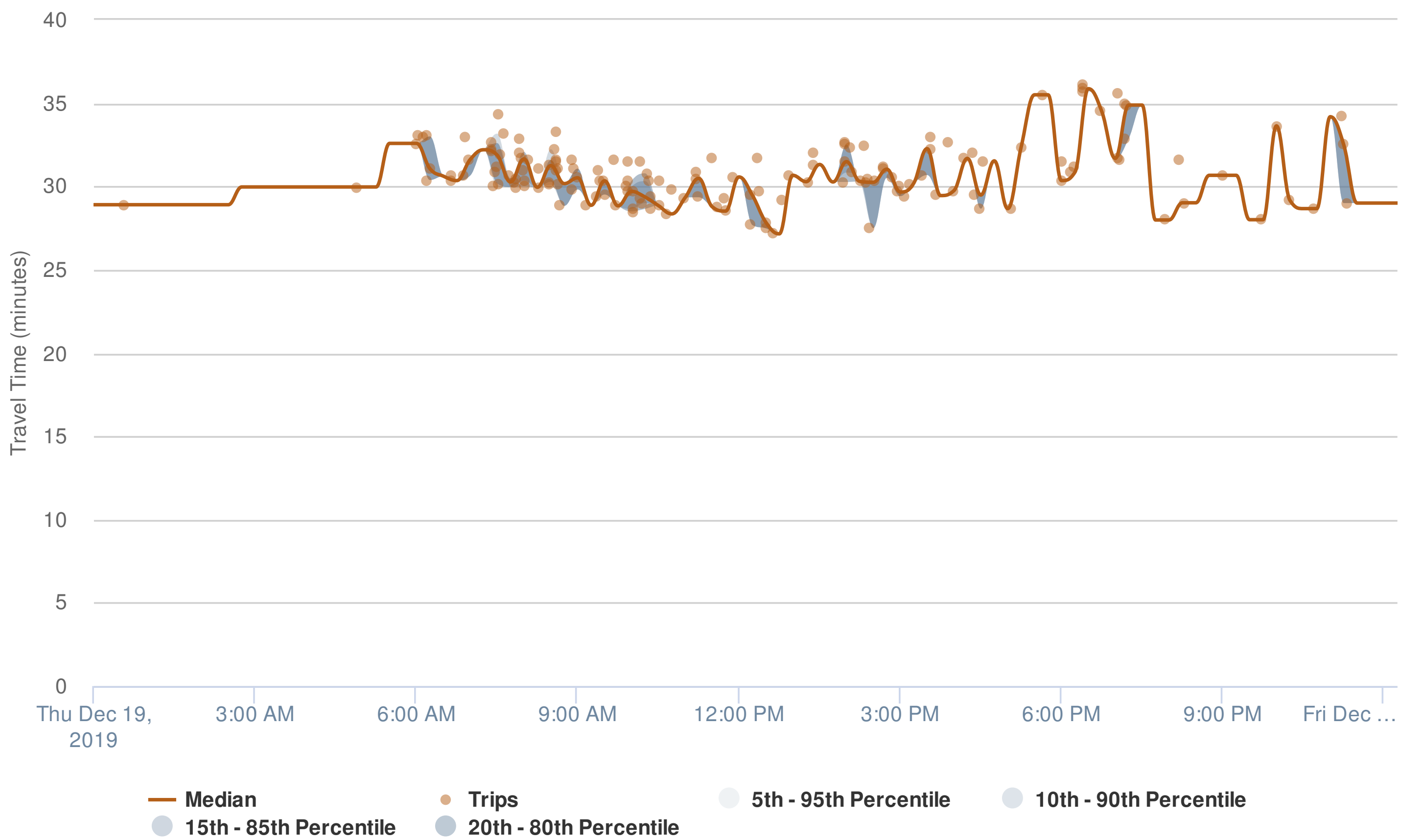
3 to 1 | (45.264635, -111.253275) to (45.671128, -111.185718)

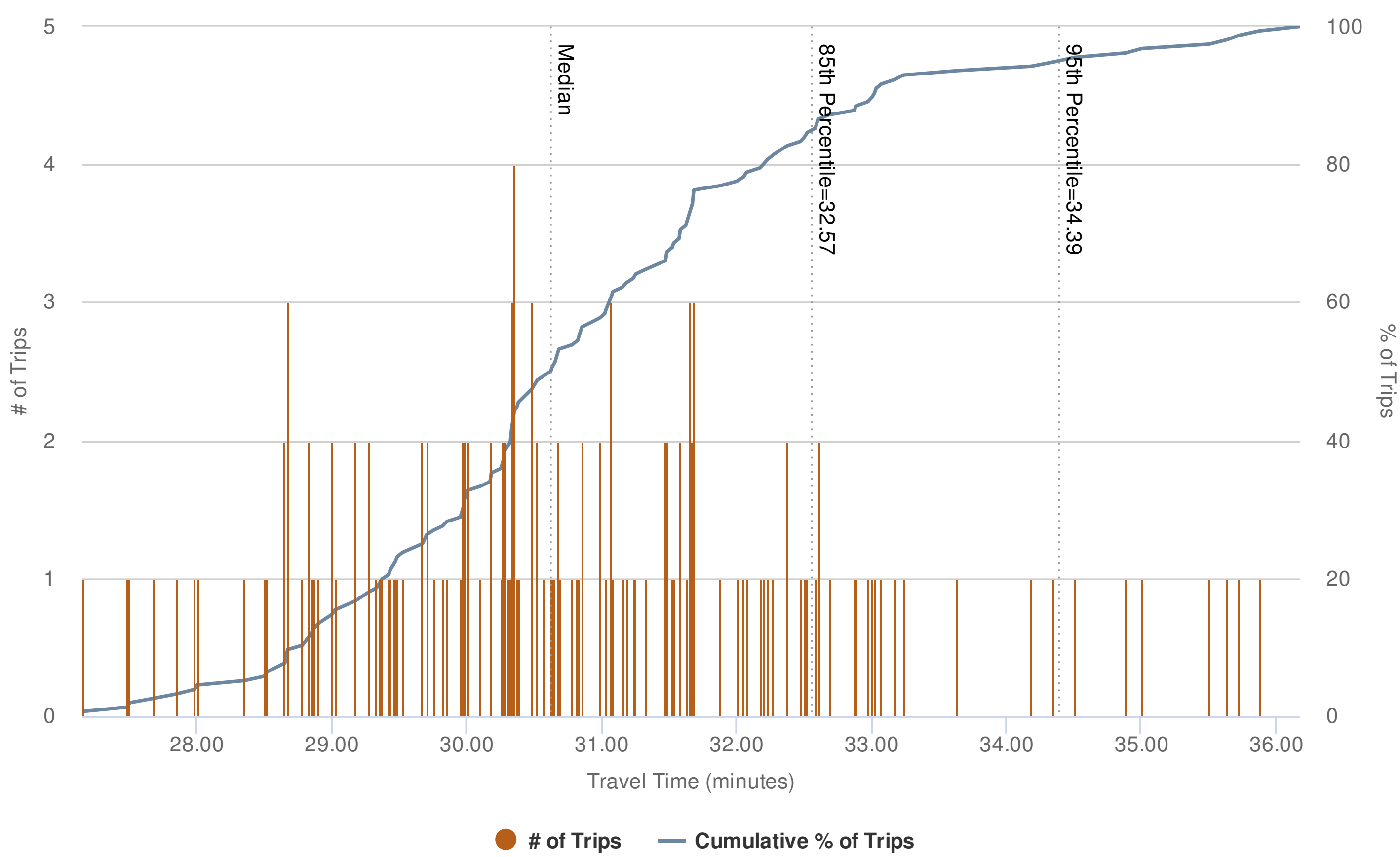




US 191_Mill St to US 191_MT 64

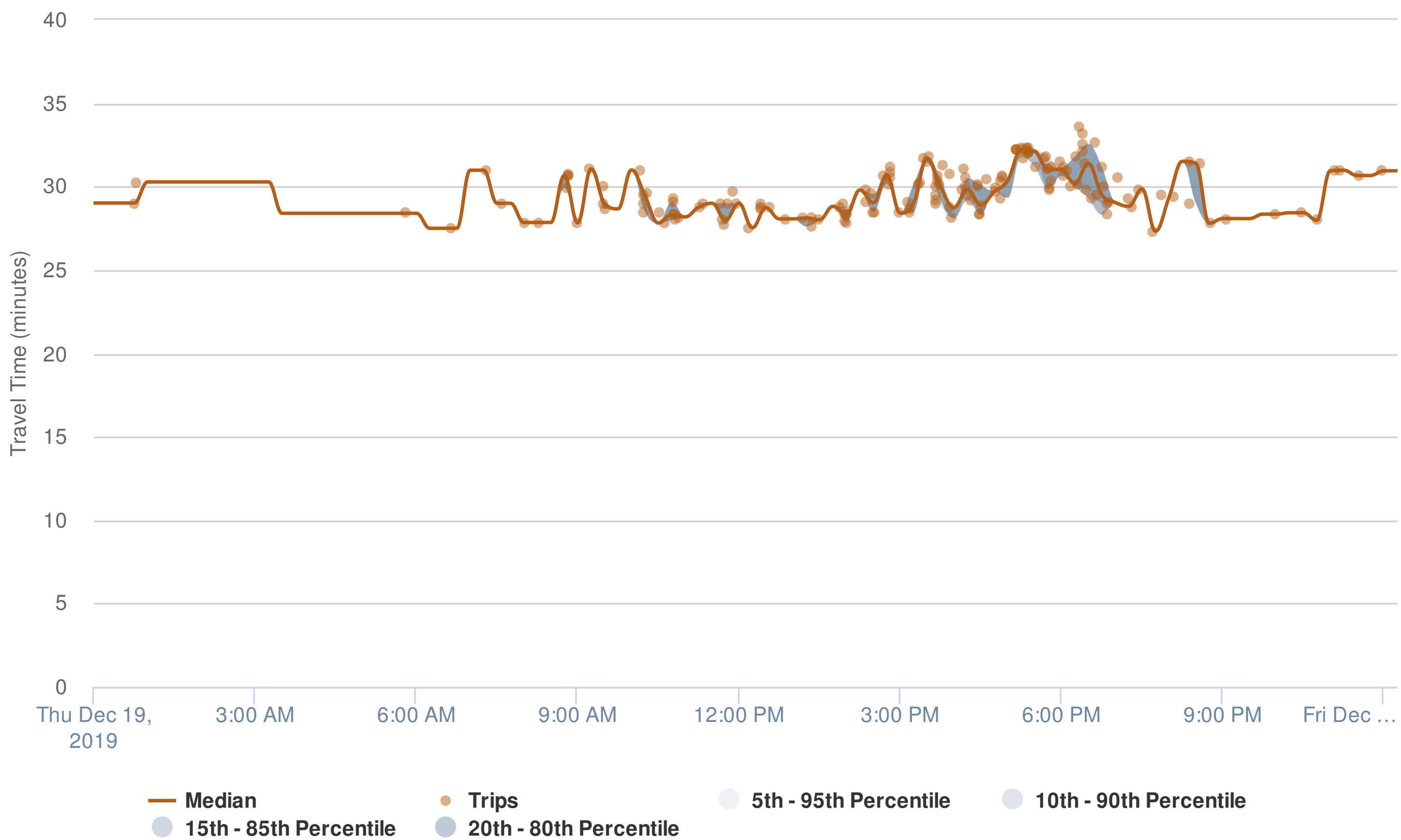
2 to 3 | (45.591191, -111.197111) to (45.264635, -111.253275)

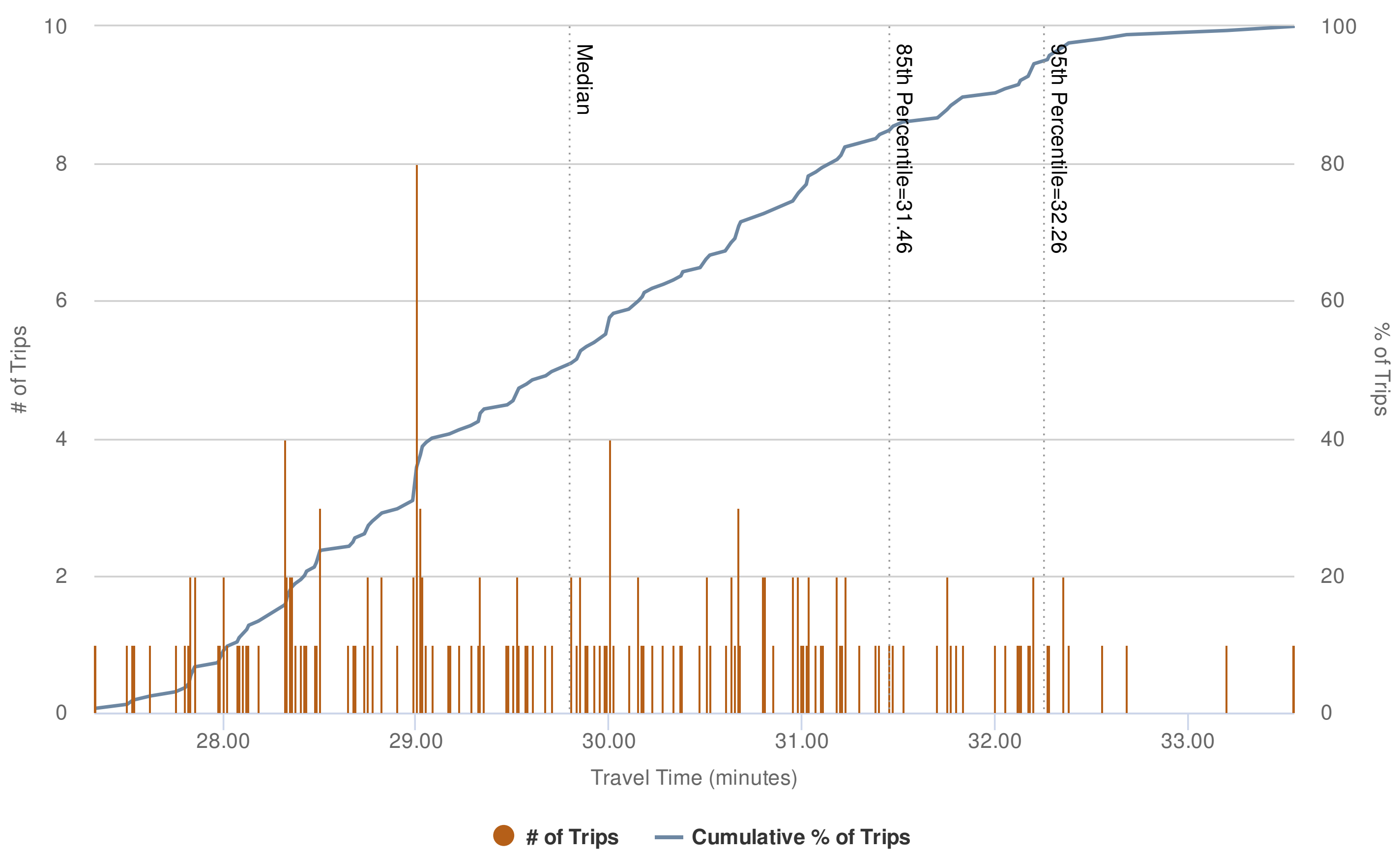




US 191_MT 64 to US 191_Mill St

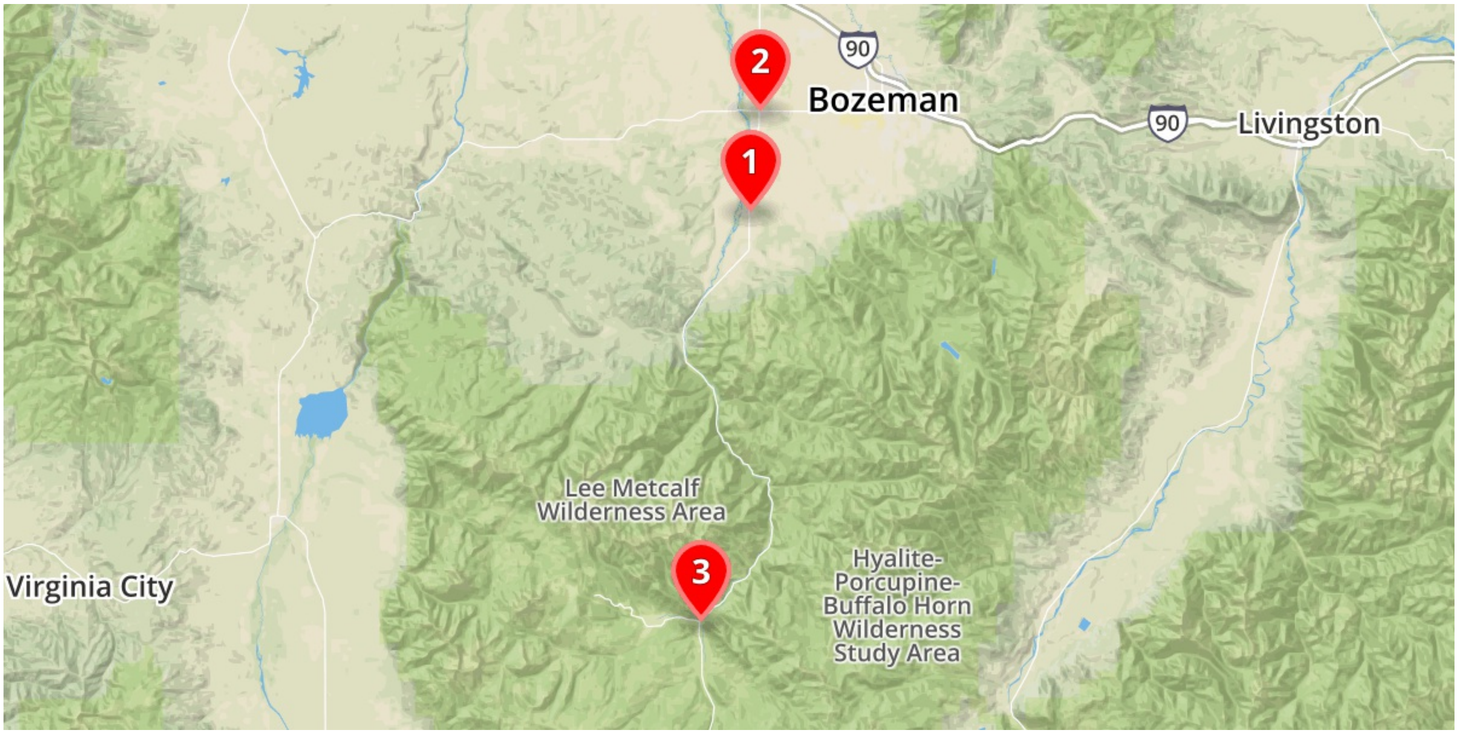
3 to 2 | (45.264635, -111.253275) to (45.591191, -111.197111)





Travel Time Summary

3 Locations | Bozeman, MT , Gallatin Gateway, MT | Sat Dec 21, 2019 - Sun Dec 22, 2019 | 12:00AM - 12:15AM (24.3h)



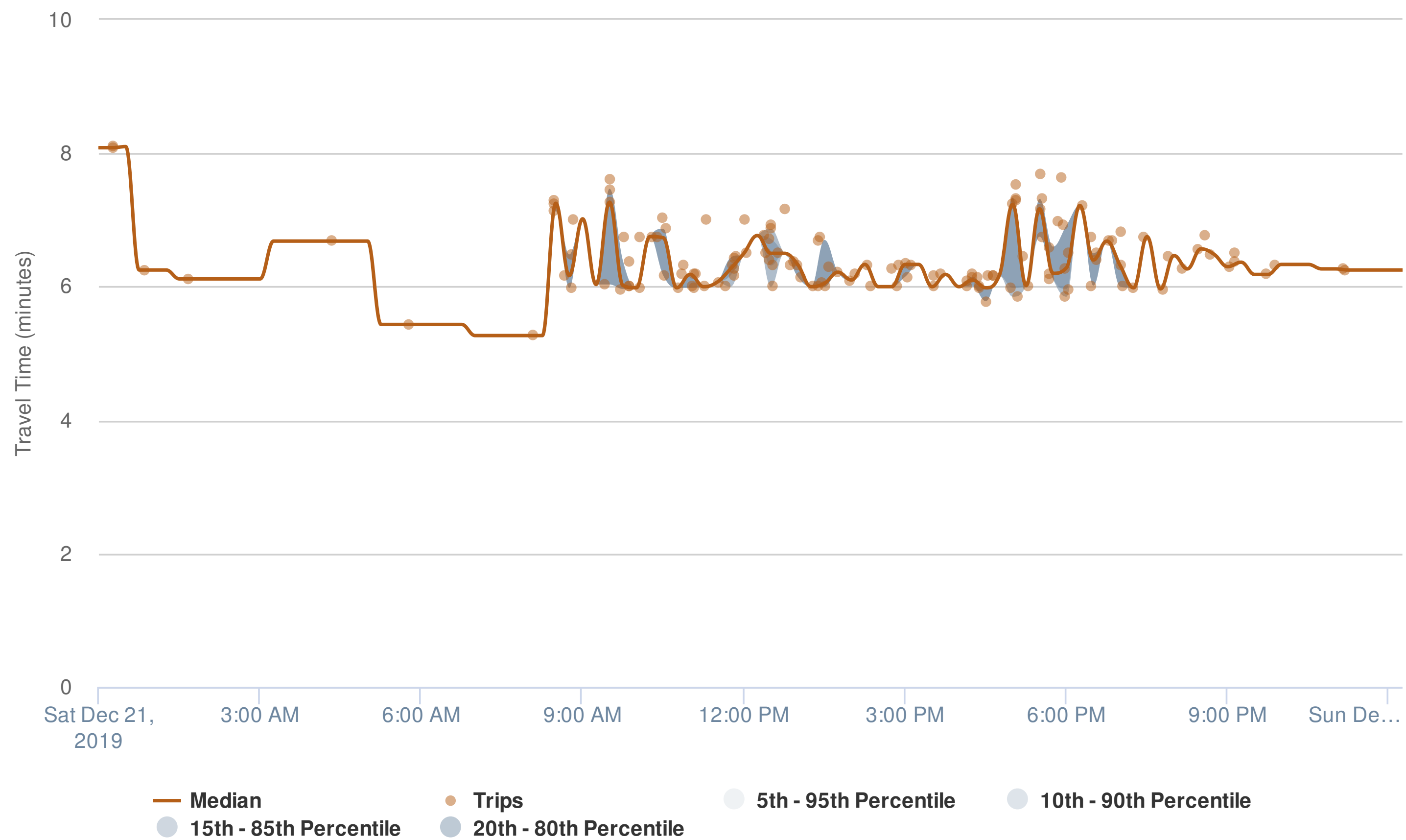
Start Location		End Location		# of Trips	Travel Time (minutes)						Distance (mis)[1]	Speed (mph)[2]					
					Median	85th Percentile	95th Percentile	Mean	Min	Max		Median	85th Percentile	95th Percentile	Mean	Min	Max
1	US 191_Mill St	2	US 191_Hwy 84_Hwy 85	141	6.32	7.00	7.33	6.45	5.27	8.10	5.6	53.55	56.38	56.69	52.75	41.76	64.23
2	US 191_Hwy 84_Hwy 85	1	US 191_Mill St	200	6.02	6.31	6.52	6.03	5.33	6.77	5.6	56.22	58.15	61.32	56.22	49.99	63.42
1	US 191_Mill St	3	US 191_Hwy 64	174	29.98	31.30	32.00	30.13	28.00	34.03	28.3	56.63	58.55	59.94	56.44	49.89	60.64
3	US 191_Hwy 64	1	US 191_Mill St	141	29.33	31.45	33.67	29.70	26.67	37.20	28.3	57.88	61.00	62.50	57.43	45.64	63.67
2	US 191_Hwy 84_Hwy 85	3	US 191_Hwy 64	222	36.02	37.89	38.66	36.27	33.50	42.17	33.9	56.53	58.25	59.85	56.23	48.29	60.78
3	US 191_Hwy 64	2	US 191_Hwy 84_Hwy 85	234	36.07	39.74	41.71	36.78	32.77	46.77	33.9	56.45	59.89	60.78	55.63	43.54	62.14

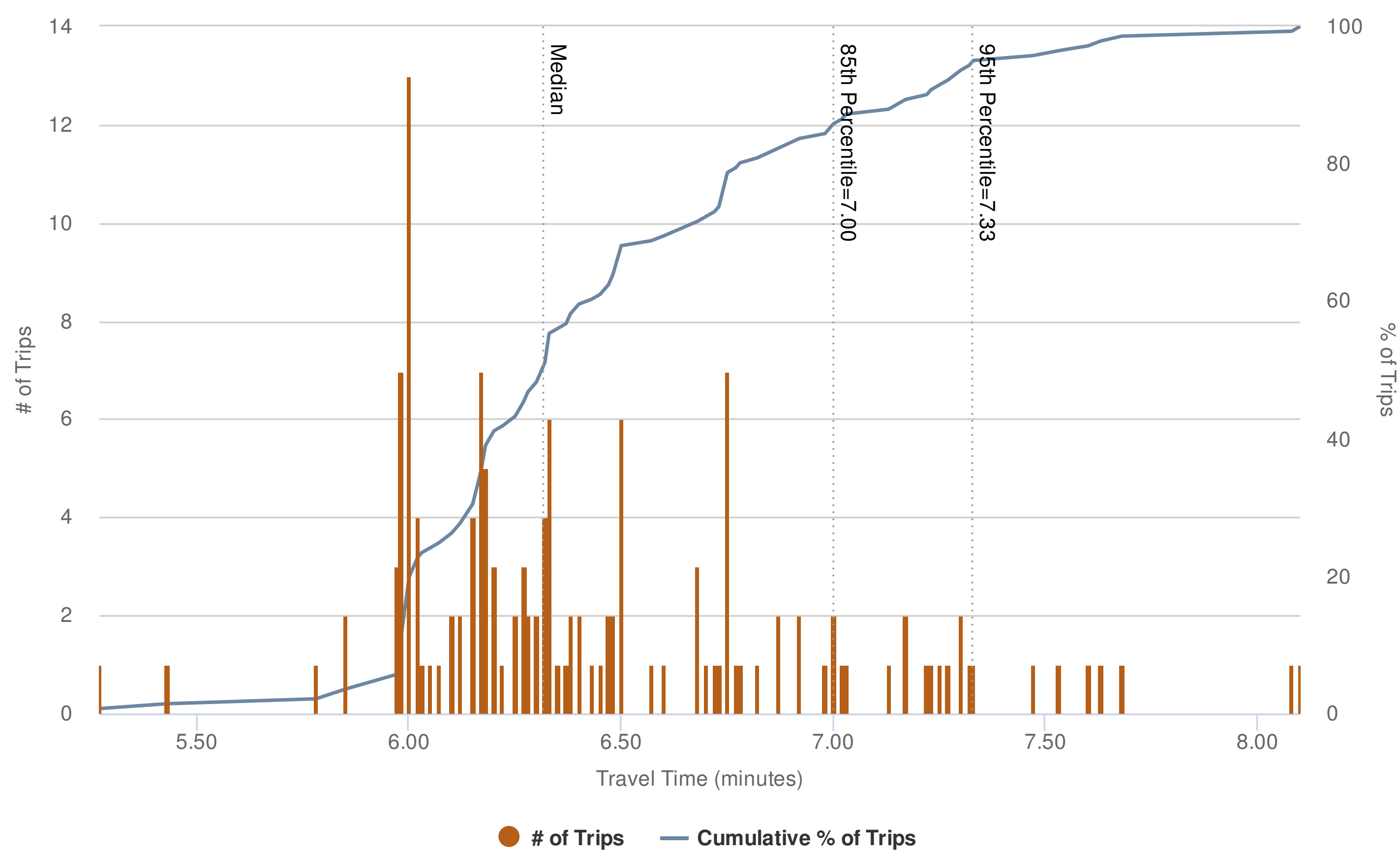
[1] Distance is the length of the Fastest Route between the locations in Google Maps. If Google Maps is unavailable or if Google Maps reports a distance longer than twice the aerial (as the bird flies) distance, the aerial distance is used and is denoted by an asterisk (*). See help.miovision.com/kb/distance for more information.

[2] Speed is the distance between the points divided by the travel time. This value is known as the space mean speed. This report was configured to include trips with calculated speeds between 1.0 mph and 90.0 mph. If you want a report that includes trips with a different range of speeds, or all trips, contact the person who generated the report.

US 191_Mill St to US 191_Hwy 84_Hwy 85

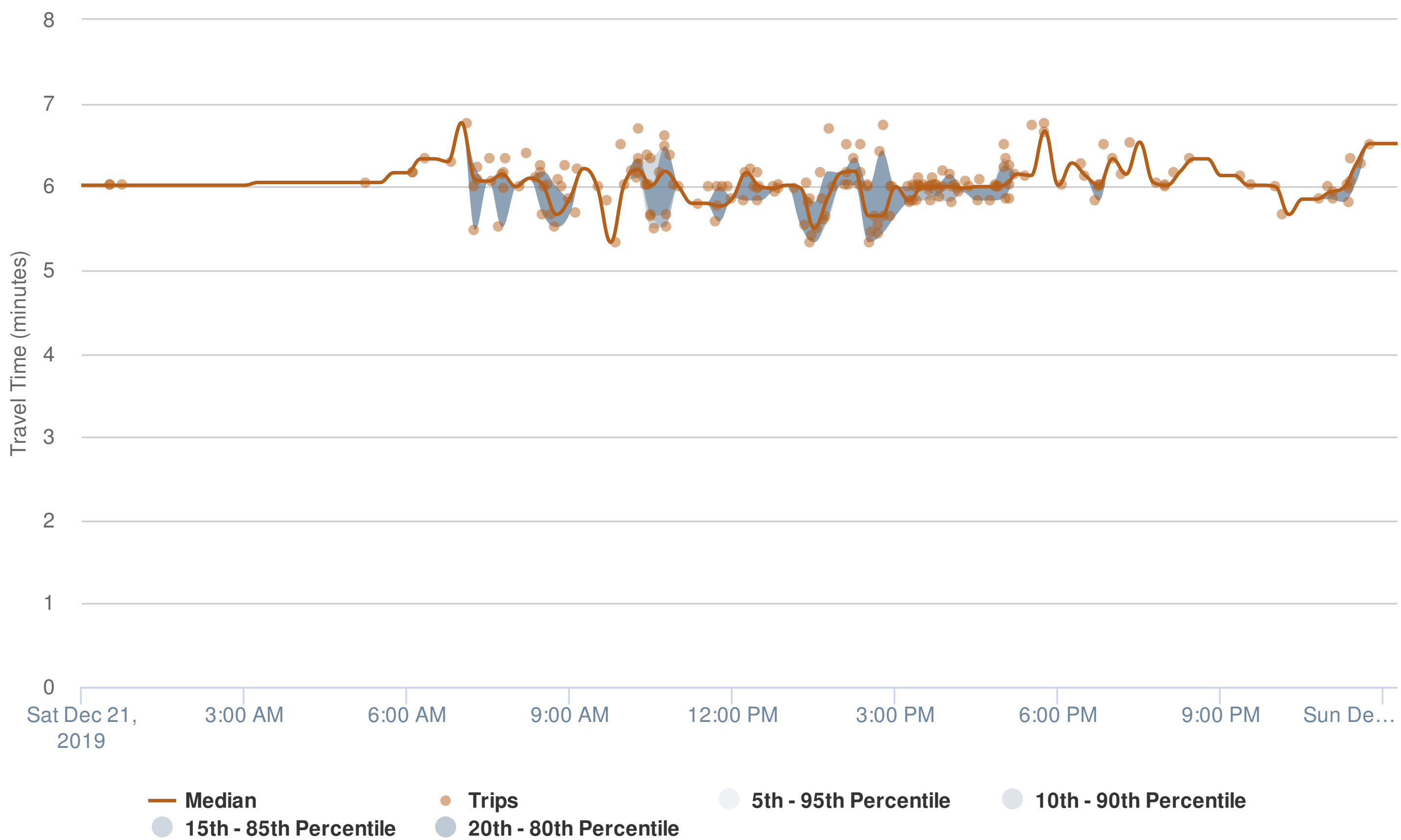
1 to 2 | (45.591191, -111.197111) to (45.671128, -111.185718)

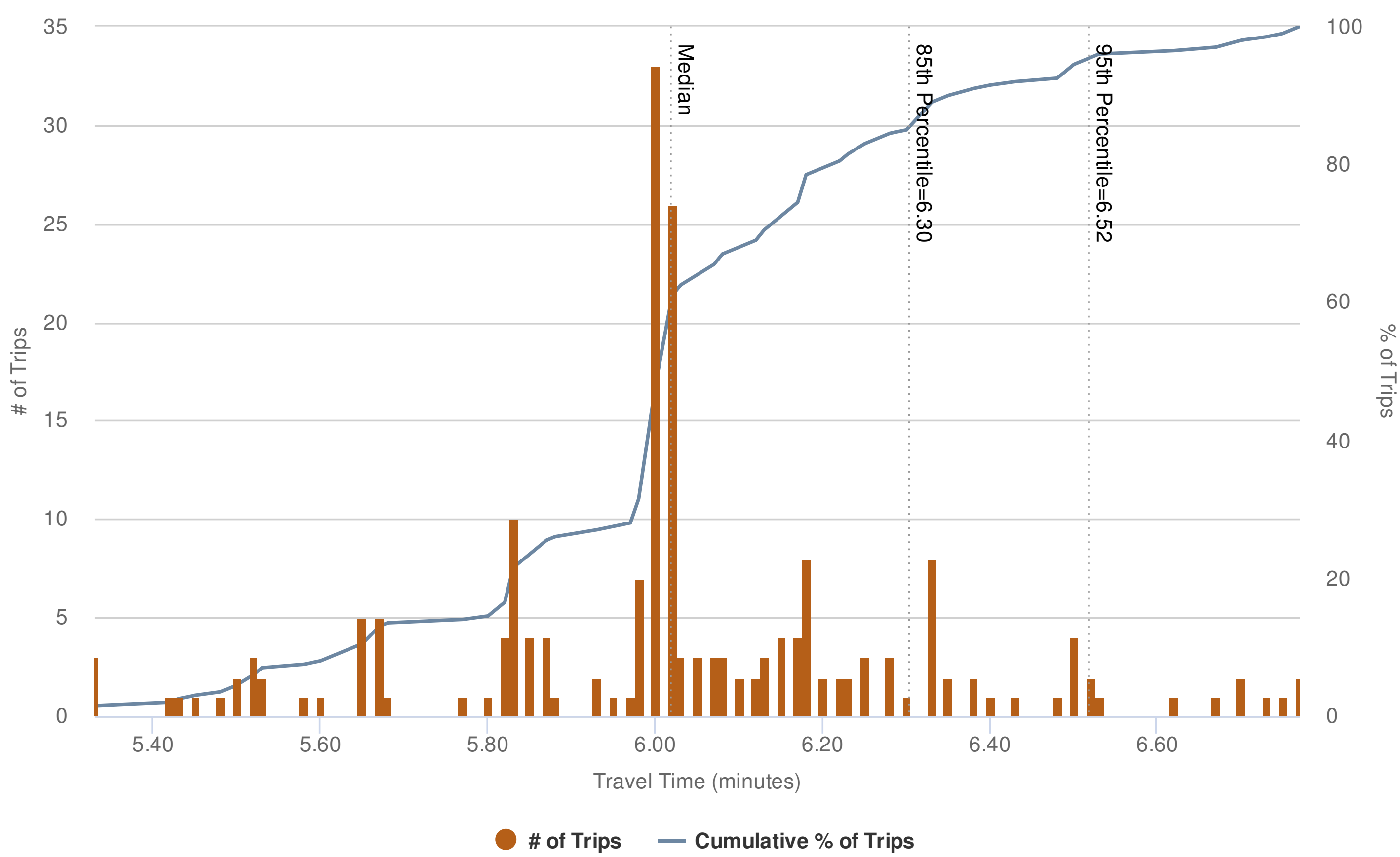




US 191_Hwy 84_Hwy 85 to US 191_Mill St

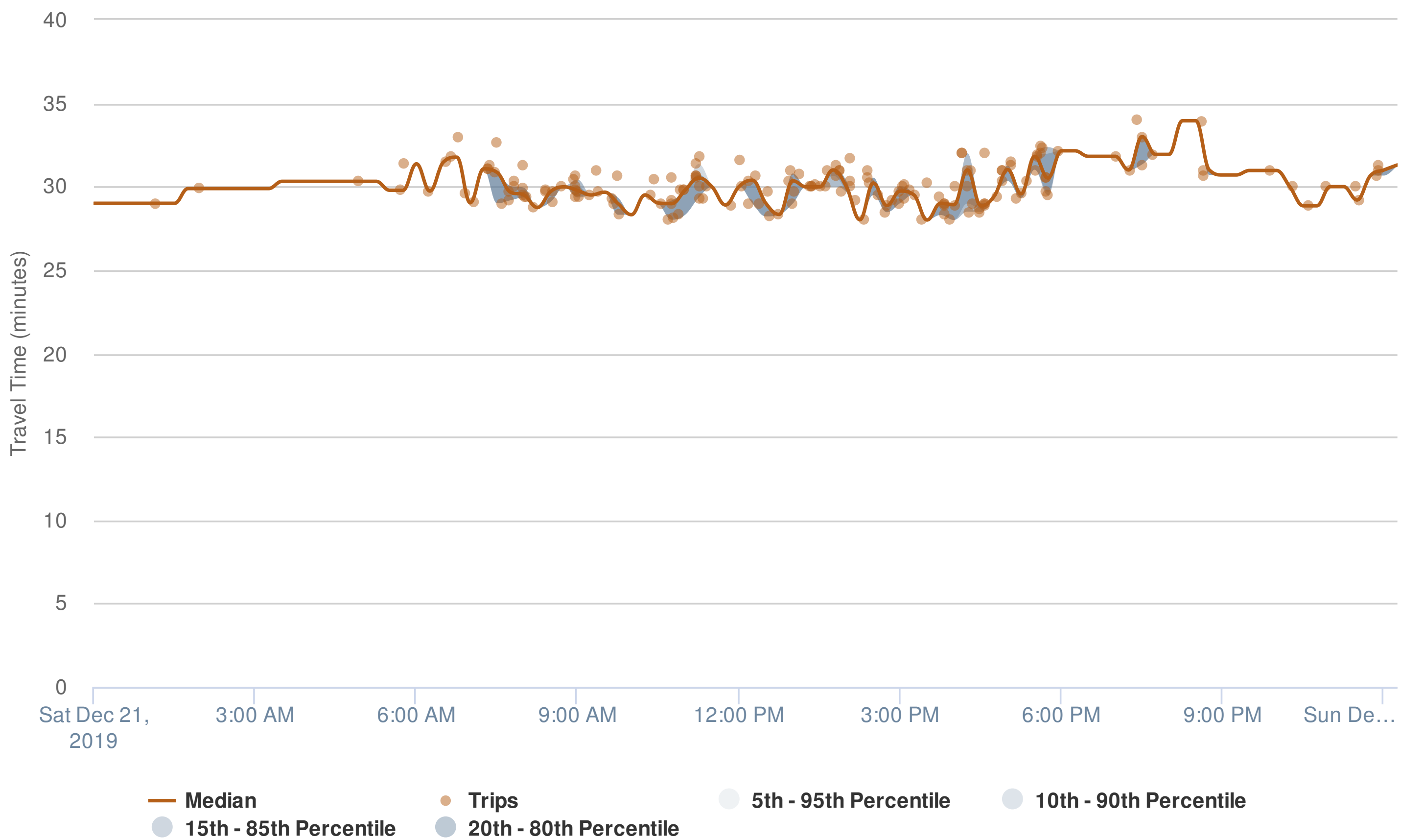
2 to 1 | (45.671128, -111.185718) to (45.591191, -111.197111)

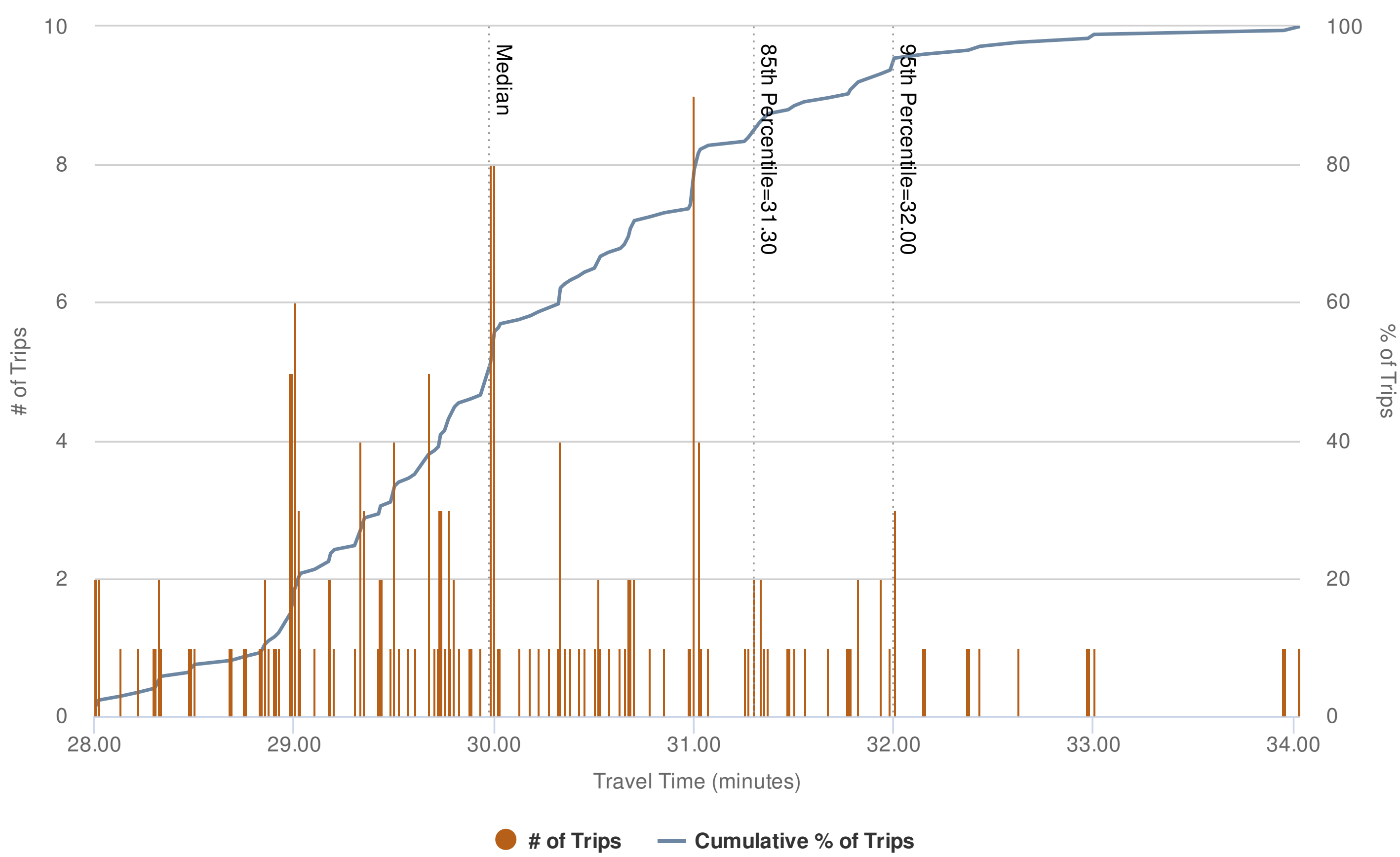




US 191_Mill St to US 191_Hwy 64

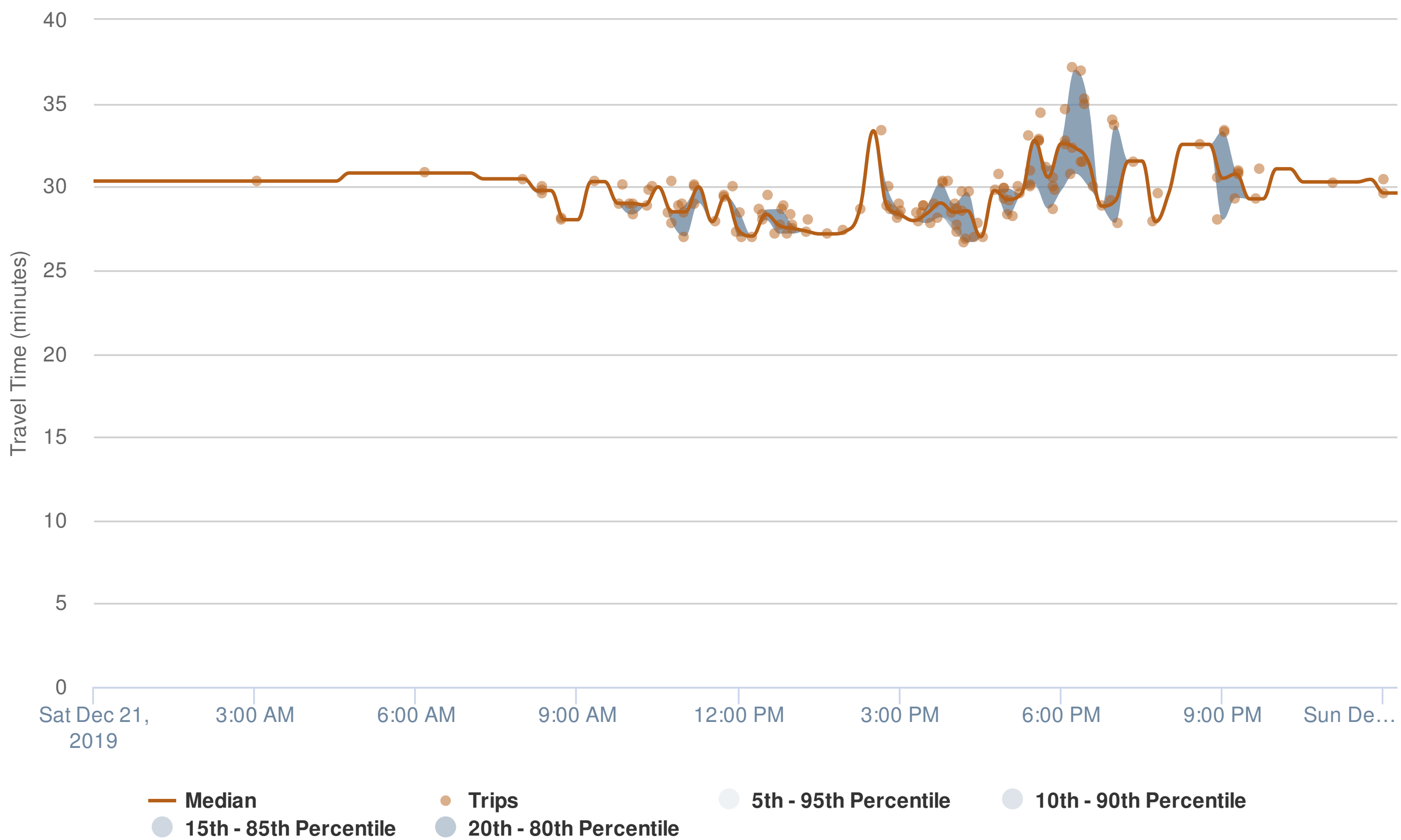
1 to 3 | (45.591191, -111.197111) to (45.264635, -111.253275)

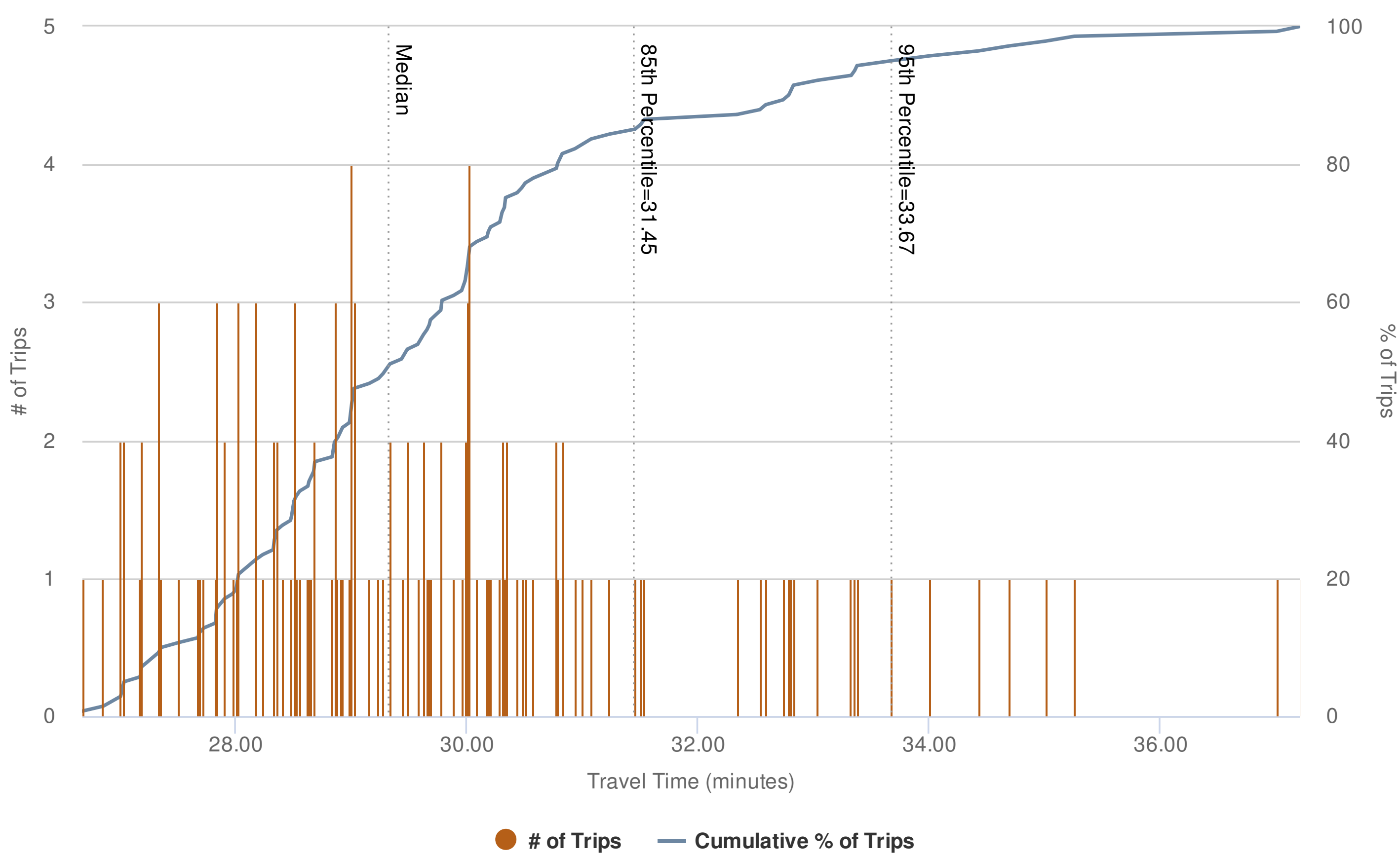




US 191_Hwy 64 to US 191_Mill St

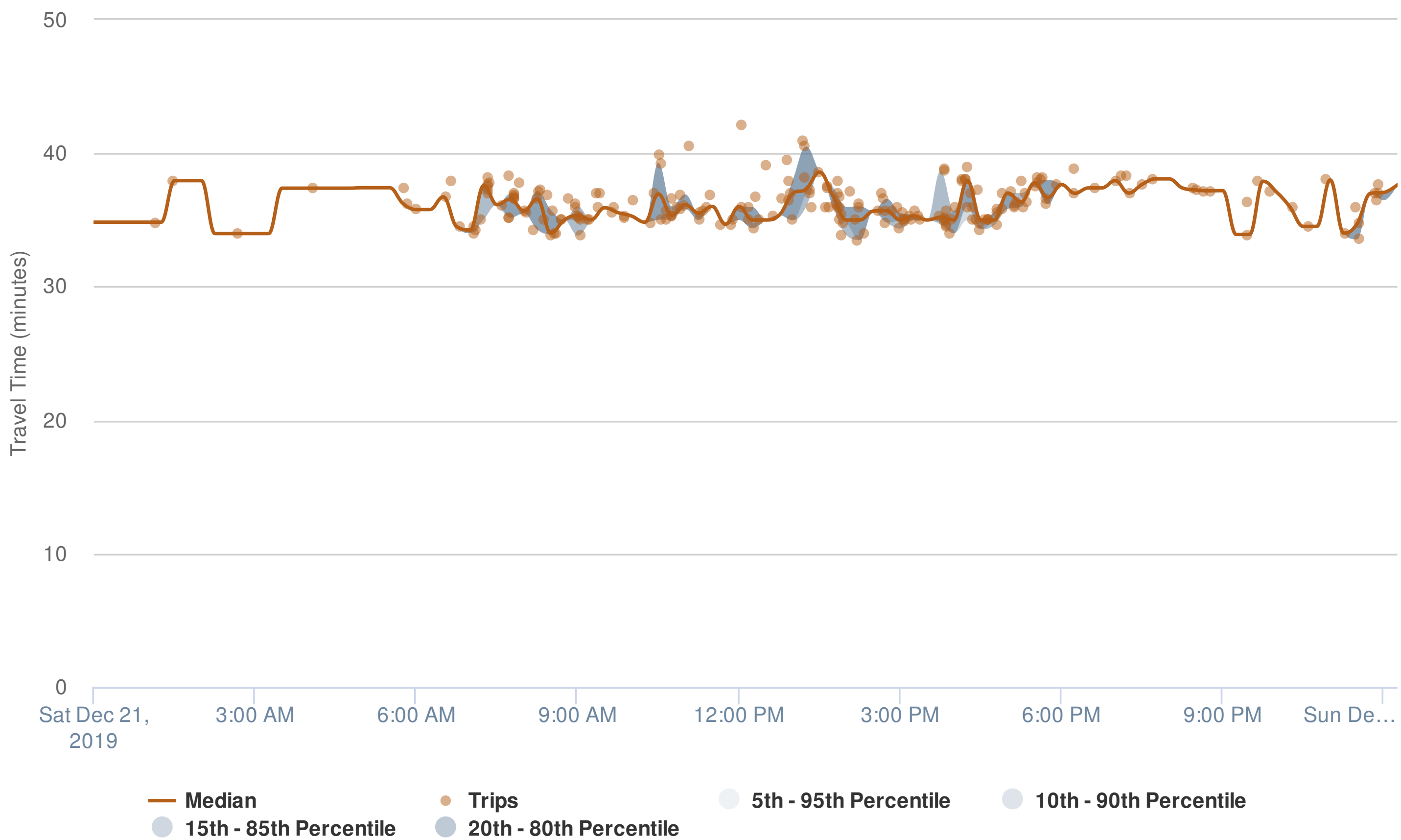
3 to 1 | (45.264635, -111.253275) to (45.591191, -111.197111)

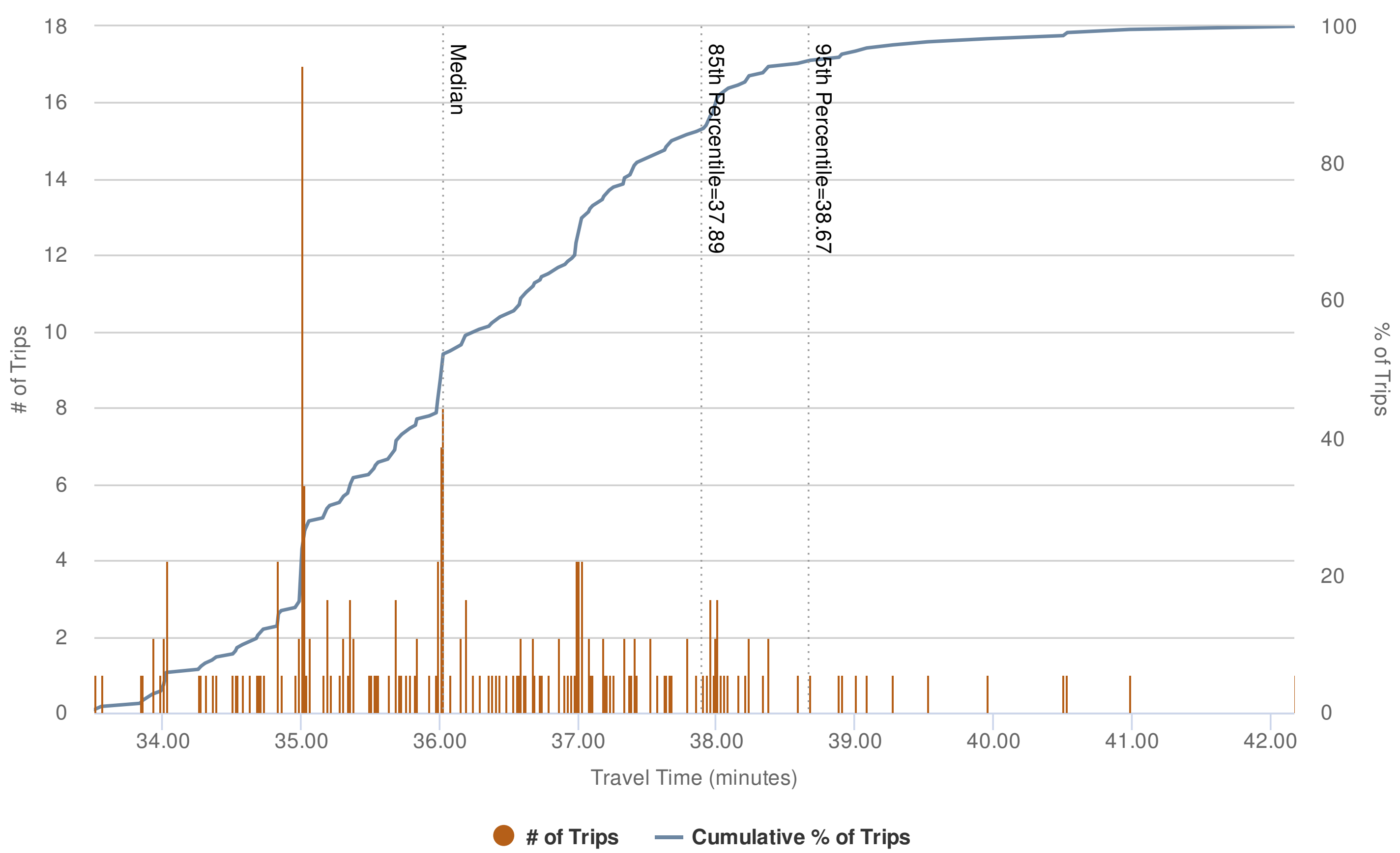




US 191_Hwy 84_Hwy 85 to US 191_Hwy 64

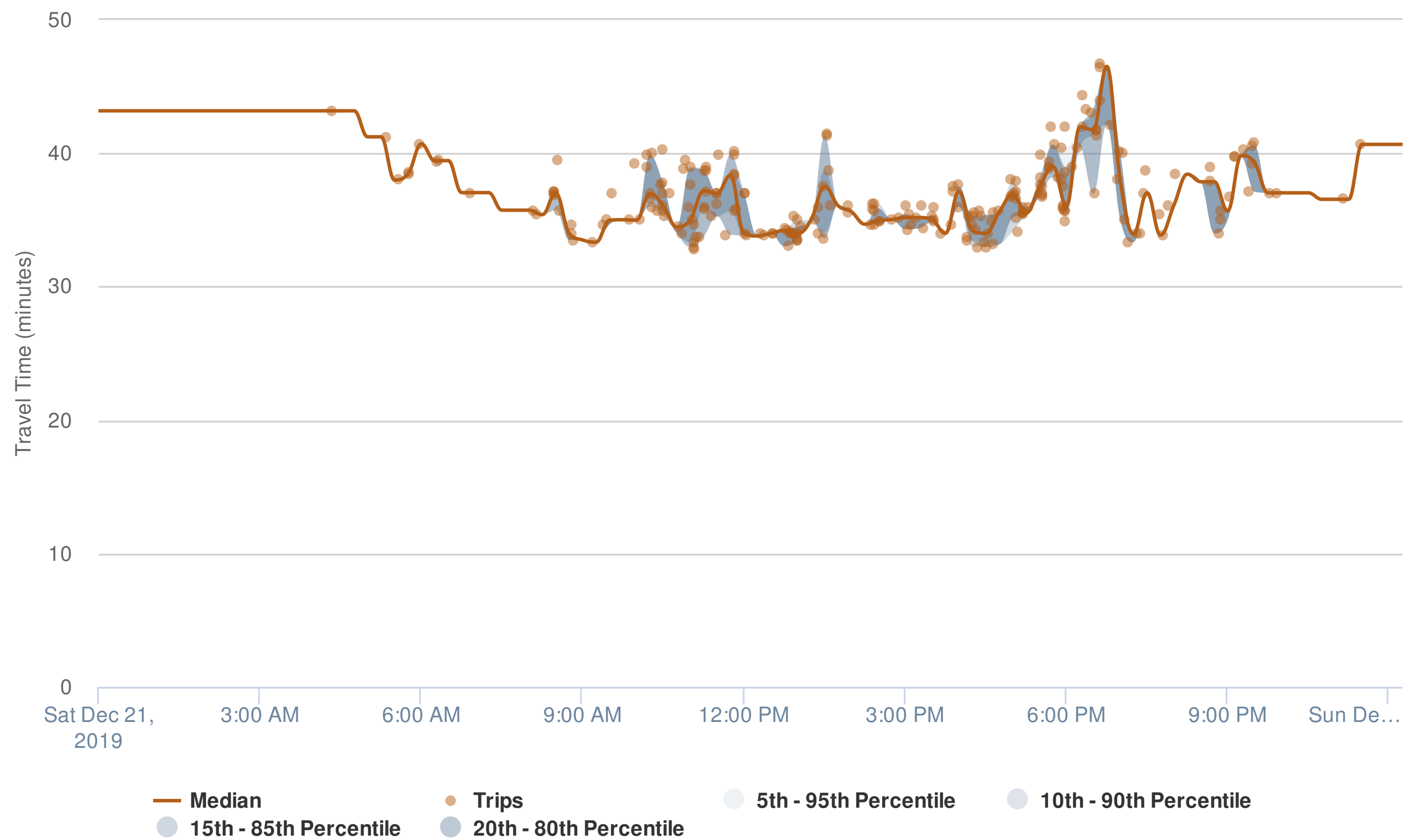
2 to 3 | (45.671128, -111.185718) to (45.264635, -111.253275)

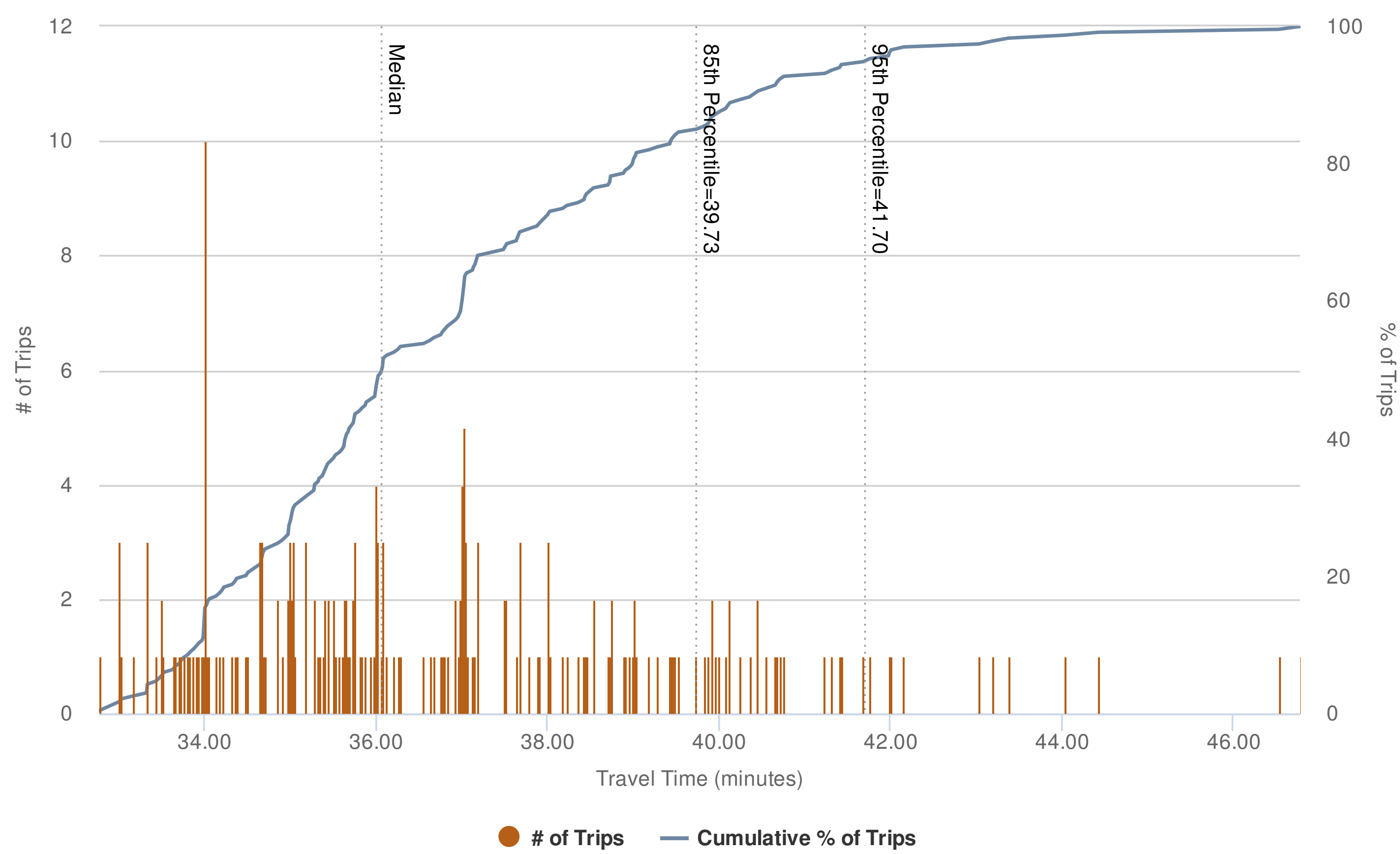




US 191_Hwy 64 to US 191_Hwy 84_Hwy 85

3 to 2 | (45.264635, -111.253275) to (45.671128, -111.185718)



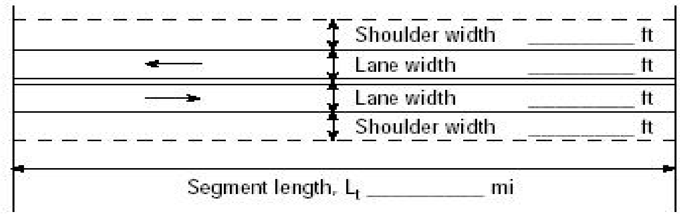


DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 78.5 - 75.8 (16-3A-006)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*632*veh/h	
Opposing direction vol., V_o	*421*veh/h	
Shoulder width ft	*4.0*	
Lane Width ft	*12.0*	
Segment Length mi	*2.8*	
Grade Length mi	Up/down	
Peak-hour factor, PHF	*0.88*	
No-passing zone	*100%*	
% Trucks and Buses , P_T	*10* %	
% Recreational vehicles, P_R	*4%*	
Access points *mi*	*15*/mi	

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.990*	*0.980*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*725*	*488*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3* mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.3* mi/h	Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*50.0* mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*38.2* mi/h
		Percent free flow speed, PFFS	*76.5* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*718*	*478*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*62.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*32.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*81.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.53*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*718.2*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*6.87*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

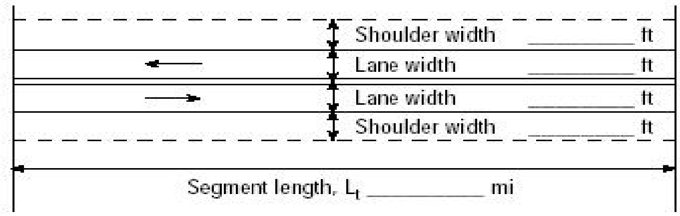
 HCS 2010™ Version 6.90 Generated: 11/25/2019 2:16 PM

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 80.6 - 78.5 (16-3A-007)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *70%*

% Trucks and Buses , P_T *9* %

% Recreational vehicles, P_R *4%*

Access points *mi* *11*/mi

Analysis direction vol., V_d *672*veh/h

Opposing direction vol., V_o *448*veh/h

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *2.1*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.991*	*0.982*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*771*	*518*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.9 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*39.0 mi/h*
		Percent free flow speed, PFFS	*76.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^* f_{g,PTSF})$	*764*	*509*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*65.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*28.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*82.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.53*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*763.6*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*6.51*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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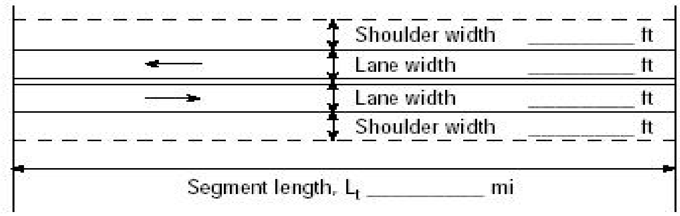
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 81.9 - 80.6 (16-3A-008)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*987*veh/h
Opposing direction vol., V_o	*658*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*1.3*
Peak-hour factor, PHF	*0.88*
No-passing zone	*100%*
% Trucks and Buses , P_T	*6* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*36*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1122*	*752*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* *mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*9.0* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.3* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*36.0* *mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*20.1* *mi/h*
		Percent free flow speed, PFFS	*55.9* *%*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1122*	*748*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*79.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*19.5*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*90.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.66*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*55.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1121.6*
Effective width, Wv (Eq. 15-29) ft	*28.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.01*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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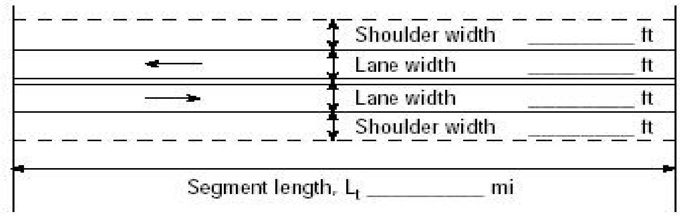
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 47.9 - 45.3 (16-4-002)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*455*veh/h
Opposing direction vol., V_o	*303*veh/h
Shoulder width ft	*2.0*
Lane Width ft	*12.0*
Segment Length mi	*2.6*
Peak-hour factor, PHF	*0.88*
No-passing zone	*100%*
% Trucks and Buses , P_T	*6* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.2*	*1.4*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/\ (1+ P_T (E_T -1)+P_R (E_R -1)\ )$	*0.988*	*0.977*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*523*	*352*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6* mi/h
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*3.1* mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*53.7* mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*43.8* mi/h
		Percent free flow speed, PFFS	*81.6* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*0.994*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*517*	*346*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*50.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*39.8*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*73.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.53*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*81.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*517.0*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*5.55*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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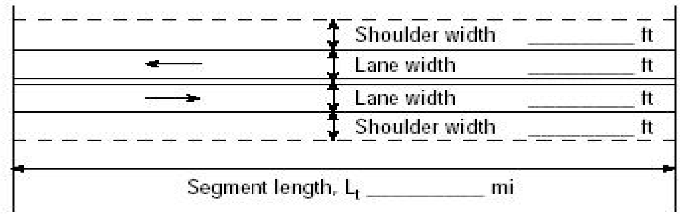
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 70.4 - 47.9 (A-043)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.88*
No-passing zone	*82%*
% Trucks and Buses , P_T	*9 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*8*/mi

Analysis direction vol., V_d	*545*veh/h
Opposing direction vol., V_o	*363*veh/h
Shoulder width ft	*2.0*
Lane Width ft	*12.0*
Segment Length mi	*22.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.991*	*0.974*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*625*	*424*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.6 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*55.4 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*44.6 mi/h*
		Percent free flow speed, PFFS	*80.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^* f_{g,PTSF})$	*619*	*413*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*57.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*34.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*78.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.53*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*80.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*619.3*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*6.70*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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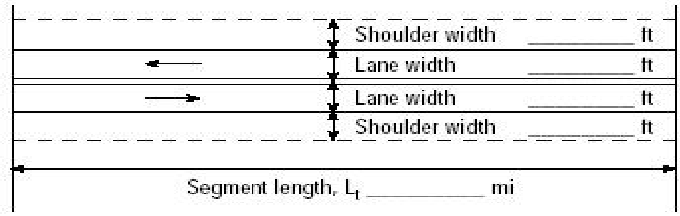
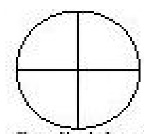
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 75.8 - 70.4 (W-107)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data





☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF	*0.88*
No-passing zone	*60%*
% Trucks and Buses , P_T	*12 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*9*/mi

Analysis direction vol., V_d	*608*veh/h
Opposing direction vol., V_o	*406*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*12.0*
Segment Length mi	*5.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*0.988*	*0.977*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*699*	*472*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*70.0* mi/h
		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3* mi/h
Mean speed of sample[3], S_{FM}		Adj. for access points[4], f_A (Exhibit 15-8)	*2.3* mi/h
Total demand flow rate, both directions, *v*		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*66.4* mi/h
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*55.0* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.3* mi/h	Percent free flow speed, PFFS	*82.8* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*691*	*461*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*61.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*30.9*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*79.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.53*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*82.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*690.9*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.71*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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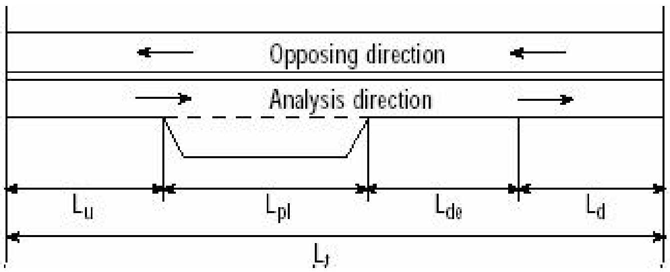
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 75.8 - 70.4 (W-107)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway



Shoulder width (ft)	*4.0*
Lane Width (ft)	*12.0*
Segment Length (mi)	*5.4*
Total length of analysis segment, L_t	*5.4*
Length of two-lane highway upstream of the passing lane, L_u	*0.2*
Length of passing lane including tapers , L_{pl}	*0.9*
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	*55.0*
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	*79.5*
Level of service[1], LOS_d (from Directional Two-Lane Highway Segment Worksheet)	*D*
Average Travel Speed	
Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23)	*1.70*
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d $L_d=L_t-(L_u+L_{pl}+L_{de})$	*2.60*
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28)	*1.11*
Average travel speed including passing lane[2], $ATS_{pl} = (ATS_d * L_t) / (L_u+L_d+(L_{pl}/f_{pl})+ (2L_{de}/(1+f_{pl,ATS})))$	*56.9*
Percent free flow speed including passing lane, $PFFS_{pl} = (ATS_{pl}/ FFS)$	*85.6*
Percent Time-Spent-Following	
Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23)	*5.77*
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d=L_t-(L_u+L_{pl}+L_{de})$	*-1.47*
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl,PTSF}$(Exhibit 15-26)	*0.61*

Percent time-spent-following including passing lane[3], $PTSF_{pl}$(%) $PTSF_{pl}= PTSF_d[L_u+L_d+f_{pl,PTSF}L_{pl}+((1+f_{pl,PTSF})/2)L_{de}]/L_t$	*58.8*
Level of Service and Other Performance Measures[4]	
Level of service including passing lane LOS_{pl} (Exhibit 15-3)	*C*
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}= VMT_{15}/ATS_{pl}$	*16.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*690.9*
Effective width, W_v (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.71*
Bicycle level of service (Exhibit 15-4)	*F*
Notes	
1. If LOS_d=F, passing lane analysis cannot be performed. 2. If L_d <0, use alternative Equation 15-18. 3. If L_d<0, use alternative Equation 15-16. 4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.	

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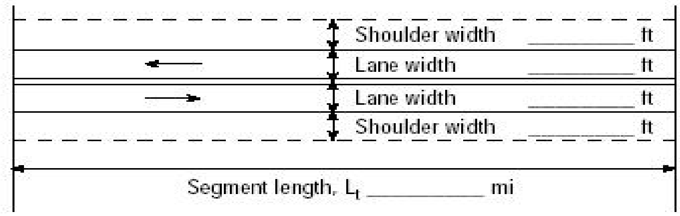
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 78.5 - 75.8 (16-3A-006)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



Analysis direction vol., V_d *857*veh/h

Opposing direction vol., V_o *571*veh/h

Shoulder width ft *4.0*

Lane Width ft *12.0*

Segment Length mi *2.8*

☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *100%*

% Trucks and Buses , P_T *10 %*

% Recreational vehicles, P_R *4%*

Access points *mi* *15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/\ (1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.990*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i\ /\ (PHF^*\ f_{g,ATS}\ ^*\ f_{HV,ATS})$	*974*	*655*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/\ f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*50.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*35.6 mi/h*
		Percent free flow speed, PFFS	*71.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/\ (1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^*\ f_{g,PTSF})$	*974*	*649*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*74.0*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*23.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}{}^*(v_{d,PTSF}\ /\ v_{d,PTSF}+v_{o,PTSF})$	*88.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.57*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*71.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*973.9*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.03*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

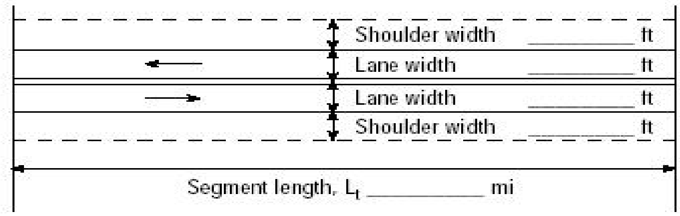
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 80.6 - 78.5 (16-3A-007)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*912*veh/h
Opposing direction vol., V_o	*608*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*12.0*
Segment Length mi	*2.1*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.88*
No-passing zone	*70%*
% Trucks and Buses , P_T	*9* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*11*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*0.991*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1036*	*697*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0* *mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3* *mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*2.8* *mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.3* *mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.0* *mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*36.2* *mi/h*
		Percent free flow speed, PFFS	*71.0* *%*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1036*	*691*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*75.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*20.7*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*88.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.61*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*71.0*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1036.4*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*6.67*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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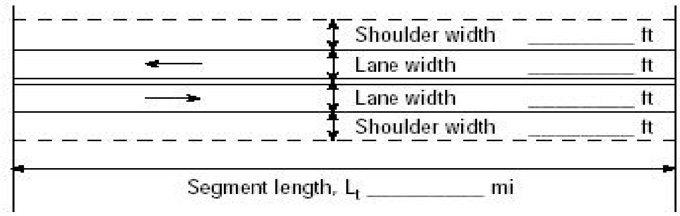
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 81.9 - 80.6 (16-3A-008)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*1339*veh/h
Opposing direction vol., V_o	*893*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*1.3*
Peak-hour factor, PHF	*0.88*
No-passing zone	*100%*
% Trucks and Buses , P_T	*6* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*36*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1522*	*1015*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0* mi/h
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*9.0* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.1* mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*36.0* mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*15.2* mi/h
		Percent free flow speed, PFFS	*42.3* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1522*	*1015*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*88.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*10.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*94.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.90*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*42.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1521.6*
Effective width, Wv (Eq. 15-29) ft	*28.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.16*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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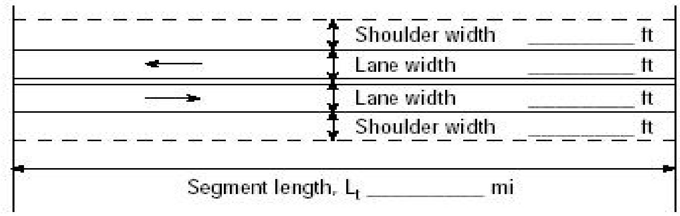
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 47.9 - 45.3 (16-4-002)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*623*veh/h
Opposing direction vol., V_o	*415*veh/h
Shoulder width ft	*2.0*
Lane Width ft	*12.0*
Segment Length mi	*2.6*
Peak-hour factor, PHF	*0.88*
No-passing zone	*100%*
% Trucks and Buses , P_T	*6* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.994*	*0.988*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*712*	*477*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*60.0 mi/h*
		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Total demand flow rate, both directions, *v*		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*53.7 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*42.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.4 mi/h*	Percent free flow speed, PFFS	*78.3 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*708*	*472*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*62.5*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*32.4*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*81.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.53*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*78.3*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*708.0*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*5.71*
Bicycle level of service (Exhibit 15-4)	*F*
Notes	

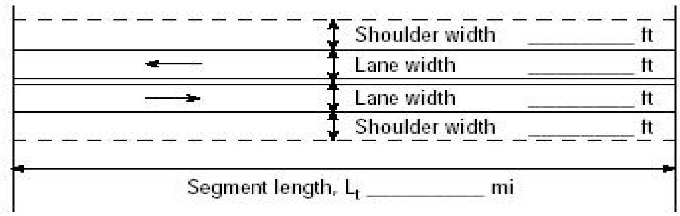
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 70.4 - 47.9 (A-043)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*746*veh/h
Opposing direction vol., V_o	*498*veh/h
Shoulder width ft	*2.0*
Lane Width ft	*12.0*
Segment Length mi	*22.4*
Grade Length mi Up/down	
Peak-hour factor, PHF	*0.88*
No-passing zone	*82%*
% Trucks and Buses, P_T	*9 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*8/mi*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.1*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.991*	*0.991*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF* f_{g,ATS} * f_{HV,ATS})$	*855*	*571*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.9 mi/h*	Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*55.4 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*42.4 mi/h*
		Percent free flow speed, PFFS	*76.5 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*848*	*566*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*68.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*26.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*84.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.53*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*76.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*847.7*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*6.86*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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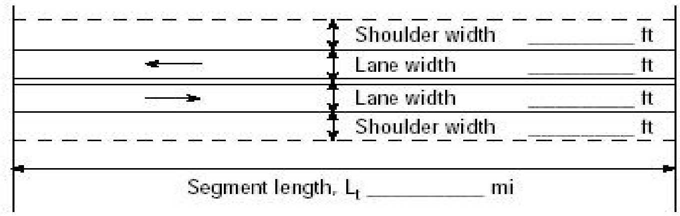
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 75.8 - 70.4 (W-107)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Existing (2018)*

Project Description: *US 191 Corridor Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down	
Peak-hour factor, PHF		*0.88*
No-passing zone		*60%*
% Trucks and Buses , P_T		*12 %*
% Recreational vehicles, P_R		*4%*
Access points *mi*		*9*/mi

Analysis direction vol., V_d	*825*veh/h
Opposing direction vol., V_o	*550*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*12.0*
Segment Length mi	*5.4*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.988*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*938*	*633*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
		Base free-flow speed[4], BFFS	*70.0 mi/h*
		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for access points[4], f_A (Exhibit 15-8)	*2.3 mi/h*
Total demand flow rate, both directions, *v*		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*66.4 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*52.6 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.6 mi/h*	Percent free flow speed, PFFS	*79.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*938*	*625*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*71.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*22.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*85.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.55*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*79.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*937.5*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.86*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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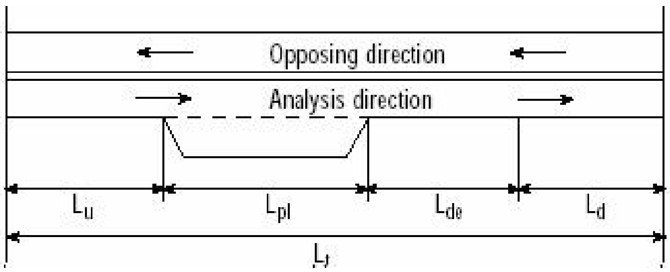
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	Kerry Pedersen	Highway of Travel	US 191
Agency or Company	RPA	From/To	RP 75.8 - 70.4 (W-107)
Date Performed	11/25/2019	Jurisdiction	MDT
Analysis Time Period	Peak Season	Analysis Year	Existing (2018)

Project Description: *US 191 Corridor Study*

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway



Shoulder width (ft)	4.0
Lane Width (ft)	12.0
Segment Length (mi)	5.4
Total length of analysis segment, L_t	5.4
Length of two-lane highway upstream of the passing lane, L_u	0.2
Length of passing lane including tapers , L_{pl}	0.9
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	52.6
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	85.5
Level of service[1], LOS_d (from Directional Two-Lane Highway Segment Worksheet)	E
Average Travel Speed	
Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23)	1.70
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d $L_d=L_t-(L_u+L_{pl}+L_{de})$	2.60
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28)	1.11
Average travel speed including passing lane[2], $ATS_{pl} = (ATS_d * L_t) / (L_u+L_d+(L_{pl}/f_{pl})+ (2L_{de}/(1+f_{pl,ATS})))$	54.4
Percent free flow speed including passing lane, $PFFS_{pl} = (ATS_{pl}/ FFS)$	81.9
Percent Time-Spent-Following	
Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23)	4.03
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d =L_t-(L_u+ L_{pl}+ L_{de})$	0.27
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl,PTSF}$(Exhibit 15-26)	0.62

Percent time-spent-following including passing lane[3], $PTSF_{pl}$(%) $PTSF_{pl}= PTSF_d[L_u+L_d+f_{pl,PTSF}L_{pl}+((1+f_{pl,PTSF})/2)L_{de}]/L_t$	67.9
Level of Service and Other Performance Measures[4]	
Level of service including passing lane LOS_{pl} (Exhibit 15-3)	D
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}= VMT_{15}/ATS_{pl}$	23.3
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	937.5
Effective width, W_v (Eq. 15-29) ft	16.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	7.86
Bicycle level of service (Exhibit 15-4)	F
Notes	
1. If LOS_d=F, passing lane analysis cannot be performed. 2. If L_d <0, use alternative Equation 15-18. 3. If L_d<0, use alternative Equation 15-16. 4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.	

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US 191 Corridor Study
Four Corners to Beaver Creek

Appendix E:

Projected Conditions Analysis

US 191 Corridor Study

Vistro File: F:\...\191 LOS.vistro
Report File: F:\...\Aug 2040 AM.pdf

Scenario 4 Aug 2040 AM
12/4/2019

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	SB Right	0.904	74.5	E
2	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	0.841	209.0	F
3	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	SB Left	1.119	145.7	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	74.5
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.904

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	147	71	141	562	87	140
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	15.70	16.30	27.60	7.90	6.80	6.40
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	243	118	233	931	144	232
Peak Hour Factor	0.9200	0.9200	0.9200	0.9200	0.9200	0.9200
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	66	32	63	253	39	63
Total Analysis Volume [veh/h]	264	128	253	1012	157	252
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	4	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	6	6	0
Maximum Green [s]	0	35	35	30	30	0
Amber [s]	0.0	4.7	4.7	3.0	3.0	0.0
All red [s]	0.0	1.3	1.3	3.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	3.0	3.0	0.0
Walk [s]	0	5	5	5	5	0
Pedestrian Clearance [s]	0	10	10	10	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	2.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	4.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	35	35	35	35	13	13
g / C, Green / Cycle	0.58	0.58	0.58	0.58	0.22	0.22
(v / s)_i Volume / Saturation Flow Rate	0.26	0.08	0.18	0.73	0.10	0.18
s, saturation flow rate [veh/h]	1003	1525	1368	1395	1577	1412
c, Capacity [veh/h]	567	884	793	809	349	313
d1, Uniform Delay [s]	12.54	5.82	6.54	12.69	20.32	22.27
k, delay calibration	0.11	0.11	0.11	0.50	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.60	0.07	0.23	123.41	0.91	4.88
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.47	0.14	0.32	1.25	0.45	0.81
d, Delay for Lane Group [s/veh]	13.14	5.89	6.77	136.09	21.22	27.15
Lane Group LOS	B	A	A	F	C	C
Critical Lane Group	No	No	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	2.05	0.47	1.05	33.94	1.90	3.61
50th-Percentile Queue Length [ft/ln]	51.30	11.75	26.36	848.44	47.52	90.33
95th-Percentile Queue Length [veh/ln]	3.69	0.85	1.90	51.07	3.42	6.50
95th-Percentile Queue Length [ft/ln]	92.34	21.16	47.44	1276.75	85.53	162.59

Movement, Approach, & Intersection Results

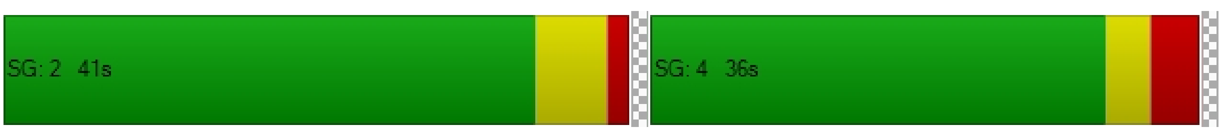
d_M, Delay for Movement [s/veh]	13.14	5.89	6.77	136.09	21.22	27.15
Movement LOS	B	A	A	F	C	C
d_A, Approach Delay [s/veh]	10.77		110.23		24.87	
Approach LOS	B		F		C	
d_I, Intersection Delay [s/veh]	74.46					
Intersection LOS	E					
Intersection V/C	0.904					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.779	6.220	4.132
Bicycle LOS	E	F	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	209.0
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.841

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	6	179	6	49	576	26	38	11	14	8	3	24
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	16.70	7.30	0.00	6.10	12.10	11.50	5.30	0.00	7.10	0.00	0.00	4.20
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	10	296	10	81	954	43	63	18	23	13	5	40
Peak Hour Factor	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480	0.9480
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	3	78	3	21	252	11	17	5	6	3	1	11
Total Analysis Volume [veh/h]	11	312	11	85	1006	45	66	19	24	14	5	42
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.00	0.00	0.07	0.01	0.00	0.84	0.17	0.08	0.20	0.05	0.06
d_M, Delay for Movement [s/veh]	11.02	0.00	0.00	8.19	0.00	0.00	208.96	196.02	175.66	65.66	47.91	18.11
Movement LOS	B	A	A	A	A	A	F	F	F	F	E	C
95th-Percentile Queue Length [veh/ln]	0.06	0.00	0.00	0.23	0.00	0.00	7.04	7.04	7.04	1.26	1.26	1.26
95th-Percentile Queue Length [ft/ln]	1.38	0.00	0.00	5.64	0.00	0.00	175.90	175.90	175.90	31.54	31.54	31.54
d_A, Approach Delay [s/veh]	0.36			0.61			199.38			31.46		
Approach LOS	A			A			F			D		
d_I, Intersection Delay [s/veh]	14.92											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 3: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	145.7
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.119

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	63	218	278	532	357	95	126	284	76	321	289	400
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	6.40	7.40	2.80	4.30	15.40	13.70	17.50	3.50	6.50	3.10	8.00	4.90
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	104	361	460	881	591	157	209	470	126	532	479	662
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	29	101	129	247	166	44	59	132	35	149	135	186
Total Analysis Volume [veh/h]	117	406	517	990	664	176	235	528	142	598	538	744
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	4	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			4,6									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	10	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	35	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	4.3	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	2.7	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	24	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	5.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	133	133	133	133	133	133	133	133	133	133	133	133
L, Total Lost Time per Cycle [s]	6.00	6.70	7.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	13	23	90	30	40	40	61	33	33	61	38	75
g / C, Green / Cycle	0.10	0.17	0.68	0.22	0.30	0.30	0.45	0.24	0.24	0.45	0.29	0.56
(v / s)_i Volume / Saturation Flow Rate	0.08	0.14	0.39	0.35	0.31	0.32	0.26	0.23	0.23	0.59	0.36	0.58
s, saturation flow rate [veh/h]	1424	2823	1309	2814	1383	1287	888	1531	1421	1018	1475	1287
c, Capacity [veh/h]	138	490	888	632	417	388	281	375	348	387	423	726
d1, Uniform Delay [s]	59.36	53.30	11.44	51.79	46.68	46.68	32.94	49.25	49.26	39.05	47.62	29.12
k, delay calibration	0.11	0.11	0.50	0.26	0.43	0.47	0.50	0.31	0.31	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	13.22	3.68	2.79	258.90	45.26	65.80	24.65	22.36	23.64	258.20	139.31	39.96
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.85	0.83	0.58	1.57	1.02	1.07	0.84	0.93	0.93	1.55	1.27	1.03
d, Delay for Lane Group [s/veh]	72.58	56.98	14.22	310.68	91.93	112.47	57.59	71.61	72.90	297.25	186.93	69.08
Lane Group LOS	E	E	B	F	F	F	E	E	E	F	F	F
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	4.41	6.83	8.43	33.26	18.96	19.85	6.90	13.62	12.76	36.86	30.36	30.14
50th-Percentile Queue Length [ft/ln]	110.20	170.85	210.71	831.53	473.92	496.32	172.55	340.44	319.10	921.53	759.11	753.58
95th-Percentile Queue Length [veh/ln]	7.85	11.12	13.19	52.03	26.38	28.41	11.21	19.67	18.62	59.57	45.08	39.97
95th-Percentile Queue Length [ft/ln]	196.28	278.04	329.74	1300.71	659.43	710.19	280.27	491.73	465.58	1489.34	1127.07	999.37

Movement, Approach, & Intersection Results

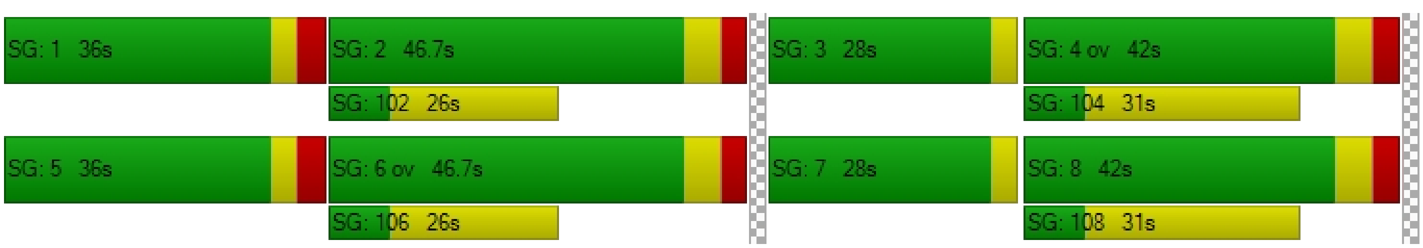
d_M, Delay for Movement [s/veh]	72.58	56.98	14.22	310.68	99.37	112.47	57.59	72.05	72.90	297.25	186.93	69.08
Movement LOS	E	E	B	F	F	F	E	E	E	F	F	F
d_A, Approach Delay [s/veh]	37.48			214.95			68.43			175.38		
Approach LOS	D			F			E			F		
d_I, Intersection Delay [s/veh]	145.71											
Intersection LOS	F											
Intersection V/C	1.119											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	3.264	3.076	2.554	3.063
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.418	3.069	2.306	4.662
Bicycle LOS	B	C	B	E

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



US 191 Corridor Study

Vistro File: F:\...\191 LOS.vistro
Report File: F:\...\Aug 2040 Noon.pdf

Scenario 5 Aug 2040 Noon
12/4/2019

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Right	0.608	17.2	B
6	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	0.661	113.9	F
11	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	WB Thru	0.924	53.7	D

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	17.2
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.608

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	185	107	96	192	182	171
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	20.00	9.30	19.70	13.10	13.20	21.00
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	306	177	159	318	301	283
Peak Hour Factor	0.9520	0.9520	0.9520	0.9520	0.9520	0.9520
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	80	46	42	84	79	74
Total Analysis Volume [veh/h]	321	186	167	334	316	297
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	61	61	61	61	61	61
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	19	19
g / C, Green / Cycle	0.49	0.49	0.49	0.49	0.31	0.31
(v / s)_i Volume / Saturation Flow Rate	0.34	0.13	0.13	0.28	0.24	0.27
s, saturation flow rate [veh/h]	938	1459	1330	1200	1344	1117
c, Capacity [veh/h]	484	720	656	592	417	347
d1, Uniform Delay [s]	17.24	8.99	8.97	10.87	18.98	19.78
k, delay calibration	0.14	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.96	0.19	0.20	0.85	2.84	6.13
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.66	0.26	0.25	0.56	0.76	0.86
d, Delay for Lane Group [s/veh]	19.20	9.18	9.17	11.72	21.82	25.91
Lane Group LOS	B	A	A	B	C	C
Critical Lane Group	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.44	1.06	0.95	2.35	4.06	4.24
50th-Percentile Queue Length [ft/ln]	86.09	26.40	23.73	58.75	101.43	106.04
95th-Percentile Queue Length [veh/ln]	6.20	1.90	1.71	4.23	7.30	7.62
95th-Percentile Queue Length [ft/ln]	154.97	47.52	42.72	105.76	182.58	190.47

Movement, Approach, & Intersection Results

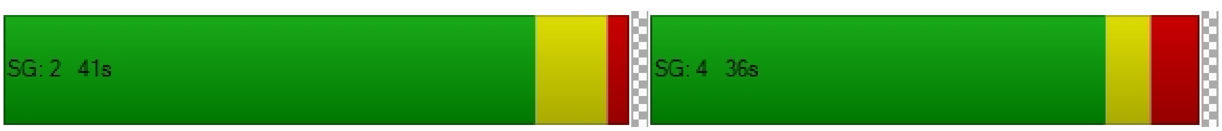
d_M, Delay for Movement [s/veh]	19.20	9.18	9.17	11.72	21.82	25.91
Movement LOS	B	A	A	B	C	C
d_A, Approach Delay [s/veh]	15.52		10.87		23.81	
Approach LOS	B		B		C	
d_I, Intersection Delay [s/veh]	17.22					
Intersection LOS	B					
Intersection V/C	0.608					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.969	4.959	4.132
Bicycle LOS	E	E	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	113.9
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.661

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	9	335	13	39	281	34	32	7	10	10	7	27
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	10.80	7.70	7.70	10.70	2.90	6.30	0.00	0.00	10.00	0.00	0.00
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	15	555	22	65	465	56	53	12	17	17	12	45
Peak Hour Factor	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850	0.8850
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	4	157	6	18	131	16	15	3	5	5	3	13
Total Analysis Volume [veh/h]	17	627	25	73	525	63	60	14	19	19	14	51
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.02	0.01	0.00	0.08	0.01	0.00	0.66	0.10	0.03	0.20	0.11	0.11
d_M, Delay for Movement [s/veh]	8.67	0.00	0.00	9.31	0.00	0.00	113.94	100.77	80.76	55.37	45.69	24.79
Movement LOS	A	A	A	A	A	A	F	F	F	F	E	C
95th-Percentile Queue Length [veh/ln]	0.05	0.00	0.00	0.26	0.00	0.00	4.62	4.62	4.62	1.91	1.91	1.91
95th-Percentile Queue Length [ft/ln]	1.30	0.00	0.00	6.54	0.00	0.00	115.39	115.39	115.39	47.64	47.64	47.64
d_A, Approach Delay [s/veh]	0.22			1.03			105.18			35.19		
Approach LOS	A			A			F			E		
d_I, Intersection Delay [s/veh]	9.00											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 11: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	53.7
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.924

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	56	285	314	400	253	112	166	261	44	289	273	402
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.80	10.20	3.50	4.60	12.20	8.10	10.20	5.80	4.20	2.40	9.50	4.20
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	93	472	520	662	419	185	275	432	73	479	452	666
Peak Hour Factor	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900	0.9900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	23	119	131	167	106	47	69	109	18	121	114	168
Total Analysis Volume [veh/h]	94	477	525	669	423	187	278	436	74	484	457	673
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	4	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			4,6									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	10	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	35	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	4.3	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	2.7	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	24	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	5.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	132	132	132	132	132	132	132	132	132	132	132	132
L, Total Lost Time per Cycle [s]	6.00	6.70	7.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	9	25	89	30	45	45	58	30	30	58	35	72
g / C, Green / Cycle	0.07	0.19	0.68	0.23	0.34	0.34	0.44	0.23	0.23	0.44	0.26	0.54
(v / s)_i Volume / Saturation Flow Rate	0.06	0.16	0.36	0.21	0.20	0.20	0.25	0.16	0.16	0.40	0.28	0.47
s, saturation flow rate [veh/h]	1643	3064	1446	3119	1581	1420	1112	1670	1587	1222	1619	1438
c, Capacity [veh/h]	117	572	977	706	540	485	334	379	360	488	427	781
d1, Uniform Delay [s]	60.62	51.91	10.95	50.49	35.99	36.08	34.01	46.94	46.96	40.81	48.77	25.98
k, delay calibration	0.11	0.11	0.50	0.11	0.19	0.19	0.50	0.12	0.12	0.50	0.45	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	11.91	3.27	2.12	7.54	1.78	2.08	20.83	2.54	2.70	38.71	60.96	12.01
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.80	0.83	0.54	0.95	0.59	0.60	0.83	0.69	0.69	0.99	1.07	0.86
d, Delay for Lane Group [s/veh]	72.53	55.18	13.07	58.03	37.77	38.16	54.84	49.48	49.65	79.53	109.72	37.99
Lane Group LOS	E	E	B	E	D	D	D	D	D	E	F	D
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.51	7.90	8.04	11.62	8.81	8.05	7.97	8.18	7.81	17.47	21.27	20.17
50th-Percentile Queue Length [ft/ln]	87.64	197.39	201.04	290.49	220.26	201.24	199.27	204.55	195.15	436.72	531.82	504.19
95th-Percentile Queue Length [veh/ln]	6.31	12.50	12.69	17.21	13.68	12.70	12.60	12.87	12.39	24.32	30.03	27.53
95th-Percentile Queue Length [ft/ln]	157.76	312.60	317.31	430.25	341.96	317.57	315.03	321.83	309.70	608.08	750.81	688.32

Movement, Approach, & Intersection Results

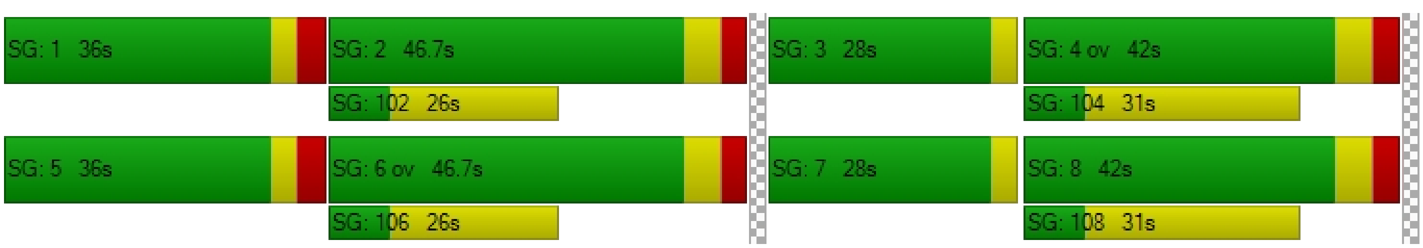
d_M, Delay for Movement [s/veh]	72.53	55.18	13.07	58.03	37.87	38.16	54.84	49.55	49.65	79.53	109.72	37.99
Movement LOS	E	E	B	E	D	D	D	D	D	E	F	D
d_A, Approach Delay [s/veh]	36.50			48.46			51.42			70.76		
Approach LOS	D			D			D			E		
d_I, Intersection Delay [s/veh]	53.74											
Intersection LOS	D											
Intersection V/C	0.924											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	2.987	3.003	2.503	2.932
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.464	2.615	2.210	4.223
Bicycle LOS	B	B	B	D

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



US 191 Corridor Study

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Report File: F:\...\Aug 2040 PM.pdf

Scenario 6 Aug 2040 PM
12/4/2019

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Left	0.894	113.0	F
6	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	4.571	2,213.9	F
11	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	WB Thru	1.367	161.5	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	113.0
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.894

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	153	183	95	167	506	235
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	8.60	10.40	11.60	1.80	8.10	5.10
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	253	303	157	277	838	389
Peak Hour Factor	0.9400	0.9400	0.9400	0.9400	0.9400	0.9400
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	67	81	42	74	223	103
Total Analysis Volume [veh/h]	269	322	167	295	891	414
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	72	72	72	72	72	72
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	30	30
g / C, Green / Cycle	0.42	0.42	0.42	0.42	0.42	0.42
(v / s)_i Volume / Saturation Flow Rate	0.26	0.22	0.12	0.22	0.63	0.32
s, saturation flow rate [veh/h]	1038	1446	1431	1320	1404	1285
c, Capacity [veh/h]	430	604	598	552	584	534
d1, Uniform Delay [s]	22.64	15.72	13.84	15.74	21.08	18.18
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.25
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	1.50	0.73	0.25	0.81	245.58	5.55
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.63	0.53	0.28	0.53	1.53	0.78
d, Delay for Lane Group [s/veh]	24.14	16.46	14.09	16.55	266.67	23.73
Lane Group LOS	C	B	B	B	F	C
Critical Lane Group	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	3.76	3.38	1.53	3.12	48.84	6.34
50th-Percentile Queue Length [ft/ln]	94.10	84.62	38.26	77.88	1220.94	158.52
95th-Percentile Queue Length [veh/ln]	6.78	6.09	2.75	5.61	76.39	10.47
95th-Percentile Queue Length [ft/ln]	169.38	152.32	68.87	140.18	1909.69	261.76

Movement, Approach, & Intersection Results

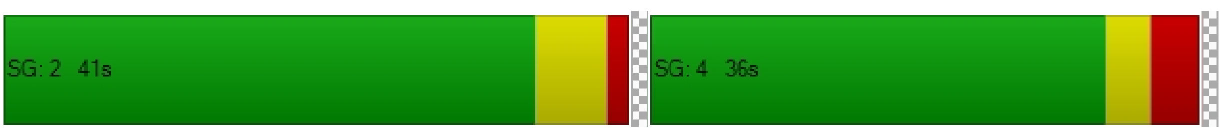
d_M, Delay for Movement [s/veh]	24.14	16.46	14.09	16.55	266.67	23.73
Movement LOS	C	B	B	B	F	C
d_A, Approach Delay [s/veh]	19.95		15.66		189.60	
Approach LOS	B		B		F	
d_I, Intersection Delay [s/veh]	113.00					
Intersection LOS	F					
Intersection V/C	0.894					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	5.108	4.895	4.132
Bicycle LOS	F	E	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	2,213.9
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	4.571

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	35	758	10	32	287	53	32	5	26	4	2	35
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	8.60	7.40	10.00	6.30	2.80	0.00	6.30	0.00	0.00	0.00	0.00	8.60
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	58	1255	17	53	475	88	53	8	43	7	3	58
Peak Hour Factor	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830	0.8830
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	16	355	5	15	134	25	15	2	12	2	1	16
Total Analysis Volume [veh/h]	66	1421	19	60	538	100	60	9	49	8	3	66
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.07	0.01	0.00	0.13	0.01	0.00	4.57	0.26	0.09	0.46	0.10	0.41
d_M, Delay for Movement [s/veh]	9.24	0.00	0.00	14.04	0.00	0.00	2213.85	2042.69	1946.20	350.20	259.06	164.00
Movement LOS	A	A	A	B	A	A	F	F	F	F	F	F
95th-Percentile Queue Length [veh/ln]	0.23	0.00	0.00	0.45	0.00	0.00	14.75	14.75	14.75	5.26	5.26	5.26
95th-Percentile Queue Length [ft/ln]	5.82	0.00	0.00	11.20	0.00	0.00	368.76	368.76	368.76	131.46	131.46	131.46
d_A, Approach Delay [s/veh]	0.40			1.21			2089.65			187.05		
Approach LOS	A			A			F			F		
d_I, Intersection Delay [s/veh]	109.39											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 11: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	161.5
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.367

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	1	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	30.00			30.00			30.00			30.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	98	482	430	504	287	132	166	334	53	293	379	620
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	3.00	10.30	2.60	1.20	4.10	1.60	10.80	2.10	1.90	1.70	2.10	3.30
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	162	798	712	835	475	219	275	553	88	485	628	1027
Peak Hour Factor	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620	0.9620
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	42	207	185	217	123	57	71	144	23	126	163	267
Total Analysis Volume [veh/h]	168	830	740	868	494	228	286	575	91	504	653	1068
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	4	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			4,6									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	10	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	35	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	4.3	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	2.7	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	7	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	24	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	5.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	152	152	152	152	152	152	152	152	152	152	152	152
L, Total Lost Time per Cycle [s]	6.00	6.70	7.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	18	40	109	30	52	52	62	34	34	62	35	72
g / C, Green / Cycle	0.12	0.26	0.72	0.20	0.34	0.34	0.41	0.23	0.23	0.41	0.23	0.47
(v / s)_i Volume / Saturation Flow Rate	0.10	0.27	0.51	0.27	0.22	0.23	0.27	0.20	0.20	0.44	0.38	0.74
s, saturation flow rate [veh/h]	1627	3061	1457	3206	1693	1518	1050	1721	1640	1135	1721	1449
c, Capacity [veh/h]	191	805	1045	632	580	520	332	390	371	388	396	686
d1, Uniform Delay [s]	66.10	56.07	12.35	61.07	42.14	42.66	42.02	56.78	56.78	48.37	58.57	40.07
k, delay calibration	0.11	0.11	0.50	0.19	0.30	0.33	0.50	0.31	0.31	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	12.21	23.62	4.05	171.78	3.32	4.50	24.39	15.59	16.22	152.49	303.34	258.12
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.88	1.03	0.71	1.37	0.64	0.67	0.86	0.88	0.88	1.30	1.65	1.56
d, Delay for Lane Group [s/veh]	78.31	79.69	16.40	232.85	45.46	47.16	66.41	72.37	73.00	200.86	361.91	298.19
Lane Group LOS	E	F	B	F	D	D	E	E	E	F	F	F
Critical Lane Group	No	No	Yes	No	No	No	Yes	No	No	No	Yes	Yes
50th-Percentile Queue Length [veh/ln]	7.10	18.06	14.80	27.30	12.43	11.92	10.00	14.37	13.75	27.62	48.60	74.36
50th-Percentile Queue Length [ft/ln]	177.42	451.59	370.02	682.51	310.73	297.88	250.09	359.13	343.85	690.39	1215.05	1859.06
95th-Percentile Queue Length [veh/ln]	11.47	25.51	21.11	41.55	18.21	17.58	15.19	20.58	19.84	42.50	74.74	114.89
95th-Percentile Queue Length [ft/ln]	286.64	637.79	527.76	1038.63	455.27	439.41	379.77	514.52	495.91	1062.44	1868.47	2872.34

Movement, Approach, & Intersection Results

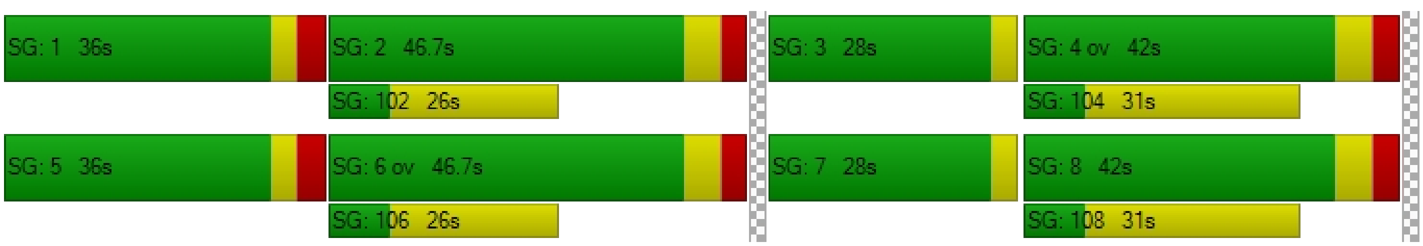
d_M, Delay for Movement [s/veh]	78.31	79.69	16.40	232.85	45.87	47.16	66.41	72.62	73.00	200.86	361.91	298.19
Movement LOS	E	F	B	F	D	D	E	E	E	F	F	F
d_A, Approach Delay [s/veh]	52.61			148.13			70.79			294.85		
Approach LOS	D			F			E			F		
d_I, Intersection Delay [s/veh]	161.47											
Intersection LOS	F											
Intersection V/C	1.367											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	3.198	3.165	2.618	3.159
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.993	2.871	2.345	5.231
Bicycle LOS	C	C	B	F

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



US 191 Corridor Study

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Report File: F:\...\Dec Thurs 2040 AM.pdf

Scenario 9 Dec Thurs 2040 AM

1/10/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	SB Right	0.982	107.4	F
2	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	2.573	1,076.9	F
3	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	WB Left	1.032	141.6	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	107.4
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.982

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	217	50	81	623	72	174
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	5.10	18.00	12.30	4.20	7.00	4.60
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	359	83	134	1032	119	288
Peak Hour Factor	0.9360	0.9360	0.9360	0.9360	0.9360	0.9360
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	96	22	36	276	32	77
Total Analysis Volume [veh/h]	384	89	143	1103	127	308
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	63	63	63	63	63	63
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	35	35	35	35	16	16
g / C, Green / Cycle	0.56	0.56	0.56	0.56	0.25	0.25
(v / s)_i Volume / Saturation Flow Rate	0.32	0.06	0.09	0.77	0.08	0.21
s, saturation flow rate [veh/h]	1214	1501	1580	1438	1574	1433
c, Capacity [veh/h]	694	833	877	798	401	365
d1, Uniform Delay [s]	12.61	6.64	6.87	14.03	19.05	22.31
k, delay calibration	0.12	0.11	0.11	0.50	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.75	0.06	0.09	179.73	0.45	5.33
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.55	0.11	0.16	1.38	0.32	0.84
d, Delay for Lane Group [s/veh]	13.36	6.70	6.95	193.76	19.50	27.63
Lane Group LOS	B	A	A	F	B	C
Critical Lane Group	No	No	No	Yes	No	Yes
50th-Percentile Queue Length [veh/ln]	3.15	0.39	0.65	46.99	1.49	4.62
50th-Percentile Queue Length [ft/ln]	78.69	9.75	16.19	1174.76	37.16	115.48
95th-Percentile Queue Length [veh/ln]	5.67	0.70	1.17	72.20	2.68	8.14
95th-Percentile Queue Length [ft/ln]	141.65	17.55	29.14	1805.09	66.88	203.60

Movement, Approach, & Intersection Results

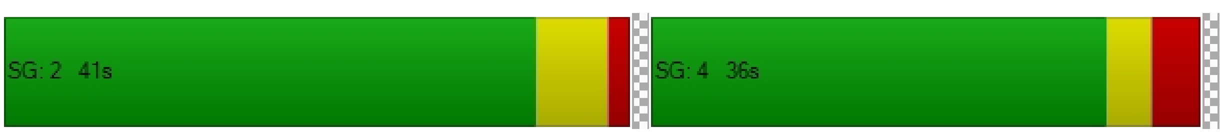
d_M, Delay for Movement [s/veh]	13.36	6.70	6.95	193.76	19.50	27.63
Movement LOS	B	A	A	F	B	C
d_A, Approach Delay [s/veh]	12.10		172.32		25.26	
Approach LOS	B		F		C	
d_I, Intersection Delay [s/veh]	107.44					
Intersection LOS	F					
Intersection V/C	0.982					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.913	6.188	4.132
Bicycle LOS	E	F	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 2: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	1,076.9
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	2.573

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			55.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	29	152	4	65	599	69	67	12	21	12	3	24
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	7.30	0.00	0.00	5.60	1.40	0.00	0.00	0.00	8.30	0.00	0.00
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	48	252	7	108	992	114	111	20	35	20	5	40
Peak Hour Factor	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900	0.8900
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	13	71	2	30	279	32	31	6	10	6	1	11
Total Analysis Volume [veh/h]	54	283	8	121	1115	128	125	22	39	22	6	45
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	2	2
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.10	0.00	0.00	0.09	0.01	0.00	2.57	0.31	0.15	0.71	0.10	0.06
d_M, Delay for Movement [s/veh]	12.02	0.00	0.00	8.10	0.00	0.00	1076.91	1053.97	1016.91	227.52	171.60	115.31
Movement LOS	B	A	A	A	A	A	F	F	F	F	F	F
95th-Percentile Queue Length [veh/ln]	0.31	0.00	0.00	0.31	0.00	0.00	19.23	19.23	19.23	4.63	4.63	4.63
95th-Percentile Queue Length [ft/ln]	7.86	0.00	0.00	7.80	0.00	0.00	480.64	480.64	480.64	115.65	115.65	115.65
d_A, Approach Delay [s/veh]	1.88			0.72			1061.62			153.75		
Approach LOS	A			A			F			F		
d_I, Intersection Delay [s/veh]	106.87											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 3: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	141.6
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.032

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	2	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	45.00			45.00			45.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	45	186	244	521	342	89	137	315	73	335	278	334
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	11.10	6.00	2.80	5.00	12.00	12.40	3.60	3.50	4.10	3.60	1.80	4.80
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	75	308	404	863	566	147	227	522	121	555	460	553
Peak Hour Factor	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870	0.8870
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	21	87	114	243	160	41	64	147	34	156	130	156
Total Analysis Volume [veh/h]	85	347	455	973	638	166	256	589	136	626	519	623
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	7	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			6,7									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	6	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	25	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	3.0	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	0.0	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	0	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	1.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	133	133	133	133	133	133	133	133	133	133	133	133
L, Total Lost Time per Cycle [s]	6.00	6.70	3.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	10	21	53	30	41	41	62	34	34	62	40	77
g / C, Green / Cycle	0.07	0.16	0.40	0.23	0.31	0.31	0.47	0.26	0.26	0.47	0.30	0.58
(v / s)_i Volume / Saturation Flow Rate	0.06	0.12	0.35	0.35	0.29	0.30	0.26	0.24	0.24	0.64	0.33	0.48
s, saturation flow rate [veh/h]	1368	2857	1309	2798	1426	1328	1000	1531	1433	985	1553	1288
c, Capacity [veh/h]	102	452	519	630	441	410	307	395	370	382	471	748
d1, Uniform Delay [s]	60.81	53.69	37.19	51.59	44.48	45.37	34.81	48.50	48.50	39.75	46.40	22.64
k, delay calibration	0.11	0.11	0.50	0.25	0.38	0.42	0.50	0.35	0.35	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	15.72	2.76	18.51	248.71	22.63	33.33	22.72	27.03	28.22	299.41	72.32	10.49
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.83	0.77	0.88	1.54	0.92	0.97	0.83	0.95	0.95	1.64	1.10	0.83
d, Delay for Lane Group [s/veh]	76.53	56.45	55.69	300.30	67.10	78.70	57.53	75.53	76.72	339.15	118.72	33.13
Lane Group LOS	E	E	E	F	E	E	E	E	E	F	F	C
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	3.23	5.62	15.75	31.98	15.27	16.26	6.93	14.80	13.98	40.08	24.47	16.60
50th-Percentile Queue Length [ft/ln]	80.64	140.43	393.77	799.39	381.86	406.58	173.35	370.10	349.45	1002.07	611.86	414.97
95th-Percentile Queue Length [veh/ln]	5.81	9.50	22.26	50.01	21.68	22.88	11.25	21.11	20.11	65.68	34.65	23.28
95th-Percentile Queue Length [ft/ln]	145.15	237.60	556.49	1250.21	542.10	571.93	281.31	527.85	502.73	1642.09	866.31	582.01

Movement, Approach, & Intersection Results

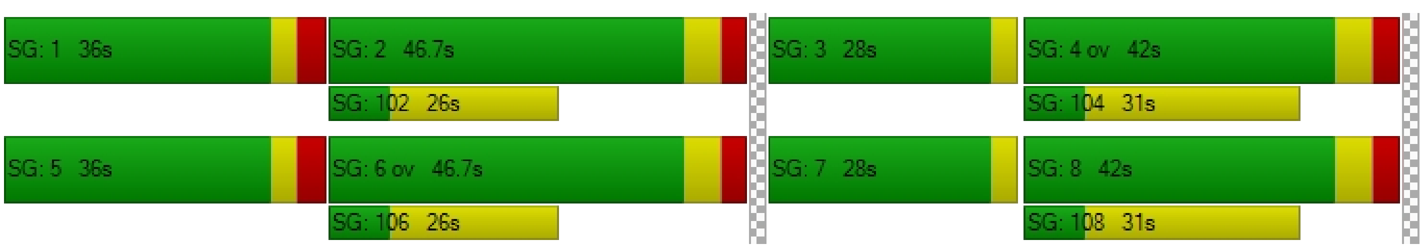
d_M, Delay for Movement [s/veh]	76.53	56.45	55.69	300.30	71.31	78.70	57.53	75.96	76.72	339.15	118.72	33.13
Movement LOS	E	E	E	F	E	E	E	E	E	F	F	C
d_A, Approach Delay [s/veh]		57.99			197.38			71.26			166.61	
Approach LOS		E			F			E			F	
d_I, Intersection Delay [s/veh]						141.63						
Intersection LOS						F						
Intersection V/C						1.032						

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	3.464	3.300	2.771	3.406
Crosswalk LOS	C	C	C	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.291	3.026	2.369	4.477
Bicycle LOS	B	C	B	E

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



191 Corridor Study

Vistro File: F:\...\191 LOS.vistro
Scenario 16 Dec Thurs 2040 Noon

Report File: F:\...\Dec Thurs 2040 Noon.pdf
1/7/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Left	0.538	16.1	B
6	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	0.258	39.8	E
11	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	NB Left	0.773	38.5	D

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	16.1
Analysis Method:	HCM 6th Edition	Level Of Service:	B
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.538

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	93	49	60	186	194	120
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.40	14.30	26.70	7.60	9.80	5.80
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	154	81	99	308	321	199
Peak Hour Factor	0.8860	0.8860	0.8860	0.8860	0.8860	0.8860
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	43	23	28	87	91	56
Total Analysis Volume [veh/h]	174	91	112	348	362	225
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	60	60	60	60	60	60
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	18	18
g / C, Green / Cycle	0.50	0.50	0.50	0.50	0.30	0.30
(v / s)_i Volume / Saturation Flow Rate	0.15	0.07	0.09	0.28	0.26	0.18
s, saturation flow rate [veh/h]	1130	1397	1243	1258	1384	1277
c, Capacity [veh/h]	587	694	618	625	421	389
d1, Uniform Delay [s]	12.25	8.17	8.40	10.56	19.79	17.74
k, delay calibration	0.11	0.11	0.11	0.11	0.11	0.11
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.28	0.08	0.14	0.78	5.22	1.36
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.30	0.13	0.18	0.56	0.86	0.58
d, Delay for Lane Group [s/veh]	12.53	8.26	8.54	11.34	25.01	19.10
Lane Group LOS	B	A	A	B	C	B
Critical Lane Group	No	No	No	Yes	Yes	No
50th-Percentile Queue Length [veh/ln]	1.28	0.47	0.59	2.36	5.03	2.61
50th-Percentile Queue Length [ft/ln]	32.09	11.68	14.85	59.07	125.70	65.21
95th-Percentile Queue Length [veh/ln]	2.31	0.84	1.07	4.25	8.71	4.70
95th-Percentile Queue Length [ft/ln]	57.76	21.02	26.73	106.33	217.64	117.38

Movement, Approach, & Intersection Results

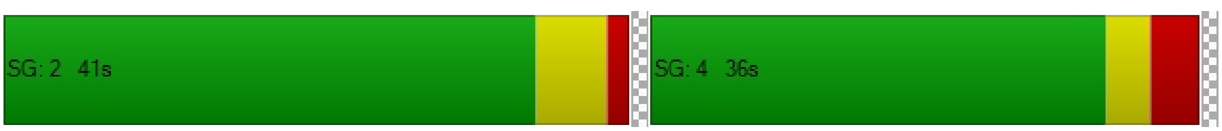
d_M, Delay for Movement [s/veh]	12.53	8.26	8.54	11.34	25.01	19.10
Movement LOS	B	A	A	B	C	B
d_A, Approach Delay [s/veh]	11.06		10.66		22.75	
Approach LOS	B		B		C	
d_I, Intersection Delay [s/veh]	16.15					
Intersection LOS	B					
Intersection V/C	0.538					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.570	4.891	4.132
Bicycle LOS	E	E	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	39.8
Analysis Method:	HCM 6th Edition	Level Of Service:	E
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.258

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			55.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	5	259	12	46	232	28	22	8	1	10	3	32
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	9.70	0.00	0.00	12.00	7.10	9.10	25.00	0.00	0.00	0.00	6.30
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	8	429	20	76	384	46	36	13	2	17	5	53
Peak Hour Factor	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240	0.9240
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	2	116	5	21	104	12	10	4	1	5	1	14
Total Analysis Volume [veh/h]	9	464	22	82	416	50	39	14	2	18	5	57
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.01	0.00	0.00	0.08	0.00	0.00	0.26	0.08	0.00	0.11	0.03	0.10
d_M, Delay for Movement [s/veh]	8.28	0.00	0.00	8.58	0.00	0.00	39.76	35.84	21.56	29.74	27.07	14.34
Movement LOS	A	A	A	A	A	A	E	E	C	D	D	B
95th-Percentile Queue Length [veh/ln]	0.02	0.00	0.00	0.24	0.00	0.00	1.39	1.39	1.39	0.88	0.88	0.88
95th-Percentile Queue Length [ft/ln]	0.62	0.00	0.00	6.11	0.00	0.00	34.78	34.78	34.78	22.12	22.12	22.12
d_A, Approach Delay [s/veh]	0.15			1.28			38.10			18.60		
Approach LOS	A			A			E			C		
d_I, Intersection Delay [s/veh]	3.70											
Intersection LOS	E											

Intersection Level Of Service Report
Intersection 11: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	38.5
Analysis Method:	HCM 6th Edition	Level Of Service:	D
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.773

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	2	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	45.00			45.00			45.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	47	233	232	349	262	89	134	241	37	228	221	305
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	10.60	6.80	3.00	3.40	8.00	14.60	9.70	4.20	10.80	3.10	5.90	6.20
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	78	386	384	578	434	147	222	399	61	378	366	505
Peak Hour Factor	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680	0.9680
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	20	100	99	149	112	38	57	103	16	98	95	130
Total Analysis Volume [veh/h]	81	399	397	597	448	152	229	412	63	390	378	522
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	7	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			6,7									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	6	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	25	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	3.0	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	0.0	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	0	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	1.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	116	116	116	116	116	116	116	116	116	116	116	116
L, Total Lost Time per Cycle [s]	6.00	6.70	3.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	8	18	50	30	41	41	48	20	20	48	30	67
g / C, Green / Cycle	0.07	0.16	0.43	0.26	0.35	0.35	0.41	0.17	0.17	0.41	0.26	0.58
(v / s)_i Volume / Saturation Flow Rate	0.05	0.13	0.27	0.19	0.19	0.19	0.20	0.14	0.14	0.30	0.23	0.37
s, saturation flow rate [veh/h]	1527	3153	1452	3150	1639	1499	1134	1692	1615	1299	1668	1415
c, Capacity [veh/h]	101	498	627	816	575	525	353	290	277	502	439	824
d1, Uniform Delay [s]	53.30	47.02	25.75	39.23	30.19	30.23	27.04	46.43	46.46	27.94	40.67	16.00
k, delay calibration	0.11	0.11	0.27	0.11	0.11	0.11	0.42	0.11	0.11	0.40	0.23	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	13.26	3.05	2.65	1.29	0.81	0.89	7.60	6.35	6.75	9.07	10.11	3.69
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.80	0.80	0.63	0.73	0.54	0.55	0.65	0.84	0.84	0.78	0.86	0.63
d, Delay for Lane Group [s/veh]	66.56	50.08	28.41	40.52	31.00	31.12	34.64	52.78	53.21	37.01	50.79	19.70
Lane Group LOS	E	D	C	D	C	C	C	D	D	D	D	B
Critical Lane Group	No	No	Yes	Yes	No	No	Yes	No	No	No	No	Yes
50th-Percentile Queue Length [veh/ln]	2.64	5.58	8.49	7.60	6.81	6.28	4.86	7.05	6.78	9.11	11.06	8.98
50th-Percentile Queue Length [ft/ln]	65.88	139.48	212.31	189.89	170.25	156.88	121.50	176.17	169.54	227.86	276.51	224.46
95th-Percentile Queue Length [veh/ln]	4.74	9.45	13.27	12.12	11.09	10.38	8.48	11.40	11.05	14.07	16.51	13.89
95th-Percentile Queue Length [ft/ln]	118.58	236.33	331.79	302.88	277.25	259.59	211.89	285.01	276.31	351.63	412.87	347.31

Movement, Approach, & Intersection Results

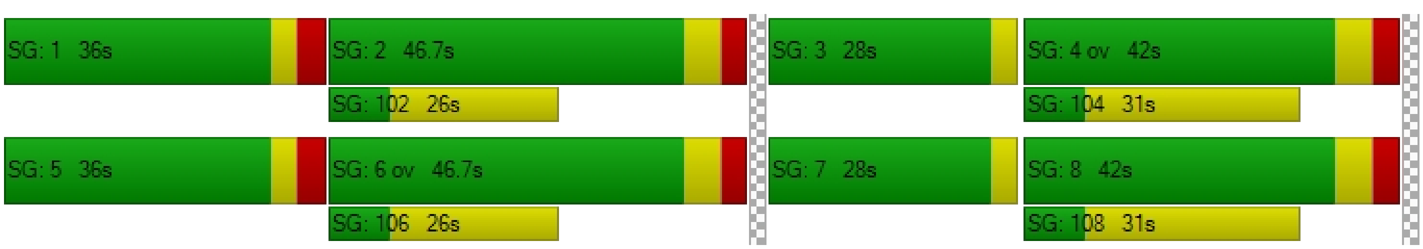
d_M, Delay for Movement [s/veh]	66.56	50.08	28.41	40.52	31.03	31.12	34.64	52.95	53.21	37.01	50.79	19.70
Movement LOS	E	D	C	D	C	C	C	D	D	D	D	B
d_A, Approach Delay [s/veh]		41.79			35.78			47.02			34.04	
Approach LOS		D			D			D			C	
d_I, Intersection Delay [s/veh]	38.47											
Intersection LOS	D											
Intersection V/C	0.773											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	2.990	3.116	2.611	3.088
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.283	2.547	2.140	3.688
Bicycle LOS	B	B	B	D

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



US 191 Corridor Study

Vistro File: F:\...\191 LOS.vistro

Report File: F:\...\Dec Thurs 2040 PM.pdf

Scenario 10 Dec Thurs 2040 PM

1/10/2020

Intersection Analysis Summary

ID	Intersection Name	Control Type	Method	Worst Mvmt	V/C	Delay (s/veh)	LOS
1	US 191 & MT 64	Signalized	HCM 6th Edition	EB Left	0.938	194.7	F
6	US 191 & Mill St/Rabel n	Two-way stop	HCM 6th Edition	EB Left	2.048	906.1	F
11	US 191/MT 85 & US 191/MT 84	Signalized	HCM 6th Edition	WB Thru	1.076	112.2	F

V/C, Delay, LOS: For two-way stop, these values are taken from the movement with the worst (highest) delay value. For all other control types, they are taken for the whole intersection.

Intersection Level Of Service Report
Intersection 1: US 191 & MT 64

Control Type:	Signalized	Delay (sec / veh):	194.7
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	0.938

Intersection Setup

Name	US 191		US 191		MT 64	
Approach	Northbound		Southbound		Eastbound	
Lane Configuration						
Turning Movement	Left	Thru	Thru	Right	Left	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1
Pocket Length [ft]	370.00	100.00	100.00	370.00	100.00	270.00
Speed [mph]	50.00		50.00		25.00	
Grade [%]	0.00		0.00		0.00	
Curb Present	No		No		No	
Crosswalk	No		No		No	

Volumes

Name	US 191		US 191		MT 64	
Base Volume Input [veh/h]	139	113	58	124	642	225
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	1.40	10.60	13.80	2.40	3.00	3.10
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0
Total Hourly Volume [veh/h]	230	187	96	205	1063	373
Peak Hour Factor	0.9830	0.9830	0.9830	0.9830	0.9830	0.9830
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	58	48	24	52	270	95
Total Analysis Volume [veh/h]	234	190	98	209	1081	379
Presence of On-Street Parking	No	No	No	No	No	No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0		0		0	
v_di, Inbound Pedestrian Volume crossing m	0		0		0	
v_co, Outbound Pedestrian Volume crossing	0		0		0	
v_ci, Inbound Pedestrian Volume crossing mi	0		0		0	
v_ab, Corner Pedestrian Volume [ped/h]	0		0		0	
Bicycle Volume [bicycles/h]	0		0		0	

Intersection Settings

Located in CBD	Yes
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
Signal Group	0	2	2	0	4	0
Auxiliary Signal Groups						
Lead / Lag	-	-	-	-	Lead	-
Minimum Green [s]	0	30	30	0	6	0
Maximum Green [s]	0	35	35	0	30	0
Amber [s]	0.0	4.7	4.7	0.0	3.0	0.0
All red [s]	0.0	1.3	1.3	0.0	3.0	0.0
Split [s]	0	0	0	0	0	0
Vehicle Extension [s]	0.0	3.0	3.0	0.0	3.0	0.0
Walk [s]	0	5	5	0	5	0
Pedestrian Clearance [s]	0	10	10	0	10	0
Rest In Walk		No	No		No	
I1, Start-Up Lost Time [s]	0.0	2.0	2.0	0.0	2.0	0.0
I2, Clearance Lost Time [s]	0.0	4.0	4.0	0.0	4.0	0.0
Minimum Recall		Yes	Yes		No	
Maximum Recall		No	No		No	
Pedestrian Recall		No	No		No	
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	C	R	L	R
C, Cycle Length [s]	72	72	72	72	72	72
L, Total Lost Time per Cycle [s]	6.00	6.00	6.00	6.00	6.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	2.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.00	4.00	4.00	4.00	4.00
g_i, Effective Green Time [s]	30	30	30	30	30	30
g / C, Green / Cycle	0.42	0.42	0.42	0.42	0.42	0.42
(v / s)_i Volume / Saturation Flow Rate	0.20	0.13	0.07	0.16	0.74	0.29
s, saturation flow rate [veh/h]	1173	1443	1403	1313	1464	1306
c, Capacity [veh/h]	512	603	586	549	609	543
d1, Uniform Delay [s]	18.97	14.08	13.14	14.54	21.08	17.35
k, delay calibration	0.11	0.11	0.11	0.11	0.50	0.20
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	0.64	0.30	0.13	0.43	355.59	2.98
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.46	0.32	0.17	0.38	1.78	0.70
d, Delay for Lane Group [s/veh]	19.61	14.37	13.27	14.97	376.66	20.33
Lane Group LOS	B	B	B	B	F	C
Critical Lane Group	Yes	No	No	No	Yes	No
50th-Percentile Queue Length [veh/ln]	2.78	1.77	0.85	2.02	69.55	5.27
50th-Percentile Queue Length [ft/ln]	69.59	44.31	21.28	50.58	1738.78	131.79
95th-Percentile Queue Length [veh/ln]	5.01	3.19	1.53	3.64	110.95	9.04
95th-Percentile Queue Length [ft/ln]	125.26	79.76	38.31	91.05	2773.85	225.92

Movement, Approach, & Intersection Results

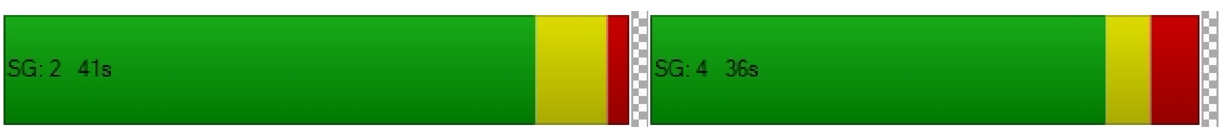
d_M, Delay for Movement [s/veh]	19.61	14.37	13.27	14.97	376.66	20.33
Movement LOS	B	B	B	B	F	C
d_A, Approach Delay [s/veh]	17.26		14.43		284.16	
Approach LOS	B		B		F	
d_I, Intersection Delay [s/veh]	194.72					
Intersection LOS	F					
Intersection V/C	0.938					

Other Modes

g_Walk,mi, Effective Walk Time [s]	0.0	0.0	0.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	0.00	0.00	0.00
I_p,int, Pedestrian LOS Score for Intersection	0.000	0.000	0.000
Crosswalk LOS	F	F	F
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	0	0	0
d_b, Bicycle Delay [s]	45.00	45.00	45.00
I_b,int, Bicycle LOS Score for Intersection	4.832	4.639	4.132
Bicycle LOS	E	E	D

Sequence

Ring 1	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-



Intersection Level Of Service Report
Intersection 6: US 191 & Mill St/Rabel n

Control Type:	Two-way stop	Delay (sec / veh):	906.1
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	2.048

Intersection Setup

Name	US 191			US 191			Mill St			Rabel Ln		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	0	1	0	1	0	0	0	0	0	0
Pocket Length [ft]	200.00	100.00	100.00	150.00	100.00	250.00	100.00	100.00	100.00	100.00	100.00	100.00
Speed [mph]	55.00			55.00			25.00			25.00		
Grade [%]	0.00			0.00			0.00			0.00		
Crosswalk	No			No			No			No		

Volumes

Name	US 191			US 191			Mill St			Rabel Ln		
Base Volume Input [veh/h]	67	706	4	30	216	103	28	7	11	4	4	28
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	0.00	3.80	0.00	3.30	3.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	111	1169	7	50	358	171	46	12	18	7	7	46
Peak Hour Factor	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320	0.9320
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	30	314	2	13	96	46	12	3	5	2	2	12
Total Analysis Volume [veh/h]	119	1254	8	54	384	183	49	13	19	8	8	49
Pedestrian Volume [ped/h]	0			0			0			0		

Intersection Settings

Priority Scheme	Free	Free	Stop	Stop
Flared Lane			No	No
Storage Area [veh]	0	0	0	0
Two-Stage Gap Acceptance			No	No
Number of Storage Spaces in Median	0	0	0	0

Movement, Approach, & Intersection Results

V/C, Movement V/C Ratio	0.12	0.01	0.00	0.10	0.00	0.00	2.05	0.27	0.03	0.32	0.21	0.23
d_M, Delay for Movement [s/veh]	9.02	0.00	0.00	12.31	0.00	0.00	906.13	829.52	761.05	225.13	178.63	100.03
Movement LOS	A	A	A	B	A	A	F	F	F	F	F	F
95th-Percentile Queue Length [veh/ln]	0.40	0.00	0.00	0.33	0.00	0.00	9.13	9.13	9.13	3.83	3.83	3.83
95th-Percentile Queue Length [ft/ln]	9.92	0.00	0.00	8.18	0.00	0.00	228.26	228.26	228.26	95.63	95.63	95.63
d_A, Approach Delay [s/veh]	0.78			1.07			859.80			125.10		
Approach LOS	A			A			F			F		
d_I, Intersection Delay [s/veh]	37.02											
Intersection LOS	F											

Intersection Level Of Service Report
Intersection 11: US 191/MT 85 & US 191/MT 84

Control Type:	Signalized	Delay (sec / veh):	112.2
Analysis Method:	HCM 6th Edition	Level Of Service:	F
Analysis Period:	15 minutes	Volume to Capacity (v/c):	1.076

Intersection Setup

Name	US 191			MT 85			MT 84			US 191		
Approach	Northbound			Southbound			Eastbound			Westbound		
Lane Configuration												
Turning Movement	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
Lane Width [ft]	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00
No. of Lanes in Pocket	1	0	1	2	0	0	1	0	1	1	0	0
Pocket Length [ft]	310.00	100.00	425.00	275.00	100.00	100.00	450.00	100.00	365.00	230.00	100.00	100.00
Speed [mph]	45.00			45.00			45.00			45.00		
Grade [%]	0.00			0.00			0.00			0.00		
Curb Present	No			No			No			No		
Crosswalk	Yes			Yes			Yes			Yes		

Volumes

Name	US 191			MT 85			MT 84			US 191		
Base Volume Input [veh/h]	74	454	452	436	284	106	151	287	56	298	299	541
Base Volume Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Heavy Vehicles Percentage [%]	4.10	4.00	1.10	1.60	3.60	3.70	3.90	0.30	1.80	1.00	1.00	2.00
Growth Factor	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558	1.6558
In-Process Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Site-Generated Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Diverted Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Pass-by Trips [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Existing Site Adjustment Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Other Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Right-Turn on Red Volume [veh/h]	0	0	0	0	0	0	0	0	0	0	0	0
Total Hourly Volume [veh/h]	123	752	748	722	470	176	250	475	93	493	495	896
Peak Hour Factor	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600	0.9600
Other Adjustment Factor	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
Total 15-Minute Volume [veh/h]	32	196	195	188	122	46	65	124	24	128	129	233
Total Analysis Volume [veh/h]	128	783	779	752	490	183	260	495	97	514	516	933
Presence of On-Street Parking	No		No	No		No	No		No	No		No
On-Street Parking Maneuver Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
Local Bus Stopping Rate [/h]	0	0	0	0	0	0	0	0	0	0	0	0
v_do, Outbound Pedestrian Volume crossing	0			0			0			0		
v_di, Inbound Pedestrian Volume crossing m	0			0			0			0		
v_co, Outbound Pedestrian Volume crossing	0			0			0			0		
v_ci, Inbound Pedestrian Volume crossing mi	0			0			0			0		
v_ab, Corner Pedestrian Volume [ped/h]	0			0			0			0		
Bicycle Volume [bicycles/h]	0			0			0			0		

Intersection Settings

Located in CBD	No
Signal Coordination Group	-
Cycle Length [s]	90
Coordination Type	Free Running
Actuation Type	Fully actuated
Offset [s]	0.0
Offset Reference	LeadGreen
Permissive Mode	SingleBand
Lost time [s]	0.00

Phasing & Timing

Control Type	Protecte	Permiss	Overlap	Protecte	Permiss	Permiss	ProtPer	Permiss	Permiss	ProtPer	Permiss	Overlap
Signal Group	1	6	7	5	2	0	3	8	0	7	4	5
Auxiliary Signal Groups			6,7									4,5
Lead / Lag	Lead	-	-	Lead	-	-	Lead	-	-	Lead	-	-
Minimum Green [s]	6	15	6	6	15	0	6	10	0	6	10	6
Maximum Green [s]	30	40	25	30	40	0	25	35	0	25	35	30
Amber [s]	3.0	4.3	3.0	3.0	4.3	0.0	3.0	4.3	0.0	3.0	4.3	3.0
All red [s]	3.0	2.4	0.0	3.0	2.4	0.0	0.0	2.7	0.0	0.0	2.7	3.0
Split [s]	0	0	0	0	0	0	0	0	0	0	0	0
Vehicle Extension [s]	3.0	3.0	3.0	3.0	3.0	0.0	3.0	3.0	0.0	3.0	3.0	3.0
Walk [s]	0	7	0	0	7	0	0	7	0	0	7	0
Pedestrian Clearance [s]	0	19	0	0	19	0	0	24	0	0	24	0
Rest In Walk		No			No			No			No	
I1, Start-Up Lost Time [s]	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0	2.0
I2, Clearance Lost Time [s]	4.0	4.7	1.0	4.0	4.7	0.0	1.0	5.0	0.0	1.0	5.0	4.0
Minimum Recall	No	Yes	No	No	Yes		No	No		No	No	No
Maximum Recall	No	No	No	No	No		No	No		No	No	No
Pedestrian Recall	No	No	No	No	No		No	No		No	No	No
Detector Location [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector Length [ft]	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Exclusive Pedestrian Phase

Pedestrian Signal Group	0
Pedestrian Walk [s]	0
Pedestrian Clearance [s]	0

Lane Group Calculations

Lane Group	L	C	R	L	C	C	L	C	C	L	C	R
C, Cycle Length [s]	146	146	146	146	146	146	146	146	146	146	146	146
L, Total Lost Time per Cycle [s]	6.00	6.70	3.00	6.00	6.70	6.70	7.00	7.00	7.00	7.00	7.00	6.00
l1_p, Permitted Start-Up Lost Time [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
l2, Clearance Lost Time [s]	4.00	4.70	0.00	4.00	4.70	4.70	0.00	5.00	5.00	0.00	5.00	0.00
g_i, Effective Green Time [s]	14	38	70	30	55	55	58	30	30	58	35	72
g / C, Green / Cycle	0.09	0.26	0.48	0.21	0.38	0.38	0.40	0.20	0.20	0.40	0.24	0.49
(v / s)_i Volume / Saturation Flow Rate	0.08	0.24	0.53	0.24	0.21	0.21	0.23	0.17	0.17	0.43	0.30	0.64
s, saturation flow rate [veh/h]	1613	3227	1475	3196	1700	1546	1139	1746	1648	1201	1736	1464
c, Capacity [veh/h]	151	850	708	657	638	580	314	357	337	409	416	722
d1, Uniform Delay [s]	65.14	52.31	37.93	58.00	35.87	36.05	38.27	55.95	55.96	48.41	55.50	37.00
k, delay calibration	0.11	0.11	0.50	0.11	0.24	0.25	0.50	0.21	0.22	0.50	0.50	0.50
I, Upstream Filtering Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
d2, Incremental Delay [s]	12.17	4.74	64.35	69.86	1.64	1.96	21.58	10.80	11.43	133.86	126.90	141.75
d3, Initial Queue Delay [s]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Rp, platoon ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
PF, progression factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Lane Group Results

X, volume / capacity	0.85	0.92	1.10	1.15	0.55	0.56	0.83	0.85	0.85	1.26	1.24	1.29
d, Delay for Lane Group [s/veh]	77.30	57.05	102.27	127.86	37.50	38.01	59.85	66.75	67.39	182.27	182.40	178.75
Lane Group LOS	E	E	F	F	D	D	E	E	E	F	F	F
Critical Lane Group	No	No	Yes	No	No	No	Yes	No	No	No	Yes	Yes
50th-Percentile Queue Length [veh/ln]	5.12	14.15	36.51	18.20	9.84	9.22	8.36	11.65	11.06	26.58	29.58	52.58
50th-Percentile Queue Length [ft/ln]	128.08	353.77	912.67	455.01	246.05	230.52	209.02	291.18	276.56	664.55	739.54	1314.60
95th-Percentile Queue Length [veh/ln]	8.84	20.32	49.91	27.04	14.99	14.20	13.10	17.24	16.52	40.34	43.25	76.93
95th-Percentile Queue Length [ft/ln]	220.88	508.00	1247.82	675.90	374.68	355.02	327.57	431.10	412.93	1008.54	1081.36	1923.34

Movement, Approach, & Intersection Results

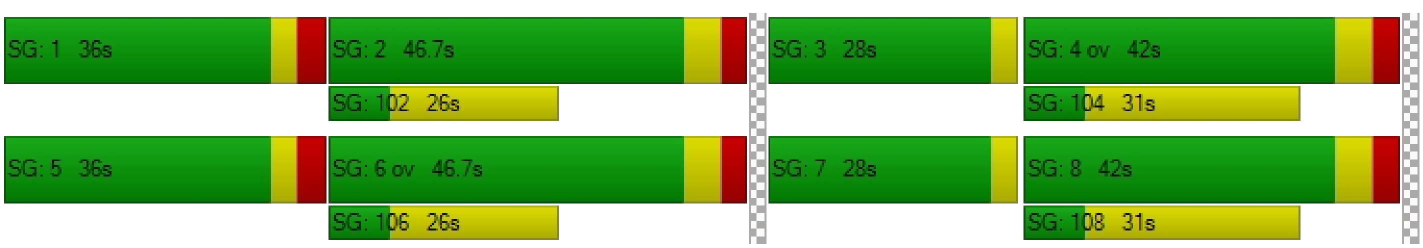
d_M, Delay for Movement [s/veh]	77.30	57.05	102.27	127.86	37.65	38.01	59.85	67.00	67.39	182.27	182.40	178.75
Movement LOS	E	E	F	F	D	D	E	E	E	F	F	F
d_A, Approach Delay [s/veh]	79.43			85.30			64.86			180.63		
Approach LOS	E			F			E			F		
d_I, Intersection Delay [s/veh]	112.25											
Intersection LOS	F											
Intersection V/C	1.076											

Other Modes

g_Walk,mi, Effective Walk Time [s]	11.0	11.0	11.0	11.0
M_corner, Corner Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
M_CW, Crosswalk Circulation Area [ft²/ped]	0.00	0.00	0.00	0.00
d_p, Pedestrian Delay [s]	34.67	34.67	34.67	34.67
I_p,int, Pedestrian LOS Score for Intersection	3.413	3.375	2.744	3.466
Crosswalk LOS	C	C	B	C
s_b, Saturation Flow Rate of the bicycle lane	2000	2000	2000	2000
c_b, Capacity of the bicycle lane [bicycles/h]	889	889	778	778
d_b, Bicycle Delay [s]	13.89	13.89	16.81	16.81
I_b,int, Bicycle LOS Score for Intersection	2.954	2.735	2.263	4.799
Bicycle LOS	C	B	B	E

Sequence

Ring 1	1	2	3	4	-	-	-	-	-	-	-	-	-	-	-	-
Ring 2	5	6	7	8	-	-	-	-	-	-	-	-	-	-	-	-
Ring 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ring 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

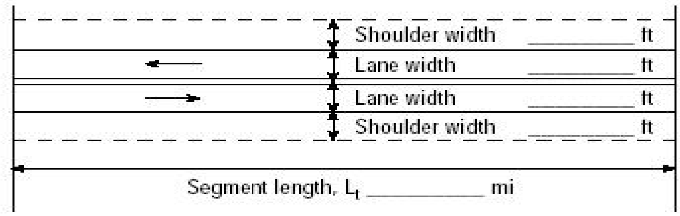


DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 78.5 - 75.8 (16-3A-006)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*1072*veh/h
Opposing direction vol., V_o	*714*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*12.0*
Segment Length mi	*2.8*
Peak-hour factor, PHF	*0.88*
No-passing zone	*100%*
% Trucks and Buses , P_T	*10* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*0.990*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1218*	*820*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.3 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*50.0 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*32.9 mi/h*
		Percent free flow speed, PFFS	*65.8 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1218*	*811*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*81.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*17.0*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*91.4*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.72*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*65.8*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1218.2*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.14*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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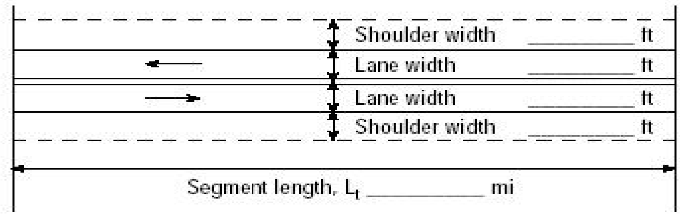
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 80.6 - 78.5 (16-3A-007)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*1140*veh/h
Opposing direction vol., V_o	*760*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*12.0*
Segment Length mi	*2.1*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.88*
No-passing zone	*70%*
% Trucks and Buses , P_T	*9* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*11*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1295*	*864*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*2.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.0 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.0 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*33.2 mi/h*
		Percent free flow speed, PFFS	*65.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1295*	*864*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*83.3*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*14.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF} / v_{d,PTSF} + v_{o,PTSF})$	*92.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.76*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*65.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1295.5*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*6.78*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

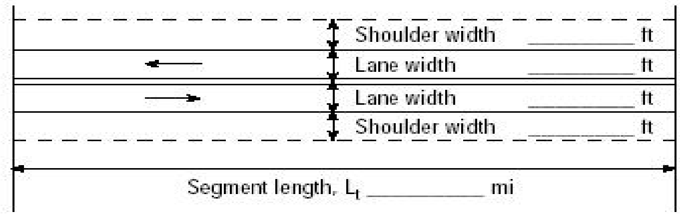
1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 81.9 - 80.6 (16-3A-008)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF	*0.88*
No-passing zone	*100%*
% Trucks and Buses , P_T	*6* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*36*/mi
Analysis direction vol., V_d	*1674*veh/h
Opposing direction vol., V_o	*1116*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*1.3*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*1902*	*1268*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*45.0 mi/h*
		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for access points[4], f_A (Exhibit 15-8)	*9.0 mi/h*
Total demand flow rate, both directions, *v*		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*36.0 mi/h*
Free-flow speed, FFS=$S_{FM}+0.00776(v/f_{HV,ATS})$		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*10.5 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.9 mi/h*	Percent free flow speed, PFFS	*29.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*1902*	*1268*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*93.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*10.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*99.8*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*F*
Volume to capacity ratio, *v/c*	*1.12*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*29.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1902.3*
Effective width, Wv (Eq. 15-29) ft	*28.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.27*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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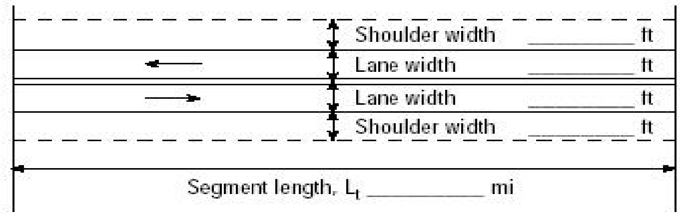
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		***Site Information***	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 47.9 - 45.3 (16-4-002)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *100%*

% Trucks and Buses , P_T *6 %*

% Recreational vehicles, P_R *4%*

Access points *mi* *15*/mi

Analysis direction vol., V_d *771*veh/h

Opposing direction vol., V_o *514*veh/h

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *2.6*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) v_i=V_i / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*876*	*588*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.0 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*53.7 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*40.3 mi/h*
		Percent free flow speed, PFFS	*75.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) v_i=V_i/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*876*	*584*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*69.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*26.3*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*85.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.53*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*876.1*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*5.82*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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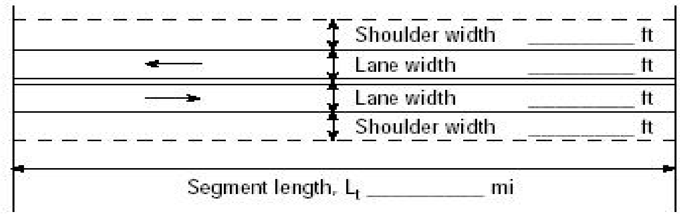
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		**Site Information**	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 70.4 - 47.9 (A-043)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



Analysis direction vol., V_d *924*veh/h

Opposing direction vol., V_o *616*veh/h

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *22.4*

☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *82%*

% Trucks and Buses , P_T *9* %

% Recreational vehicles, P_R *4%*

Access points *mi* *8*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*0.991*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*1050*	*706*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.5 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*55.4 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*40.3 mi/h*
		Percent free flow speed, PFFS	*72.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^* f_{g,PTSF})$	*1050*	*700*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*76.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*20.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*89.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.62*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*0*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*72.7*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1050.0*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*6.97*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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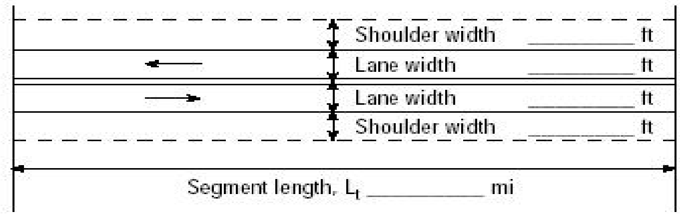
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 75.8 - 70.4 (W-107)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*1032*veh/h
Opposing direction vol., V_o	*688*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*12.0*
Segment Length mi	*5.4*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.88*
No-passing zone	*60%*
% Trucks and Buses , P_T	*12 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*9/mi*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*0.988*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1173*	*791*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*70.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*2.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*66.4 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*50.0 mi/h*
		Percent free flow speed, PFFS	*75.2 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1173*	*782*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*80.2*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*16.7*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*90.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.69*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*75.2*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1172.7*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.98*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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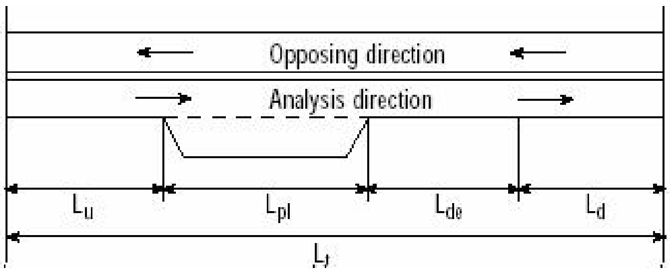
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		***Site Information***	
Analyst	*Kerry Pedersen*	Highway of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 75.8 - 70.4 (W-107)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Average Annual*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway



Shoulder width (ft)	*4.0*
Lane Width (ft)	*12.0*
Segment Length (mi)	*5.4*
Total length of analysis segment, L_t	*5.4*
Length of two-lane highway upstream of the passing lane, L_u	*0.2*
Length of passing lane including tapers , L_{pl}	*0.9*
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	*50.0*
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	*90.2*
Level of service[1], LOS_d (from Directional Two-Lane Highway Segment Worksheet)	*E*
Average Travel Speed	
Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23)	*1.70*
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d $L_d=L_t-(L_u+L_{pl}+L_{de})$	*2.60*
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28)	*1.11*
Average travel speed including passing lane[2], $ATS_{pl} = (ATS_d{}^* L_t) / (L_u+L_d+(L_{pl}/f_{pl})+(2L_{de}/(1+f_{pl,ATS})))$	*51.7*
Percent free flow speed including passing lane, $PFFS_{pl} = (ATS_{pl}/ FFS)$	*77.8*
Percent Time-Spent-Following	
Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23)	*3.60*
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d=L_t-(L_u+L_{pl}+L_{de})$	*0.70*
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl,PTSF}$(Exhibit 15-26)	*0.62*

Percent time-spent-following including passing lane[3], $PTSF_{pl}$(%) $PTSF_{pl} = PTSF_d[L_u + L_d + f_{pl,PTSF} L_{pl} + ((1+f_{pl,PTSF})/2) L_{de}]/L_t$	73.1
Level of Service and Other Performance Measures[4]	
Level of service including passing lane LOS_{pl} (Exhibit 15-3)	D
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15} = VMT_{15}/ATS_{pl}$	30.6
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1172.7
Effective width, W_v (Eq. 15-29) ft	16.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	7.98
Bicycle level of service (Exhibit 15-4)	F

Notes

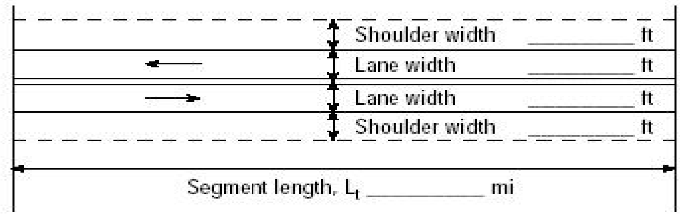
1. If LOS_d=F, passing lane analysis cannot be performed.
2. If L_d <0, use alternative Equation 15-18.
3. If L_d<0, use alternative Equation 15-16.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		**Site Information**	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 78.5 - 75.8 (16-3A-006)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*1454*veh/h
Opposing direction vol., V_o	*969*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*12.0*
Segment Length mi	*2.8*
Peak-hour factor, PHF	*0.88*
No-passing zone	*100%*
% Trucks and Buses , P_T	*10* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*15*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1652*	*1101*

Free-Flow Speed from Field Measurement		**Estimated Free-Flow Speed**	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0* mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3* mi/h
Free-flow speed, FFS=S_{FM}+0.00776(v/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8* mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.0* mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*50.0* mi/h
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*27.5* mi/h
		Percent free flow speed, PFFS	*55.1* %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1652*	*1101*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*90.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*10.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF} / v_{d,PTSF} + v_{o,PTSF})$	*96.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.97*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*55.1*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1652.3*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.30*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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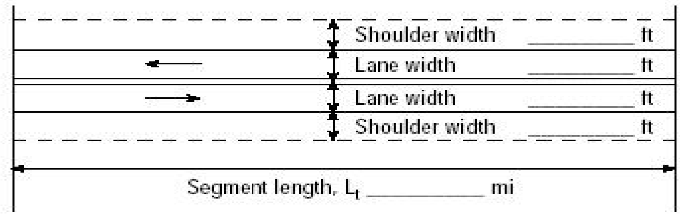
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 80.6 - 78.5 (16-3A-007)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*1546*veh/h
Opposing direction vol., V_o	*1031*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*12.0*
Segment Length mi	*2.1*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.88*
No-passing zone	*70%*
% Trucks and Buses , P_T	*9* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*11*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*1757*	*1172*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*55.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.8 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*51.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*27.5 mi/h*
		Percent free flow speed, PFFS	*53.9 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	*1757*	*1172*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*92.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*9.8*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*98.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*F*
Volume to capacity ratio, *v/c*	*1.03*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*53.9*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1756.8*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*6.93*
Bicycle level of service (Exhibit 15-4)	*F*
Notes	

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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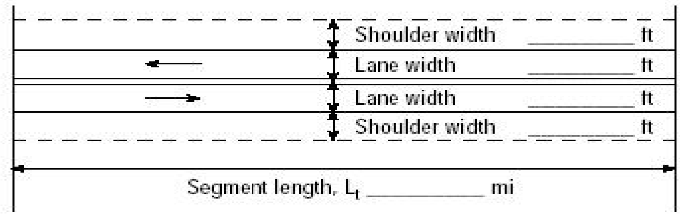
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 81.9 - 80.6 (16-3A-008)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*2271*veh/h
Opposing direction vol., V_o	*1514*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*1.3*
Peak-hour factor, PHF	*0.88*
No-passing zone	*100%*
% Trucks and Buses , P_T	*6* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*36*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*2581*	*1720*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*45.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*9.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.6 mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*36.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*2.0 mi/h*
		Percent free flow speed, PFFS	*5.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}*f_{g,PTSF})$	*2581*	*1720*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*97.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*10.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*100.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*F*
Volume to capacity ratio, *v/c*	*1.52*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*5.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*2580.7*
Effective width, Wv (Eq. 15-29) ft	*28.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*3.43*
Bicycle level of service (Exhibit 15-4)	*C*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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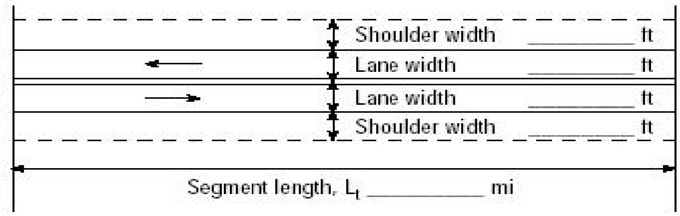
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 47.9 - 45.3 (16-4-002)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☐ Class II highway ☑ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF *0.88*

No-passing zone *100%*

% Trucks and Buses , P_T *6* %

% Recreational vehicles, P_R *4%*

Access points *mi* *15*/mi

Analysis direction vol., V_d *1057*veh/h

Opposing direction vol., V_o *705*veh/h

Shoulder width ft *2.0*

Lane Width ft *12.0*

Segment Length mi *2.6*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}$=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*0.994*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1201*	*806*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
		Base free-flow speed[4], BFFS	*60.0 mi/h*
		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Mean speed of sample[3], S_{FM}		Adj. for access points[4], f_A (Exhibit 15-8)	*3.8 mi/h*
Total demand flow rate, both directions, *v*		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*53.7 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*36.7 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.4 mi/h*	Percent free flow speed, PFFS	*68.4 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1201*	*801*
Base percent time-spent-following[4], $BPTSF_d$(%)=100(1-$e^{av_d^b}$)	*80.9*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*17.3*	
Percent time-spent-following, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*91.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.71*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*68.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1201.1*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*5.98*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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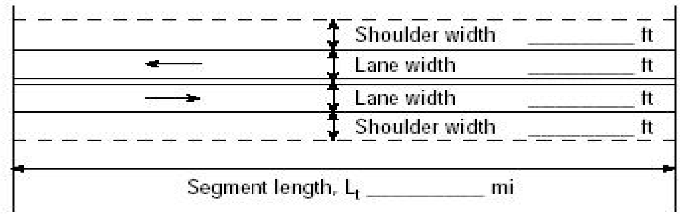
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 70.4 - 47.9 (A-043)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☐ Class I highway ☑ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*1266*veh/h
Opposing direction vol., V_o	*844*veh/h
Shoulder width ft	*2.0*
Lane Width ft	*12.0*
Segment Length mi	*22.4*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.88*
No-passing zone	*82%*
% Trucks and Buses , P_T	*9* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*8*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/ (1+ P_T (E_T -1)+P_R (E_R -1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i$ / (PHF* $f_{g,ATS}$ * $f_{HV,ATS}$)	*1439*	*959*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*60.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*2.6 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Adj. for access points[4], f_A (Exhibit 15-8)	*2.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.0 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*55.4 mi/h*
		Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*35.8 mi/h*
		Percent free flow speed, PFFS	*64.6 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/ (1+ P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i$/(PHF*$f_{HV,PTSF}$* $f_{g,PTSF}$)	*1439*	*959*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*86.6*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*12.3*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF} / v_{d,PTSF} + v_{o,PTSF})$	*94.0*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.85*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*0*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*64.6*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1438.6*
Effective width, Wv (Eq. 15-29) ft	*14.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.13*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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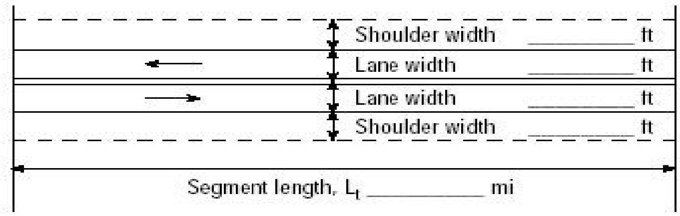
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*Kerry Pedersen*	Highway / Direction of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 75.8 - 70.4 (W-107)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*1400*veh/h
Opposing direction vol., V_o	*933*veh/h
Shoulder width ft	*4.0*
Lane Width ft	*12.0*
Segment Length mi	*5.4*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.88*
No-passing zone	*60%*
% Trucks and Buses , P_T	*12 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*9*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*1591*	*1060*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*70.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.0 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*66.4 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*44.8 mi/h*
		Percent free flow speed, PFFS	*67.5 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*1.000*
Grade adjustment factor[1], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^* f_{g,PTSF})$	*1591*	*1060*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*89.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*9.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}{}^*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*95.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*E*
Volume to capacity ratio, *v/c*	*0.94*

Capacity, $C_{d,ATS}$ (Equation 15-12) veh/h	*1700*
Capacity, $C_{d,PTSF}$ (Equation 15-13) veh/h	*1700*
Percent Free-Flow Speed $PFFS_d$(Equation 15-11 - Class III only)	*67.5*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*1590.9*
Effective width, Wv (Eq. 15-29) ft	*16.00*
Effective speed factor, S_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*8.13*
Bicycle level of service (Exhibit 15-4)	*F*

Notes

1. Note that the adjustment factor for level terrain is 1.00,as level terrain is one of the base conditions. For the purpose of grade adjustment, specific downgrade segments are treated as level terrain.
2. If v_i(v_d or v_o) >=1,700 pc/h, terminate analysis--the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only
5. Exhibit 15-20 provides coefficients a and b for Equation 15-10.
6. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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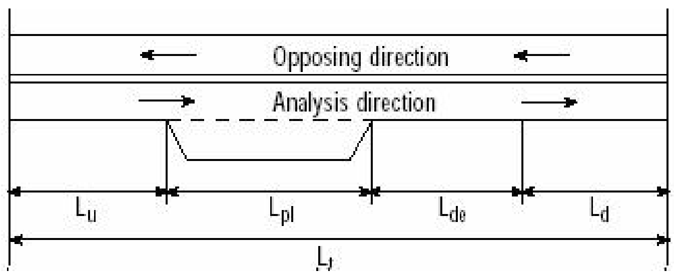
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		***Site Information***	
Analyst	*Kerry Pedersen*	Highway of Travel	*US 191*
Agency or Company	*RPA*	From/To	*RP 75.8 - 70.4 (W-107)*
Date Performed	*11/25/2019*	Jurisdiction	*MDT*
Analysis Time Period	*Peak Season*	Analysis Year	*Future (2040)*

Project Description: *US 191 Corridor Study*

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway



Shoulder width (ft)	*4.0*
Lane Width (ft)	*12.0*
Segment Length (mi)	*5.4*
Total length of analysis segment, L_t	*5.4*
Length of two-lane highway upstream of the passing lane, L_u	*0.2*
Length of passing lane including tapers , L_{pl}	*0.9*
Average travel speed, ATS_d (from Directional Two-Lane Highway Segment Worksheet)	*44.8*
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	*95.6*
Level of service[1], LOS_d (from Directional Two-Lane Highway Segment Worksheet)	*E*
Average Travel Speed	
Length of the downstream highway segment within the effective length of passing lane for average travel speed, L_{de} (Exhibit 15-23)	*1.70*
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d $L_d=L_t-(L_u+L_{pl}+L_{de})$	*2.60*
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28)	*1.11*
Average travel speed including passing lane[2], $ATS_{pl} = (ATS_d * L_t) / (L_u+L_d+(L_{pl}/f_{pl})+ (2L_{de}/(1+f_{pl,ATS})))$	*46.4*
Percent free flow speed including passing lane, $PFFS_{pl} = (ATS_{pl}/ FFS)$	*69.8*
Percent Time-Spent-Following	
Length of the downstream highway segment within the effective length of passing lane for percent time-spent-following, L_{de} (Exhibit 15-23)	*3.60*
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d =L_t-(L_u+ L_{pl}+ L_{de})$	*0.70*
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl,PTSF}$(Exhibit 15-26)	*0.62*

Percent time-spent-following including passing lane[3], $PTSF_{pl}$(%) $PTSF_{pl}= PTSF_d[L_u+L_d+f_{pl,PTSF}L_{pl}+((1+f_{pl,PTSF})/2)L_{de}]/L_t$	77.4
Level of Service and Other Performance Measures[4]	
Level of service including passing lane LOS_{pl} (Exhibit 15-3)	D
Peak 15-min total travel time, TT_{15}(veh-h) $TT_{15}= VMT_{15}/ATS_{pl}$	46.3
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	1590.9
Effective width, W_v (Eq. 15-29) ft	16.00
Effective speed factor, S_t (Eq. 15-30)	4.79
Bicycle level of service score, BLOS (Eq. 15-31)	8.13
Bicycle level of service (Exhibit 15-4)	F
Notes	

1. If LOS_d=F, passing lane analysis cannot be performed.
2. If L_d <0, use alternative Equation 15-18.
3. If L_d<0, use alternative Equation 15-16.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

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